**Exercise 10**

*gRPC / Binary protocols*

**Pre-reqs**

None

**Objectives**

Demonstrate the use of a fast binary protocol

Demonstrate a python client calling a Java service via ProtoBuf messages

**Steps**

1. Firstly, we need to checkout the code from Github.   
   In a new terminal window, type the following:

cd ~  
git clone <https://github.com/pzfreo/grpc-sample.git>  
cd grpc-sample

1. There is a Java server project ready to go.  
   Firstly build it:  
     
   cd java  
   gradle build shadowJar
2. Open the Java project in vscode and take a look.
3. Have a look at src/main/proto/purchase.proto  
   This contains the gRPC service definition in the ProtoBuf format.  
     
   It looks like this:

syntax = "proto3";

package freo.me.purchase;

service Purchase {

rpc purchase (PurchaseRequest) returns (PurchaseReply) {}

}

message PurchaseRequest {

string poNumber = 1;

string lineItem = 2;

int32 quantity = 3;

Date date = 4;

string customerNumber= 5;

string paymentReference = 6;

}

message Date {

int32 year = 1;

int32 month = 2;

int32 day = 3;

}

message PurchaseReply {

string message = 1;

int32 returncode = 2;

}

1. Now look at the PurchaseServer.java  
     
   This will only work when the .proto file has been compiled into Java. That happens as part of the gradle build. Most of this file is “boilerplate”. The real logic happens near the bottom where it says:  
     
   This code handles any requests against the purchase method (defined as “rpc purchase” in the proto file). It prints out some basic information and then responds with “order accepted” and a returncode of 0.

public void

purchase(PurchaseRequest req,

StreamObserver<PurchaseReply> responseObserver) {

System.out.println("Customer Number: " +req.getCustomerNumber());

System.out.println("PO Number: " +req.getPoNumber());

PurchaseReply reply = PurchaseReply.newBuilder().

setMessage("order accepted").setReturncode(0).build();

responseObserver.onNext(reply);

responseObserver.onCompleted();

}

1. You can run this code as a JAR just like before:  
     
   java -jar build/libs/PurchaseGRPC-all.jar

Now lets create a Python client. In a new terminal window:  
  
cd ~/grpc-sample  
mkdir python  
cd python  
cp ../java/src/main/proto/purchase.proto .

1. We need to install the python grpc tools:

sudo python -m pip install pip --upgrade  
sudo python -m pip install grpcio  
sudo python -m pip install grpcio-tools

1. Now we can run the client code compiler (all on one line please)  
     
   python -m grpc\_tools.protoc -I .   
   --python\_out=. --grpc\_python\_out=. purchase.proto
2. If you look at the directory (ls), you will see two new files:  
   > ls -l

total 20

-rw-rw-r-- 1 oxsoa oxsoa 1433 Jan 10 19:24 purchase\_pb2\_grpc.py

-rw-rw-r-- 1 oxsoa oxsoa 8269 Jan 10 19:24 purchase\_pb2.py

-rw-rw-r-- 1 oxsoa oxsoa 446 Jan 10 19:21 purchase.proto

1. These files will let us call the purchase service. Create and edit a new python program:  
     
   code purchase-client.py
2. Type in the following code:

import grpc;

import purchase\_pb2;

import purchase\_pb2\_grpc;

import time;

def run():

channel = grpc.insecure\_channel('localhost:50051')

stub = purchase\_pb2\_grpc.PurchaseStub(channel)

print ("starting")

response = stub.purchase(purchase\_pb2.PurchaseRequest(poNumber="001",quantity=5))

print("Purchase client received: " + response.message)

print("Purchase client received: " + str(response.returncode))

run()

1. Run the program:

python purchase-client.py

1. Check the console log on your Java server and you should see it has been called.

Extension

1. Change the python code to call the server 1000 times. Add a timer around the code: e.g.  
     
   import time  
     
   t0 = time.time()  
   // code  
   t1 = time.time()  
     
   t = t1-t0  
   print "elapsed seconds: " + str(t)
2. See how long it takes. Note that if you run it more than once the Java server may “warm up” and do some JIT compilation, so the numbers should improve and then stabilize.
3. You could also remove all the console logging in the Java and Python code and try again. What is the throughput of requests once the system is warm?

**Extension**

The performance of the python client <-> Java server seems a little slow. Use another language to create a client and see if it is python that is the problem.