Cloud Computing Homework4 -- Message Queue

Name	ID	Class
Qing Liu	6130116184	Class 164 of Computer Science and Technology

Run the rabbitmq in docker

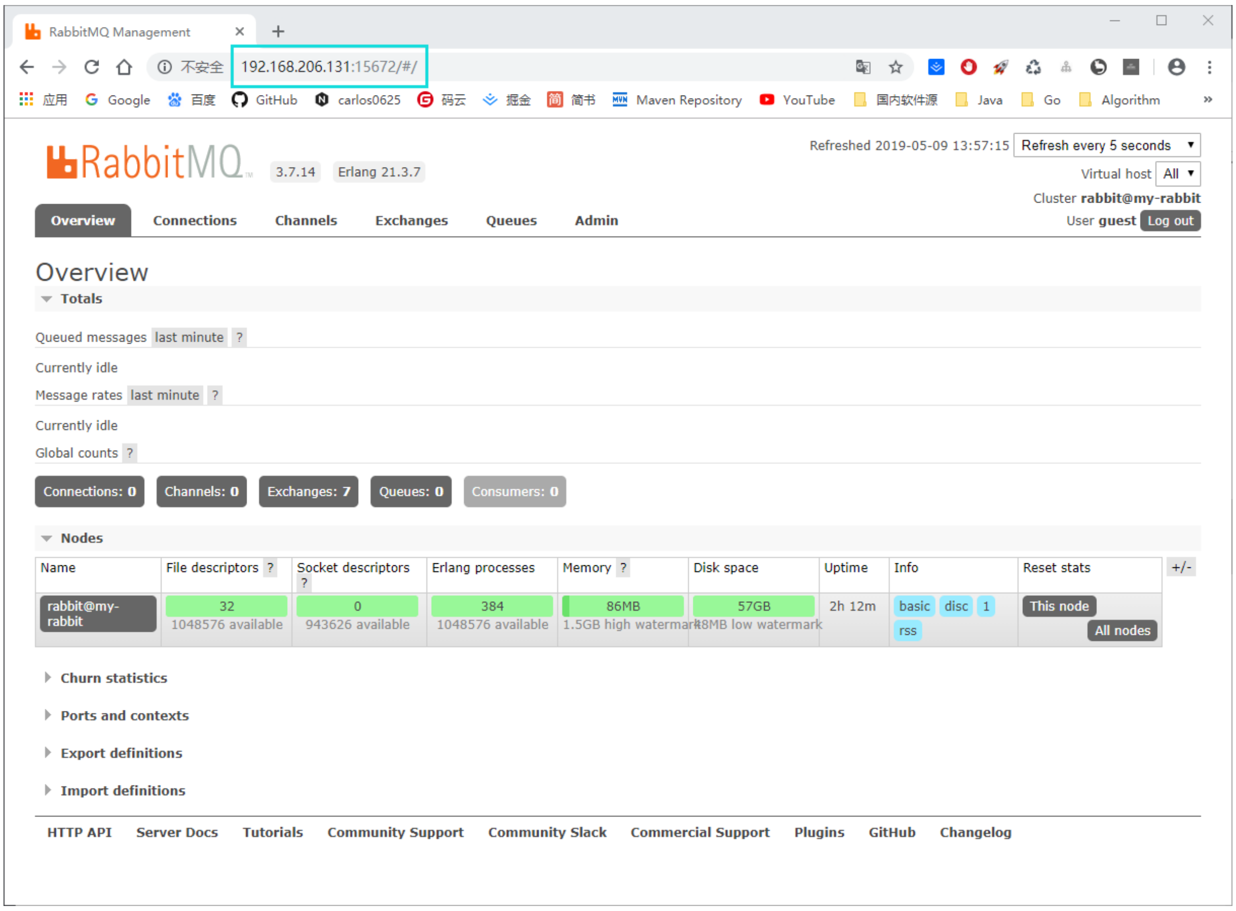
- Pull the image from docker hub

```
docker pull rabbitmq:management
```

- Run a rabbitmq container

```
docker run -d --hostname my-rabbit \
-p 5671:5671 -p 5672:5672 -p 4369:4369 \
-p 25672:25672 -p 15671:15671 \
-p 15672:15672  \
--name okong-rabbit -d rabbitmq:management
```

- Visit the `<ip>:15672` in chrome of host


RabbitMQ Management
192.168.206.131:15672/#/
应用 Google 百度 GitHub carlos0625 码云 掘金 简书 Maven Repository YouTube 国内软件源 Java Go Algorithm
RabbitMQ 3.7.14 Erlang 21.3.7
Overview Connections Channels Exchanges Queues Admin

Refreshed 2019-05-09 13:57:15 Refresh every 5 seconds
Virtual host All
Cluster rabbit@my-rabbit
User guest Log out

Overview

Totals

Queued messages last minute ?

Currently idle

Message rates last minute ?

Currently idle

Global counts ?

Connections: 0 Channels: 0 Exchanges: 7 Queues: 0 Consumers: 0

Nodes

Name	File descriptors ?	Socket descriptors ?	Erlang processes	Memory ?	Disk space	Uptime	Info	Reset stats	+/-
rabbit@my-rabbit	32 1048576 available	0 943626 available	384 1048576 available	86MB 1.5GB high watermark	57GB 48MB low watermark	2h 12m	basic disc 1 rss	This node All nodes	

Churn statistics

Ports and contexts

Export definitions

Import definitions

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Write the go scripts, build image and run the containers

- Write the script sending messages in go programming language and dockerfile

`send.go`:

```go
// send.go

package main

import (
  "fmt"
  "github.com/streadway/amqp"
  "log"
  "strconv"
)

func failOnError(err error, msg string) {
  if err != nil {
    // Exit the program.
    panic(fmt.Sprintf("%s: %s", msg, err))
  }
}

func main() {
  //create the connection
  conn, err := amqp.Dial("amqp://guest:guest@192.168.206.131:5672/")
```

```
    failOnError(err, "Error connecting to the broker")
    defer conn.Close()

    //get the channel
    ch, err := conn.Channel()
    failOnError(err, "Failed to open a channel")
    defer ch.Close()


    q, err := ch.QueueDeclare(
      "hello",
      false,
      false,
      false,
      false,
      nil,
      )
    failOnError(err, "Failed to declare a queue")

    // publisher
    for i := 0; i < 100; i++ {
      body := "hello" + strconv.Itoa(i)
      err = ch.Publish(
        "",
        q.Name,
        false,
        false,
        amqp.Publishing{
          ContentType: "text/plain",
          Body: []byte(body),
        })
      log.Printf(" [x] Sent %s", body)
    }

    failOnError(err, "Failed to publish a message")
  }
```

`Dockerfile`:

```
FROM golang:latest

WORKDIR /go/src/send
COPY . /go/src/send

RUN go get -v github.com/streadway/amqp
RUN go build .

EXPOSE 8000

ENTRYPOINT ["./send"]
```

- Write the script receiving messages in go programming language and dockerfile

  `receive.go`:

```go
// receive.go

package main

import (
  "fmt"
  "github.com/streadway/amqp"
  "log"
)

func failOnError(err error, msg string) {
  if err != nil {
    // Exit the program.
    panic(fmt.Sprintf("%s: %s", msg, err))
  }
}

func main() {
  //create the connection
  conn, err := amqp.Dial("amqp://guest:guest@192.168.206.131:5672/")
  failOnError(err, "Error connecting to the broker")
  defer conn.Close()

  //get the channel
  ch, err := conn.Channel()
  failOnError(err, "Failed to open a channel")
  defer ch.Close()

  q, err := ch.QueueDeclare(
    "hello",
    false,
    false,
    false,
    false,
    nil)
  failOnError(err, "Failed to declare a queue")

  //consumer
  msgs, err := ch.Consume(
    q.Name,
    "",
    true,
    false,
    false,
    false,
    nil)
  failOnError(err, "Failed to register a consumer")

  forever := make(chan bool)
```

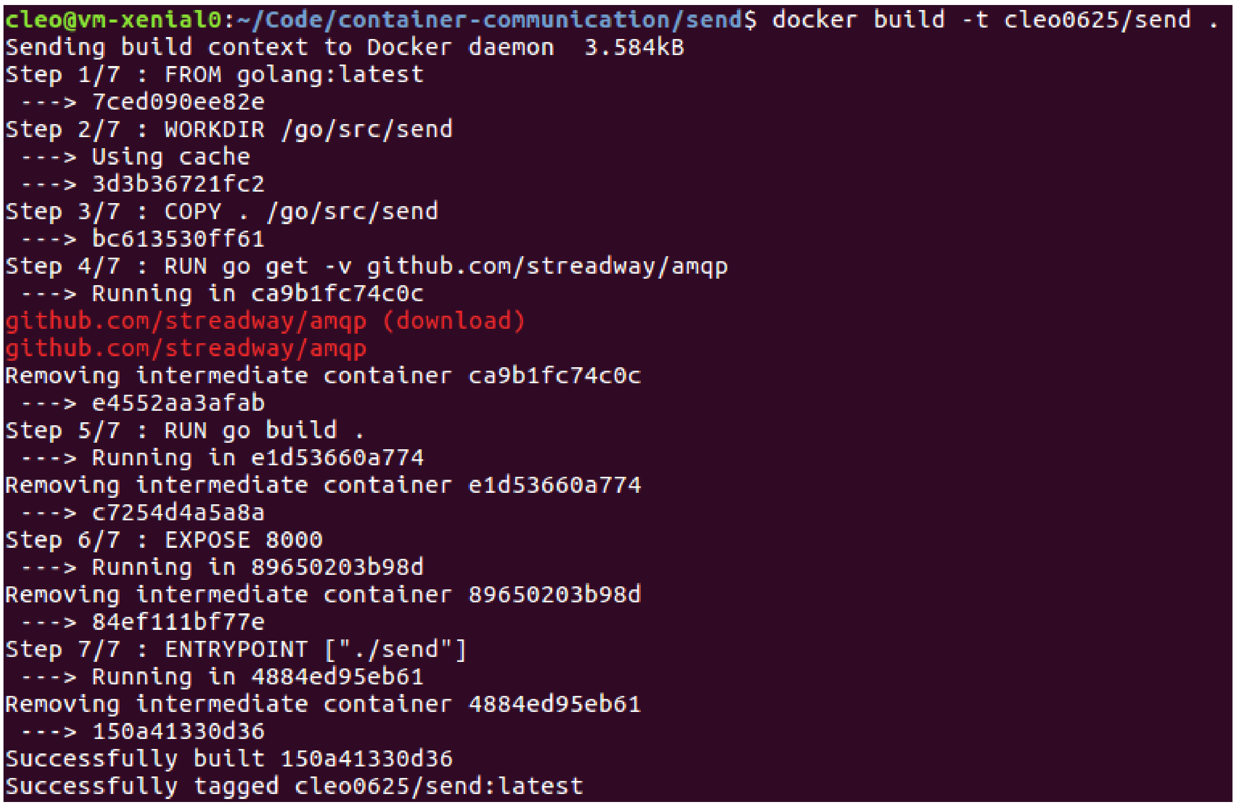
```
    go func() {
      for d := range msgs {
        log.Printf("Received a message: %s", d.Body)
      }
    }()

    log.Printf(" [*] Waiting for messages. To exit press CTRL+C")
    <-forever
  }
```

`dockerfile`:

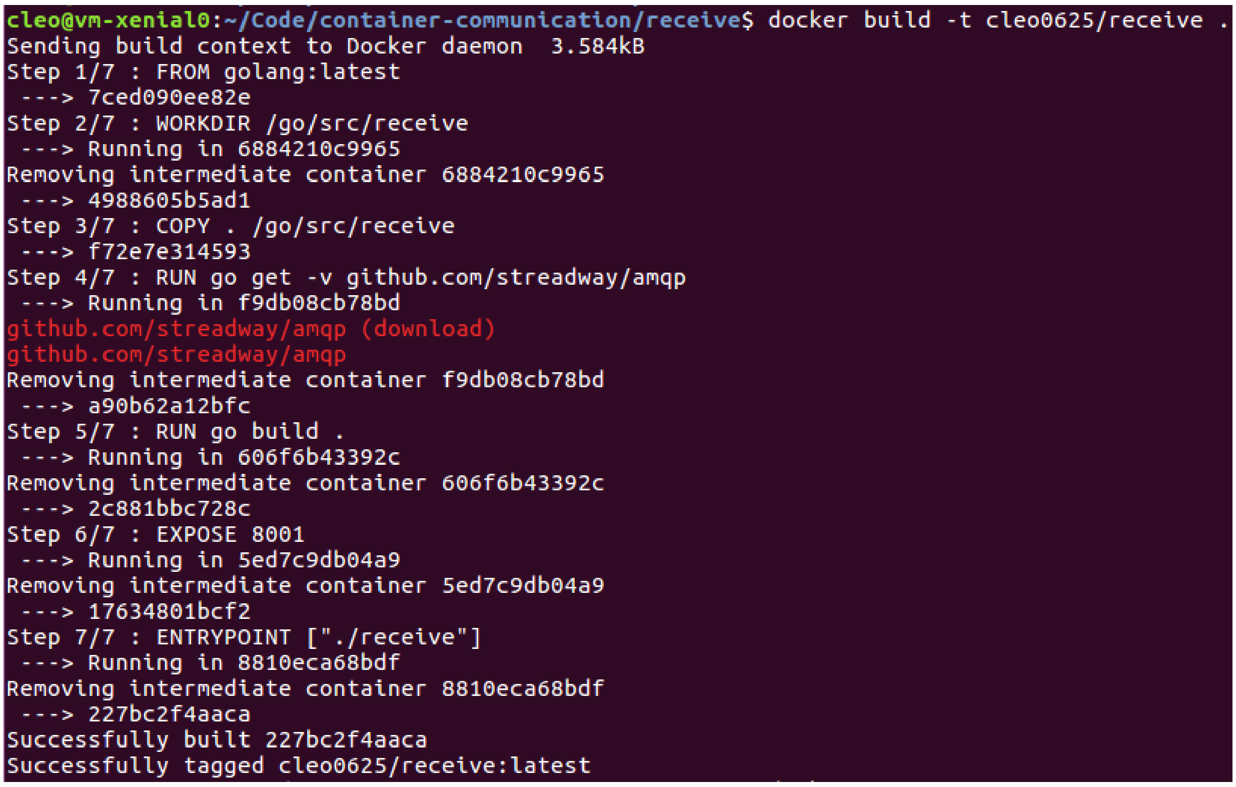
```
FROM golang:latest

WORKDIR /go/src/receive
COPY . /go/src/receive

RUN go get -v github.com/streadway/amqp
RUN go build .

EXPOSE 8001

ENTRYPOINT ["./receive"]
```

- Build the two programs into images

```
cd ~/Code/container-communication/send
docker build -t cleo0625/send .
cd ../receive
docker build -t cleo0625/receive .
```



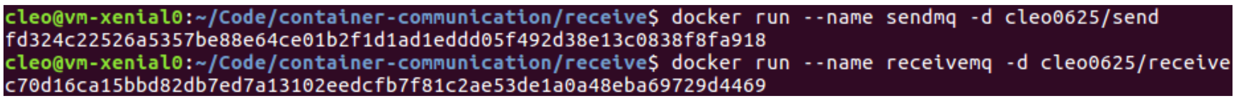
```
cleo@vm-xenial0:~/Code/container-communication/send$ docker build -t cleo0625/send .
Sending build context to Docker daemon  3.584kB
Step 1/7 : FROM golang:latest
 ---> 7ced090ee82e
Step 2/7 : WORKDIR /go/src/send
 ---> Using cache
 ---> 3d3b36721fc2
Step 3/7 : COPY . /go/src/send
 ---> bc613530ff61
Step 4/7 : RUN go get -v github.com/streadway/amqp
 ---> Running in ca9b1fc74c0c
github.com/streadway/amqp (download)
github.com/streadway/amqp
Removing intermediate container ca9b1fc74c0c
 ---> e4552aa3afab
Step 5/7 : RUN go build .
 ---> Running in e1d53660a774
Removing intermediate container e1d53660a774
 ---> c7254d4a5a8a
Step 6/7 : EXPOSE 8000
 ---> Running in 89650203b98d
Removing intermediate container 89650203b98d
 ---> 84ef111bf77e
Step 7/7 : ENTRYPOINT ["./send"]
 ---> Running in 4884ed95eb61
Removing intermediate container 4884ed95eb61
 ---> 150a41330d36
Successfully built 150a41330d36
Successfully tagged cleo0625/send:latest
```



```
cleo@vm-xenial0:~/Code/container-communication/receive$ docker build -t cleo0625/receive .
Sending build context to Docker daemon  3.584kB
Step 1/7 : FROM golang:latest
 ---> 7ced090ee82e
Step 2/7 : WORKDIR /go/src/receive
 ---> Running in 6884210c9965
Removing intermediate container 6884210c9965
 ---> 4988605b5ad1
Step 3/7 : COPY . /go/src/receive
 ---> f72e7e314593
Step 4/7 : RUN go get -v github.com/streadway/amqp
 ---> Running in f9db08cb78bd
github.com/streadway/amqp (download)
github.com/streadway/amqp
Removing intermediate container f9db08cb78bd
 ---> a90b62a12bfc
Step 5/7 : RUN go build .
 ---> Running in 606f6b43392c
Removing intermediate container 606f6b43392c
 ---> 2c881bbc728c
Step 6/7 : EXPOSE 8001
 ---> Running in 5ed7c9db04a9
Removing intermediate container 5ed7c9db04a9
 ---> 17634801bcf2
Step 7/7 : ENTRYPOINT ["./receive"]
 ---> Running in 8810eca68bdf
Removing intermediate container 8810eca68bdf
 ---> 227bc2f4aaca
Successfully built 227bc2f4aaca
Successfully tagged cleo0625/receive:latest
```

- Run send container and receive container

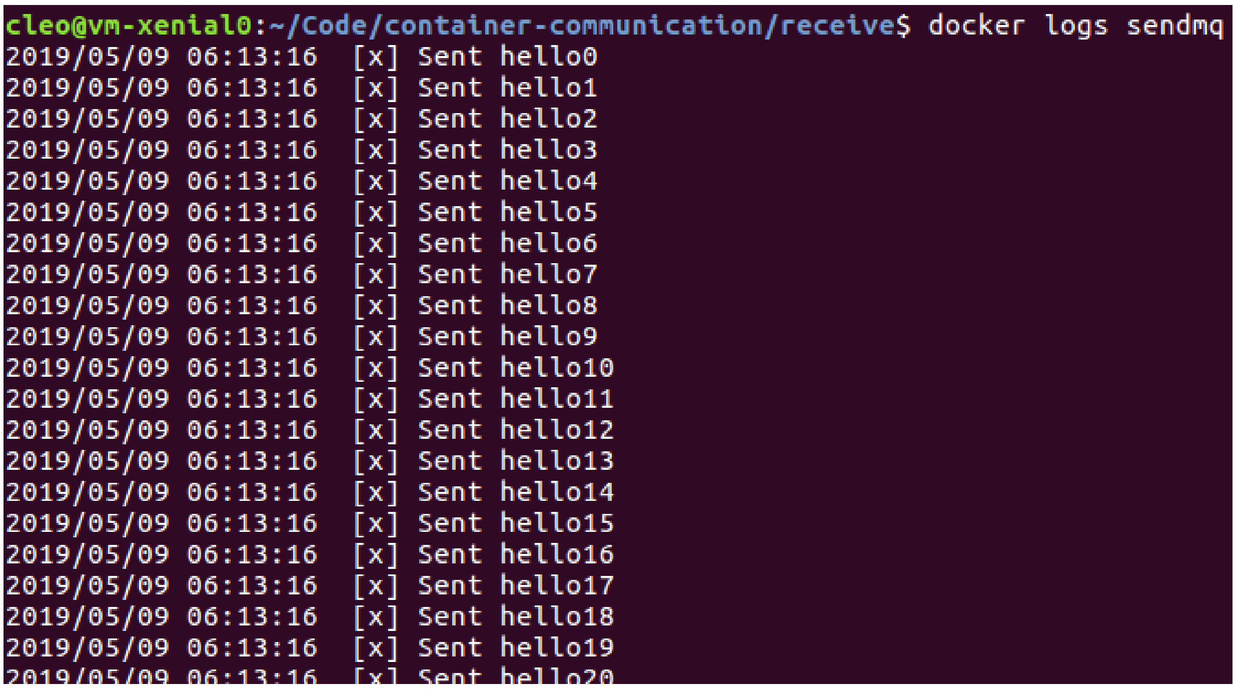
```
docker run --name sendmq -d cleo0625/send
docker run --name receivemq -d cleo0625/receive
```



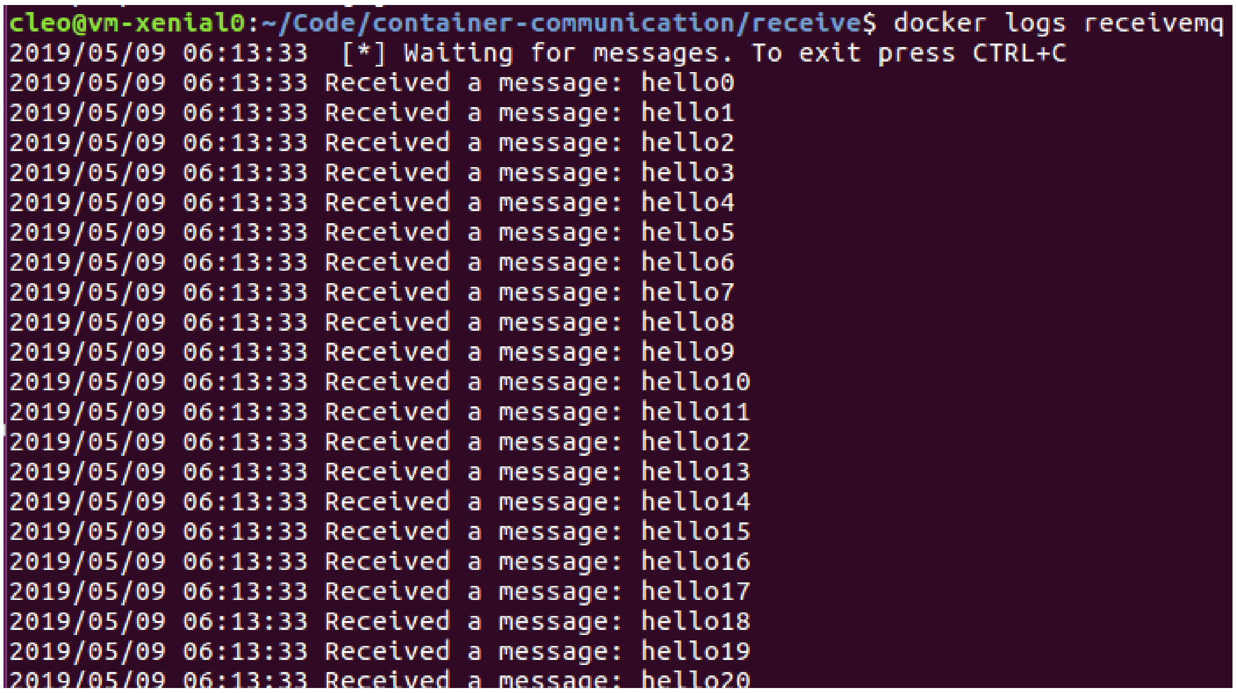
```
cleo@vm-xenial0:~/Code/container-communication/receive$ docker run --name sendmq -d cleo0625/send
fd324c22526a5357be88e64ce01b2f1d1ad1eddd05f492d38e13c0838f8fa918
cleo@vm-xenial0:~/Code/container-communication/receive$ docker run --name receivemq -d cleo0625/receive
c70d16ca15bbd82db7ed7a13102eedcfb7f81c2ae53de1a0a48eba69729d4469
```

- Check the logs of those two containers

```
docker logs sendmq
docker logs receivemq
```



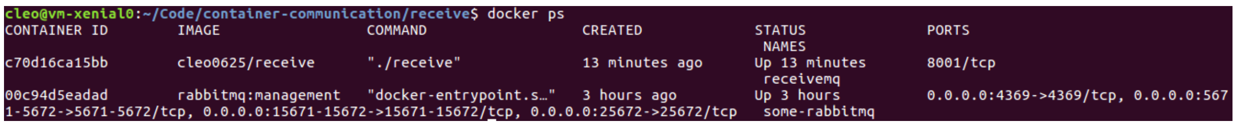
```
cleo@vm-xenial0:~/Code/container-communication/receive$ docker logs sendmq
2019/05/09 06:13:16  [x] Sent hello0
2019/05/09 06:13:16  [x] Sent hello1
2019/05/09 06:13:16  [x] Sent hello2
2019/05/09 06:13:16  [x] Sent hello3
2019/05/09 06:13:16  [x] Sent hello4
2019/05/09 06:13:16  [x] Sent hello5
2019/05/09 06:13:16  [x] Sent hello6
2019/05/09 06:13:16  [x] Sent hello7
2019/05/09 06:13:16  [x] Sent hello8
2019/05/09 06:13:16  [x] Sent hello9
2019/05/09 06:13:16  [x] Sent hello10
2019/05/09 06:13:16  [x] Sent hello11
2019/05/09 06:13:16  [x] Sent hello12
2019/05/09 06:13:16  [x] Sent hello13
2019/05/09 06:13:16  [x] Sent hello14
2019/05/09 06:13:16  [x] Sent hello15
2019/05/09 06:13:16  [x] Sent hello16
2019/05/09 06:13:16  [x] Sent hello17
2019/05/09 06:13:16  [x] Sent hello18
2019/05/09 06:13:16  [x] Sent hello19
2019/05/09 06:13:16  [x] Sent hello20
```



```
cleo@vm-xenial0:~/Code/container-communication/receive$ docker logs receivemq
2019/05/09 06:13:33  [*] Waiting for messages. To exit press CTRL+C
2019/05/09 06:13:33 Received a message: hello0
2019/05/09 06:13:33 Received a message: hello1
2019/05/09 06:13:33 Received a message: hello2
2019/05/09 06:13:33 Received a message: hello3
2019/05/09 06:13:33 Received a message: hello4
2019/05/09 06:13:33 Received a message: hello5
2019/05/09 06:13:33 Received a message: hello6
2019/05/09 06:13:33 Received a message: hello7
2019/05/09 06:13:33 Received a message: hello8
2019/05/09 06:13:33 Received a message: hello9
2019/05/09 06:13:33 Received a message: hello10
2019/05/09 06:13:33 Received a message: hello11
2019/05/09 06:13:33 Received a message: hello12
2019/05/09 06:13:33 Received a message: hello13
2019/05/09 06:13:33 Received a message: hello14
2019/05/09 06:13:33 Received a message: hello15
2019/05/09 06:13:33 Received a message: hello16
2019/05/09 06:13:33 Received a message: hello17
2019/05/09 06:13:33 Received a message: hello18
2019/05/09 06:13:33 Received a message: hello19
2019/05/09 06:13:33 Received a message: hello20
```

- After running that two containers, check the containers' status

```
docker ps
```

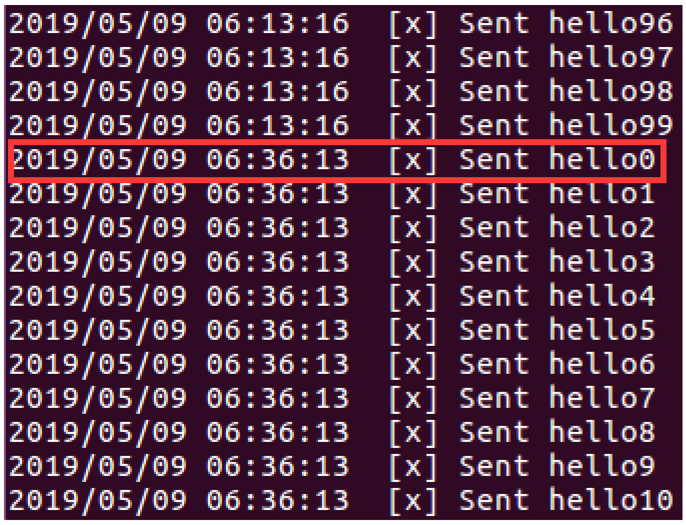


```
cleo@vm-xenial0:~/Code/container-communication/receive$ docker ps
CONTAINER ID        IMAGE                 COMMAND                  CREATED             STATUS              PORTS
                                                                                        NAMES
c70d16ca15bb        cleo0625/receive      "./receive"              13 minutes ago      Up 13 minutes       8001/tcp
                                                                                        receivemq
00c94d5eadad        rabbitmq:management   "docker-entrypoint.s…"   3 hours ago         Up 3 hours          0.0.0.0:4369->4369/tcp, 0.0.0.0:567
1-5672->5671-5672/tcp, 0.0.0.0:15671-15672->15671-15672/tcp, 0.0.0.0:25672->25672/tcp   some-rabbitmq
```

There are only two containers running in docker. One is rabbitmq container, and another one is receivemq container. It is waiting for sending messages.

We can running a new sending messages container to send the new messages to rabbitmq:

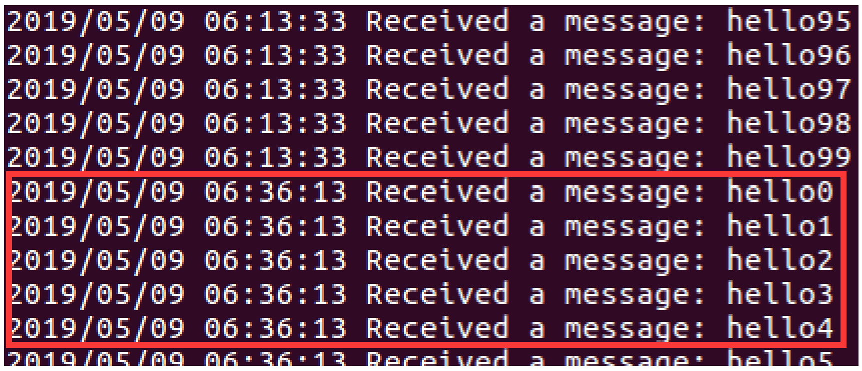
```
docker start sendmq
docker logs sendmq
```



```
2019/05/09 06:13:16  [x] Sent hello96
2019/05/09 06:13:16  [x] Sent hello97
2019/05/09 06:13:16  [x] Sent hello98
2019/05/09 06:13:16  [x] Sent hello99
2019/05/09 06:36:13  [x] Sent hello0
2019/05/09 06:36:13  [x] Sent hello1
2019/05/09 06:36:13  [x] Sent hello2
2019/05/09 06:36:13  [x] Sent hello3
2019/05/09 06:36:13  [x] Sent hello4
2019/05/09 06:36:13  [x] Sent hello5
2019/05/09 06:36:13  [x] Sent hello6
2019/05/09 06:36:13  [x] Sent hello7
2019/05/09 06:36:13  [x] Sent hello8
2019/05/09 06:36:13  [x] Sent hello9
2019/05/09 06:36:13  [x] Sent hello10
```

We can see that new messages had already been sent. And we can log out the logs of receivemq container.

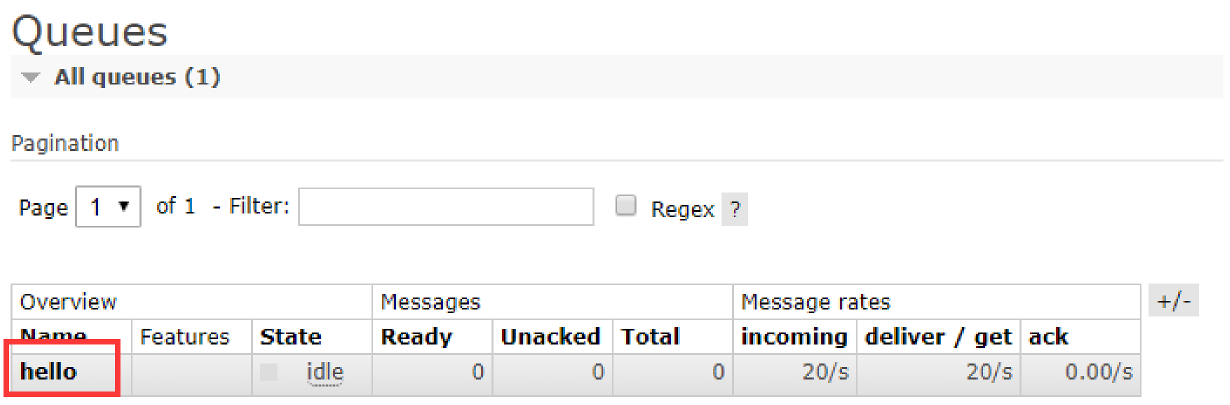
```
docker logs receivemq
```



```
2019/05/09 06:13:33 Received a message: hello95
2019/05/09 06:13:33 Received a message: hello96
2019/05/09 06:13:33 Received a message: hello97
2019/05/09 06:13:33 Received a message: hello98
2019/05/09 06:13:33 Received a message: hello99
2019/05/09 06:36:13 Received a message: hello0
2019/05/09 06:36:13 Received a message: hello1
2019/05/09 06:36:13 Received a message: hello2
2019/05/09 06:36:13 Received a message: hello3
2019/05/09 06:36:13 Received a message: hello4
2019/05/09 06:36:13 Received a message: hello5
```

We can see that the receivemq container had received new messages.

By checking the management web page, we can see the `hello` queue's message rate:


Queues

All queues (1)

Pagination

Page 1 of 1 - Filter: Regex ?

Overview			Messages			Message rates		
Name	Features	State	Ready	Unacked	Total	incoming	deliver / get	ack
hello		idle	0	0	0	20/s	20/s	0.00/s

Run IBM cphtestp

- Clone cphtestp from github

```
git clone https://github.com/ibm-messaging/cphtestp.git
```

- Download the MQ Client seperately and copy the necessary file into root directory

  This step need to create a new IBM account. Selcet `9.1.0.0-IBM-MQC-UbuntuLinuxX64.tar.gz` and download in http mode.

```
cd Downloads
tar -xzvf 9.1.0.0-IBM-MQC-UbuntuLinuxX64.tar.gz
ls
```

  Here is the result of command `ls`

```
9.1.0.0-IBM-MQC-UbuntuLinuxX64.tar.gz  ibmmq-msg-ko_9.1.0.0_amd64.deb
copyright                              ibmmq-msg-pl_9.1.0.0_amd64.deb
ibmmq-bcbridge_9.1.0.0_amd64.deb       ibmmq-msg-pt_9.1.0.0_amd64.deb
ibmmq-client_9.1.0.0_amd64.deb         ibmmq-msg-ru_9.1.0.0_amd64.deb
ibmmq-gskit_9.1.0.0_amd64.deb          ibmmq-msg-zh-cn_9.1.0.0_amd64.deb
ibmmq-java_9.1.0.0_amd64.deb           ibmmq-msg-zh-tw_9.1.0.0_amd64.deb
ibmmq-jre_9.1.0.0_amd64.deb            ibmmq-runtime_9.1.0.0_amd64.deb
ibmmq-man_9.1.0.0_amd64.deb            ibmmq-samples_9.1.0.0_amd64.deb
ibmmq-msg-cs_9.1.0.0_amd64.deb         ibmmq-sdk_9.1.0.0_amd64.deb
ibmmq-msg-de_9.1.0.0_amd64.deb         ibmmq-sfbridge_9.1.0.0_amd64.deb
ibmmq-msg-es_9.1.0.0_amd64.deb         lap
ibmmq-msg-fr_9.1.0.0_amd64.deb         licenses
ibmmq-msg-hu_9.1.0.0_amd64.deb         mqlicense.sh
ibmmq-msg-it_9.1.0.0_amd64.deb         Packages.gz
ibmmq-msg-ja_9.1.0.0_amd64.deb         READMES
```

Then, copy `lap/`, `mqlicense.sh`, `ibmmq-client_9.1.0.0_amd64.deb`, `ibmmq-runtime_9.1.0.0_amd64.deb` to root directory

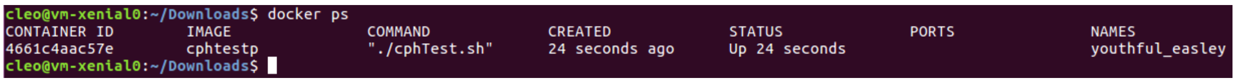
```
cd /home/cleo/Code/cphtestp
cp -r /home/cleo/Downloads/lap .
cp /home/cleo/Downloads/mqlicense.sh .
cp /home/cleo/Downloads/ibmmq-client_9.1.0.0_amd64.deb .
cp /home/cleo/Downloads/ibmmq-runtime_9.1.0.0_amd64.deb .
cp /home/cleo/Downloads/ibmmq-gskit_9.1.0.0_amd64.deb .
```

- Build the image of `cphtestp`

```
docker build --tag cphtestp .
```

- Run the container in network host mode

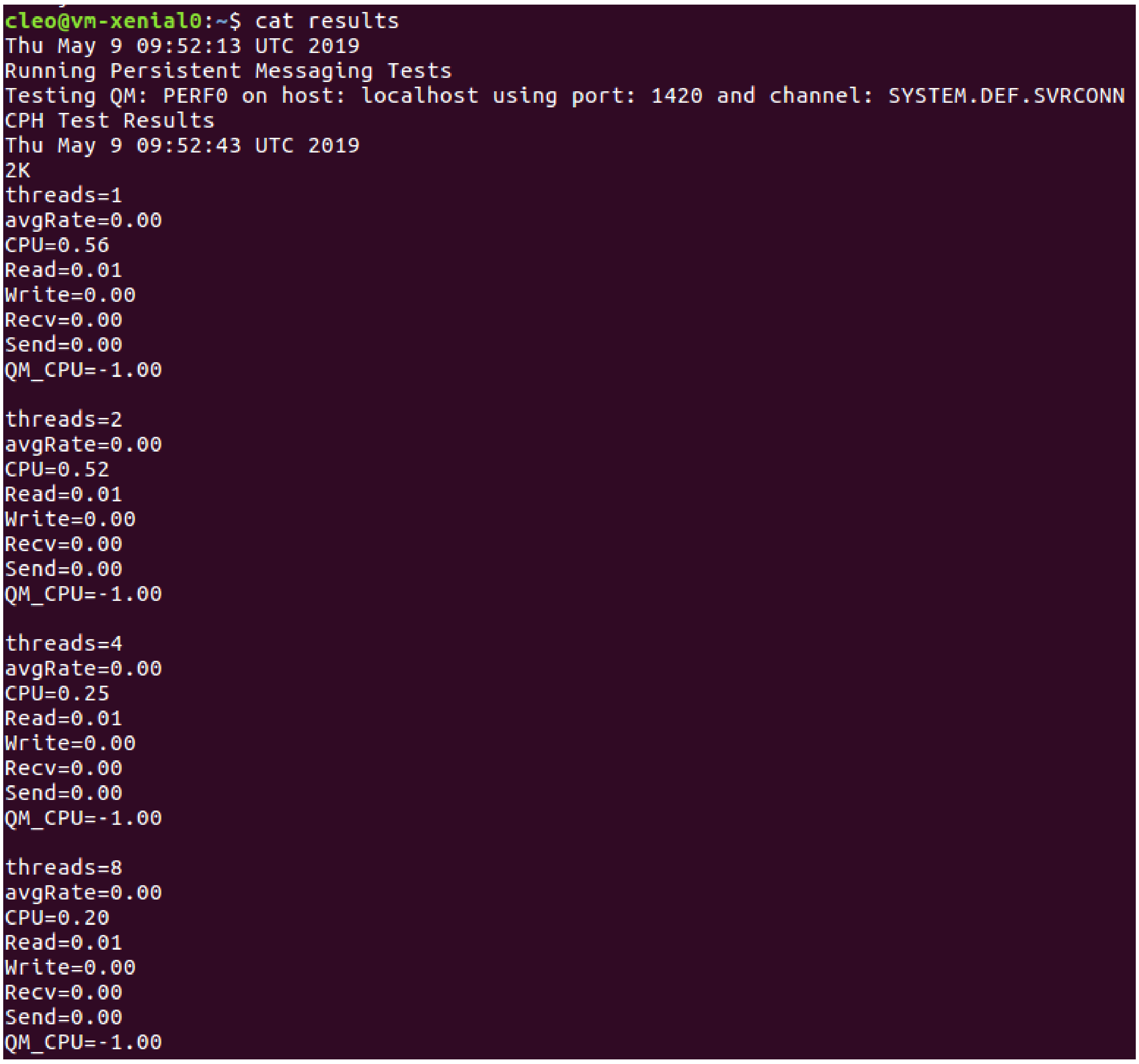
```
docker run -itd --net="host" cphtestp
```



```
cleo@vm-xenial0:~/Downloads$ docker ps
CONTAINER ID        IMAGE               COMMAND             CREATED             STATUS              PORTS               NAMES
4661c4aac57e        cphtestp            "./cphTest.sh"      24 seconds ago      Up 24 seconds                           youthful_easley
cleo@vm-xenial0:~/Downloads$
```

- Obtain the avaliavle results

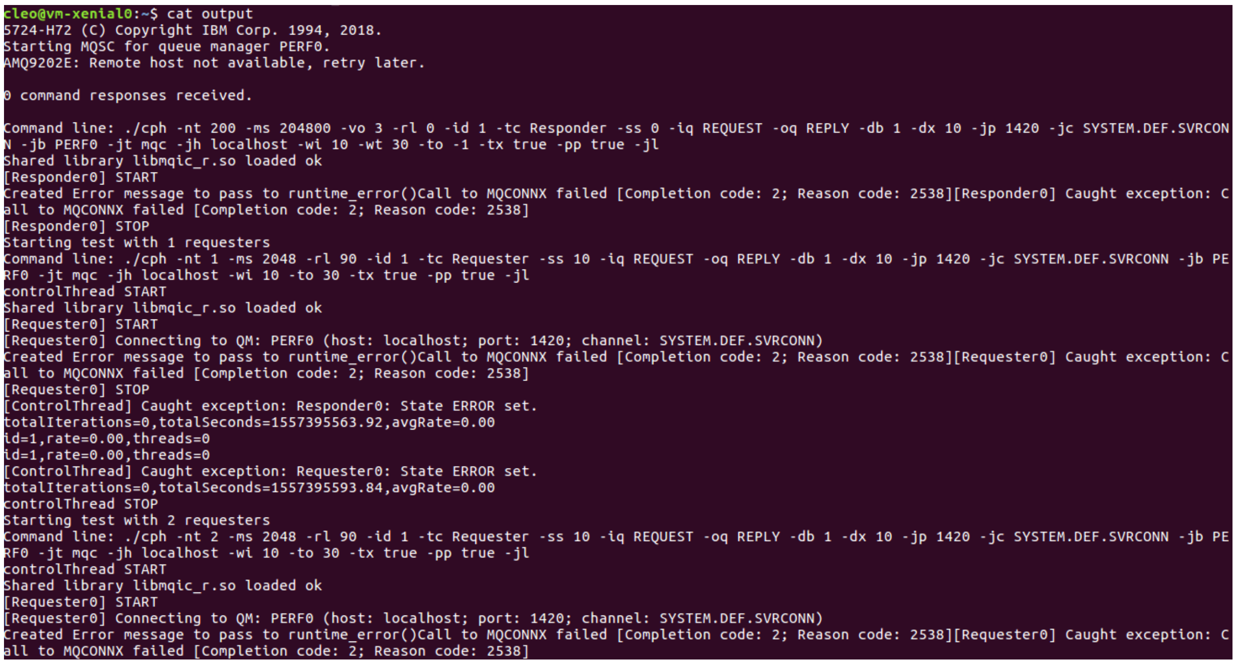
```
docker cp objective_euclid:/home/mqperf/cph/results .
cat result
```



```
cleo@vm-xenial0:~$ cat results
Thu May 9 09:52:13 UTC 2019
Running Persistent Messaging Tests
Testing QM: PERF0 on host: localhost using port: 1420 and channel: SYSTEM.DEF.SVRCONN
CPH Test Results
Thu May 9 09:52:43 UTC 2019
2K
threads=1
avgRate=0.00
CPU=0.56
Read=0.01
Write=0.00
Recv=0.00
Send=0.00
QM_CPU=-1.00

threads=2
avgRate=0.00
CPU=0.52
Read=0.01
Write=0.00
Recv=0.00
Send=0.00
QM_CPU=-1.00

threads=4
avgRate=0.00
CPU=0.25
Read=0.01
Write=0.00
Recv=0.00
Send=0.00
QM_CPU=-1.00

threads=8
avgRate=0.00
CPU=0.20
Read=0.01
Write=0.00
Recv=0.00
Send=0.00
QM_CPU=-1.00
```

- View the output from the running responder and requester processes

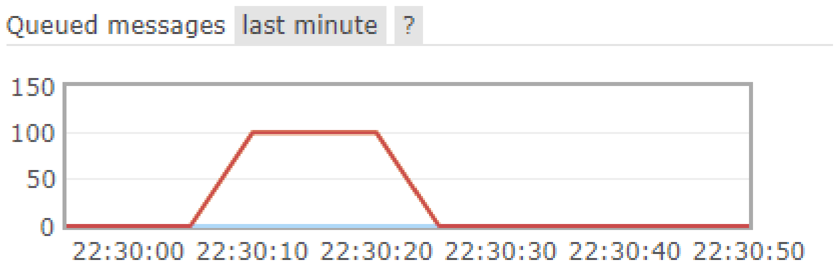
```
docker cp objective_euclid:/home/mqperf/cph/output .
cat output
```

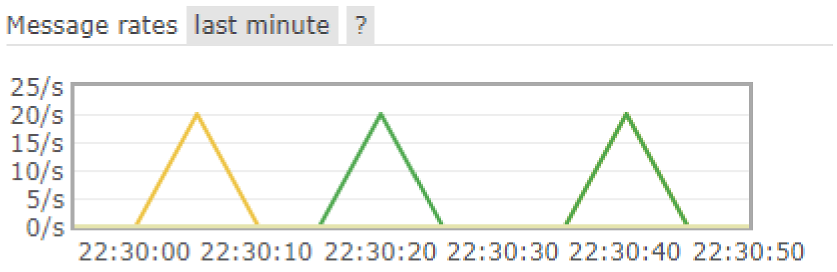


```
cleo@vm-xenial0:~$ cat output
5724-H72 (C) Copyright IBM Corp. 1994, 2018.
Starting MQSC for queue manager PERF0.
AMQ9202E: Remote host not available, retry later.

0 command responses received.

Command line: ./cph -nt 200 -ms 204800 -vo 3 -rl 0 -id 1 -tc Responder -ss 0 -iq REQUEST -oq REPLY -db 1 -dx 10 -jp 1420 -jc SYSTEM.DEF.SVRCON
N -jb PERF0 -jt mqc -jh localhost -wi 10 -wt 30 -to -1 -tx true -pp true -jl
Shared library libmqic_r.so loaded ok
[Responder0] START
Created Error message to pass to runtime_error()Call to MQCONNX failed [Completion code: 2; Reason code: 2538][Responder0] Caught exception: C
all to MQCONNX failed [Completion code: 2; Reason code: 2538]
[Responder0] STOP
Starting test with 1 requesters
Command line: ./cph -nt 1 -ms 2048 -rl 90 -id 1 -tc Requester -ss 10 -iq REQUEST -oq REPLY -db 1 -dx 10 -jp 1420 -jc SYSTEM.DEF.SVRCONN -jb PE
RF0 -jt mqc -jh localhost -wi 10 -to 30 -tx true -pp true -jl
controlThread START
Shared library libmqic_r.so loaded ok
[Requester0] START
[Requester0] Connecting to QM: PERF0 (host: localhost; port: 1420; channel: SYSTEM.DEF.SVRCONN)
Created Error message to pass to runtime_error()Call to MQCONNX failed [Completion code: 2; Reason code: 2538][Requester0] Caught exception: C
all to MQCONNX failed [Completion code: 2; Reason code: 2538]
[Requester0] STOP
[ControlThread] Caught exception: Responder0: State ERROR set.
totalIterations=0,totalSeconds=1557395563.92,avgRate=0.00
id=1,rate=0.00,threads=0
id=1,rate=0.00,threads=0
[ControlThread] Caught exception: Requester0: State ERROR set.
totalIterations=0,totalSeconds=1557395593.84,avgRate=0.00
controlThread STOP
Starting test with 2 requesters
Command line: ./cph -nt 2 -ms 2048 -rl 90 -id 1 -tc Requester -ss 10 -iq REQUEST -oq REPLY -db 1 -dx 10 -jp 1420 -jc SYSTEM.DEF.SVRCONN -jb PE
RF0 -jt mqc -jh localhost -wi 10 -to 30 -tx true -pp true -jl
controlThread START
Shared library libmqic_r.so loaded ok
[Requester0] START
[Requester0] Connecting to QM: PERF0 (host: localhost; port: 1420; channel: SYSTEM.DEF.SVRCONN)
Created Error message to pass to runtime_error()Call to MQCONNX failed [Completion code: 2; Reason code: 2538][Requester0] Caught exception: C
all to MQCONNX failed [Completion code: 2; Reason code: 2538]
```

Test the performance of MQ in docker container

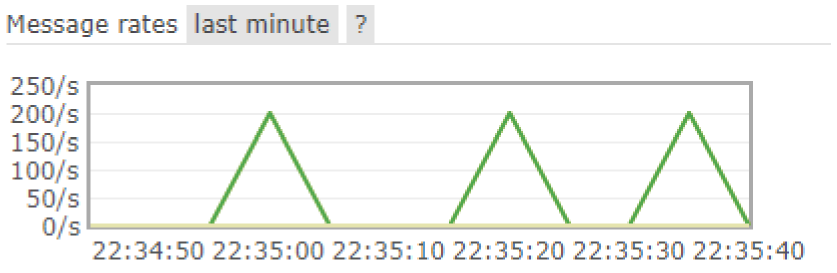
- 100 messages





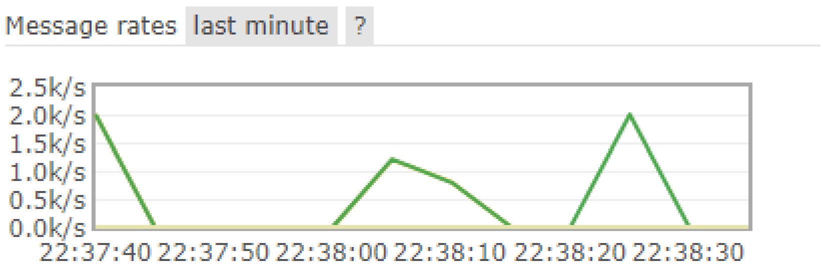
max: 20/s

- 1000 messages



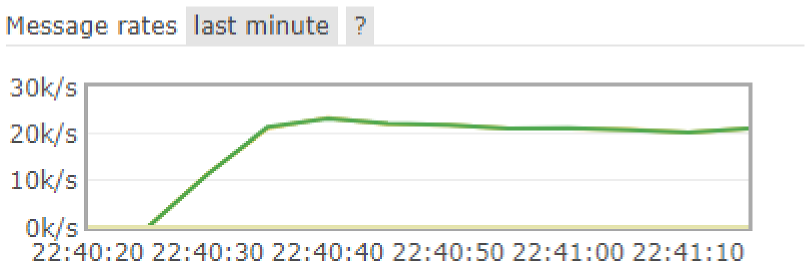
max: 200/s

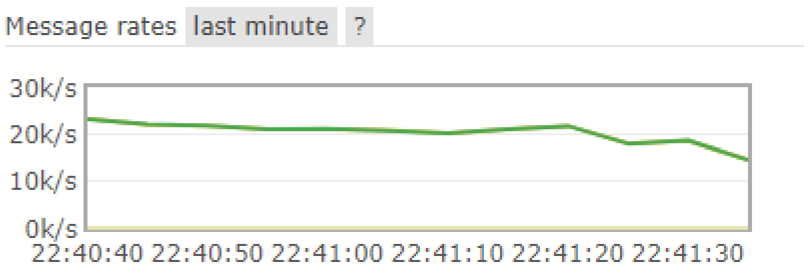
- 10000 messages

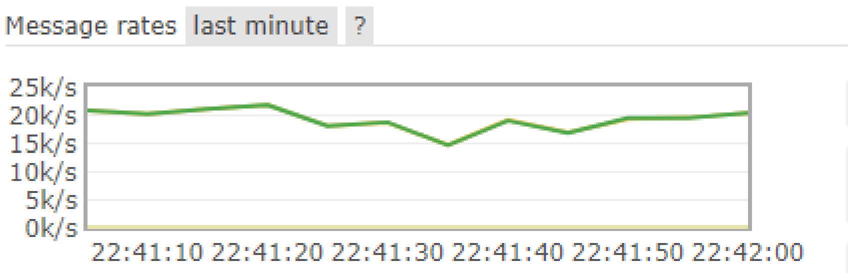


max: 2.0k/s

- infinitas messages







max: 21700/s