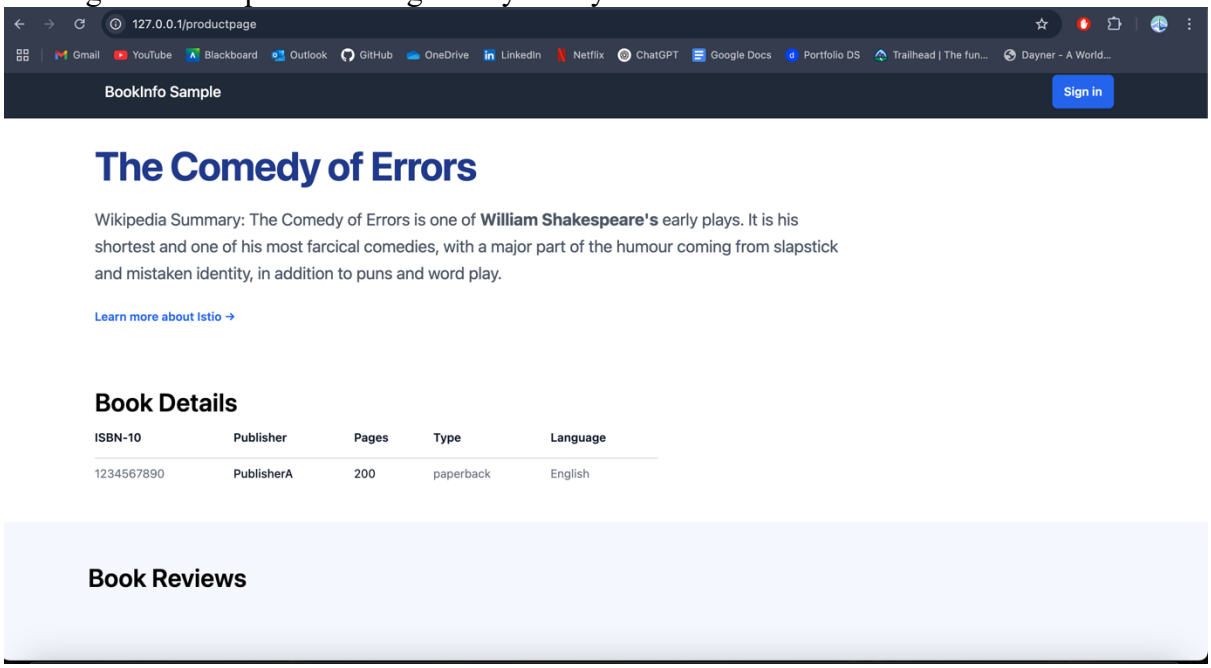
Cloud Lab 5

Traffic Shifting:

Here I am running this command to route all traffic to v1

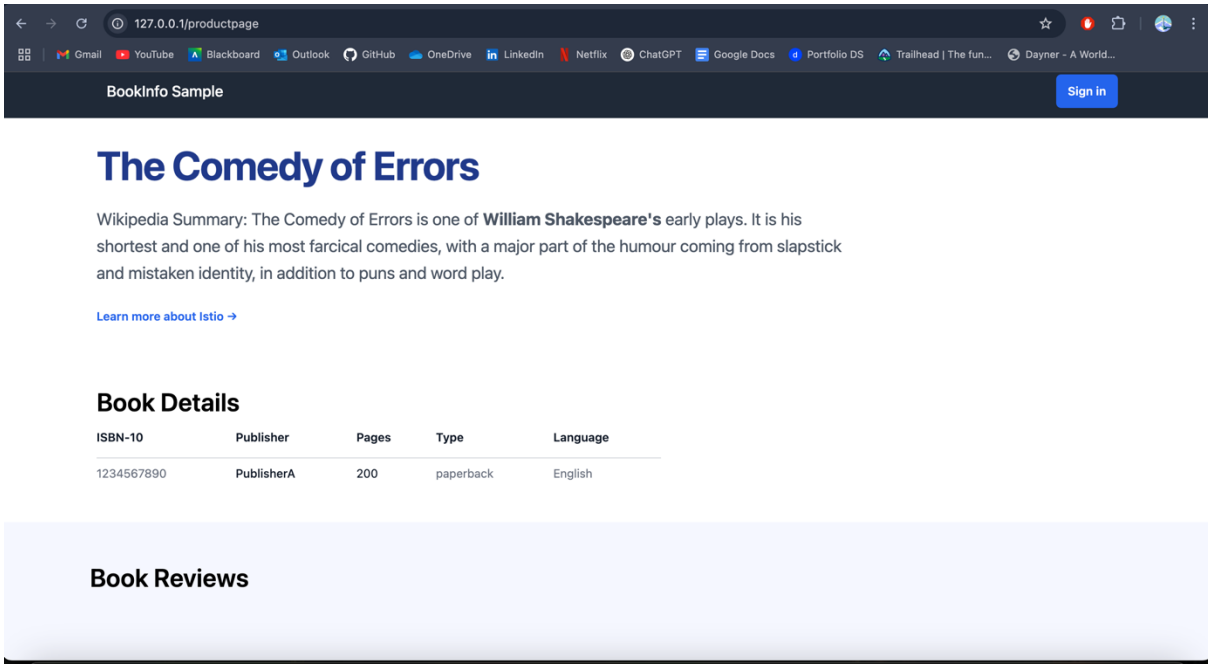
```
aaron@Aarons-MacBook-Air istio-1.25.0 % kubectl apply -f samples/bookinfo/networ
king/virtual-service-all-v1.yaml

virtualservice.networking.istio.io/productpage created
virtualservice.networking.istio.io/reviews created
virtualservice.networking.istio.io/ratings created
virtualservice.networking.istio.io/details created
```

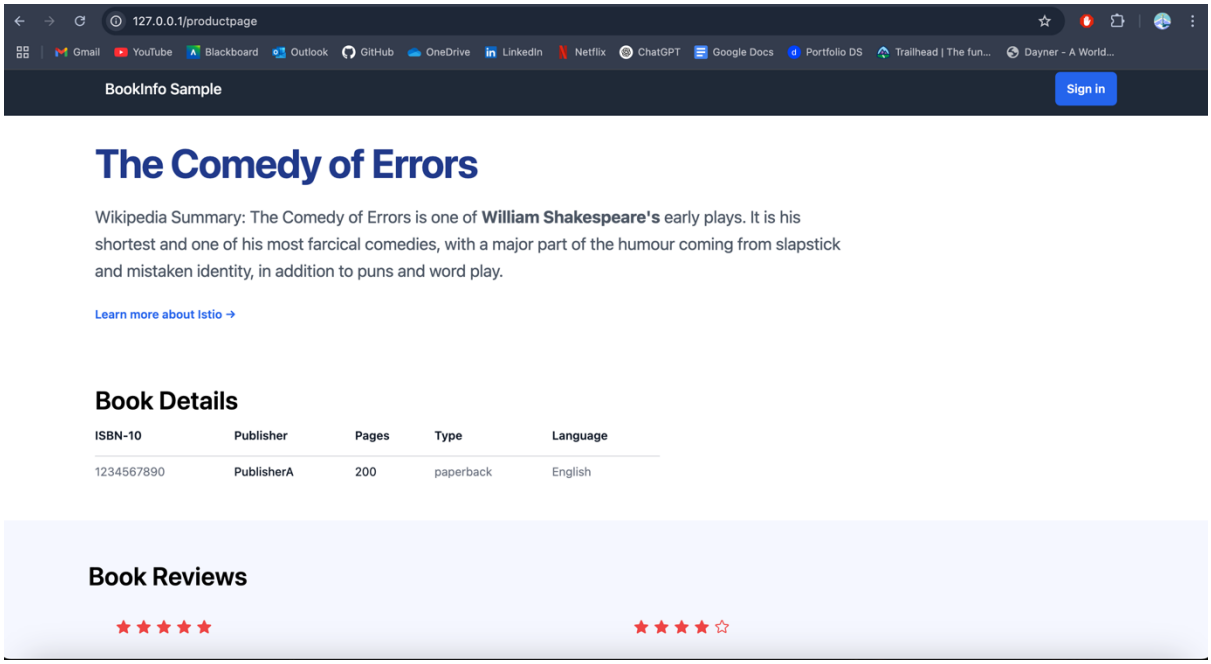
I then got it back up and running locally on my browser



Then I ran this, now the stars will show up 50% of the time because they are split between v1 and v3

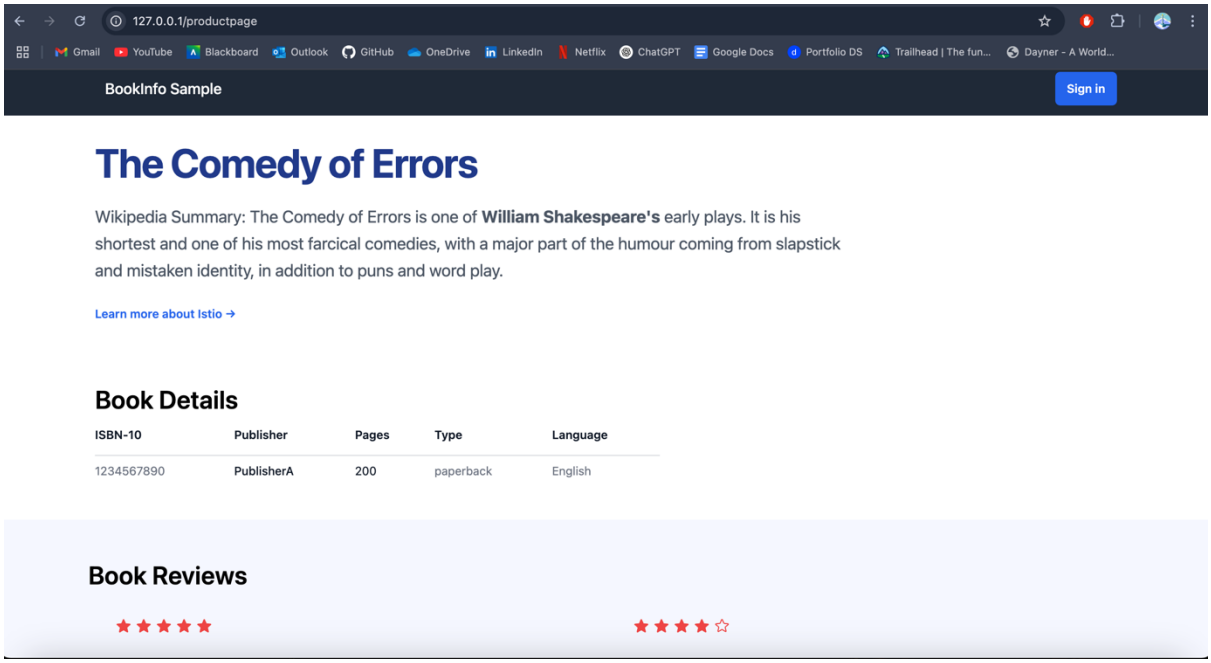
```
aaron@Aarons-MacBook-Air istio-1.25.0 % kubectl apply -f samples/bookinfo/networ
king/virtual-service-reviews-50-v3.yaml

virtualservice.networking.istio.io/reviews configured
aaron@Aarons-MacBook-Air istio-1.25.0 %
```





Now I am routing 100% of the traffic to v3 so the stars will be there every time

```
aaron@Aarons-MacBook-Air istio-1.25.0 % kubectl apply -f samples/bookinfo/networking/virtual-service-reviews-v3.yaml

virtualservice.networking.istio.io/reviews configured
aaron@Aarons-MacBook-Air istio-1.25.0 %
```



Request Routing

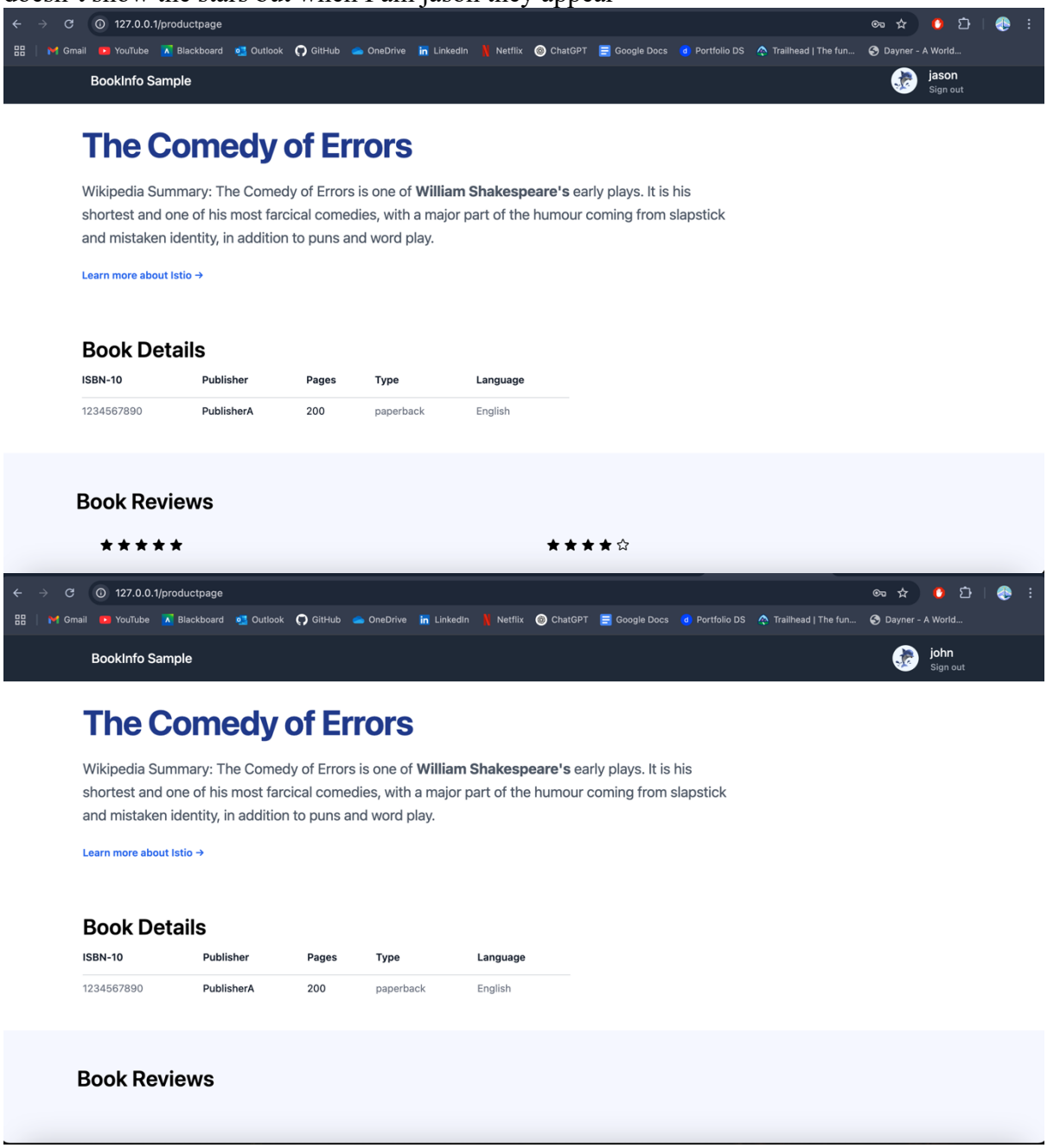
Here I am routing everything to v1

```
aaron@Aarons-MacBook-Air istio-1.25.0 % kubectl apply -f samples/bookinfo/networ
king/virtual-service-all-v1.yaml

virtualservice.networking.istio.io/productpage unchanged
virtualservice.networking.istio.io/reviews configured
virtualservice.networking.istio.io/ratings unchanged
virtualservice.networking.istio.io/details unchanged
```

Here I am enabling user based routing as can be seen this is for users with the name jason

```
estination":{"host":"reviews","subset":"v2"}}]},{"route":[{"destination":{"host"
:"reviews","subset":"v1"}}]}]}}
  creationTimestamp: "2025-03-26T11:48:56Z"
  generation: 9
  name: reviews
  namespace: default
  resourceVersion: "297926"
  uid: 7b1d7533-d238-4356-9b1b-cfb64ac08af9
spec:
  hosts:
  - reviews
  http:
  - match:
    - headers:
        end-user:
          exact: jason
    route:
    - destination:
        host: reviews
        subset: v2
  - route:
    - destination:
        host: reviews
        subset: v1
```

As can be seen in the screenshots below when I am logged in as a user that isn't jason it doesn't show the stars but when I am jason they appear



Fault Injection

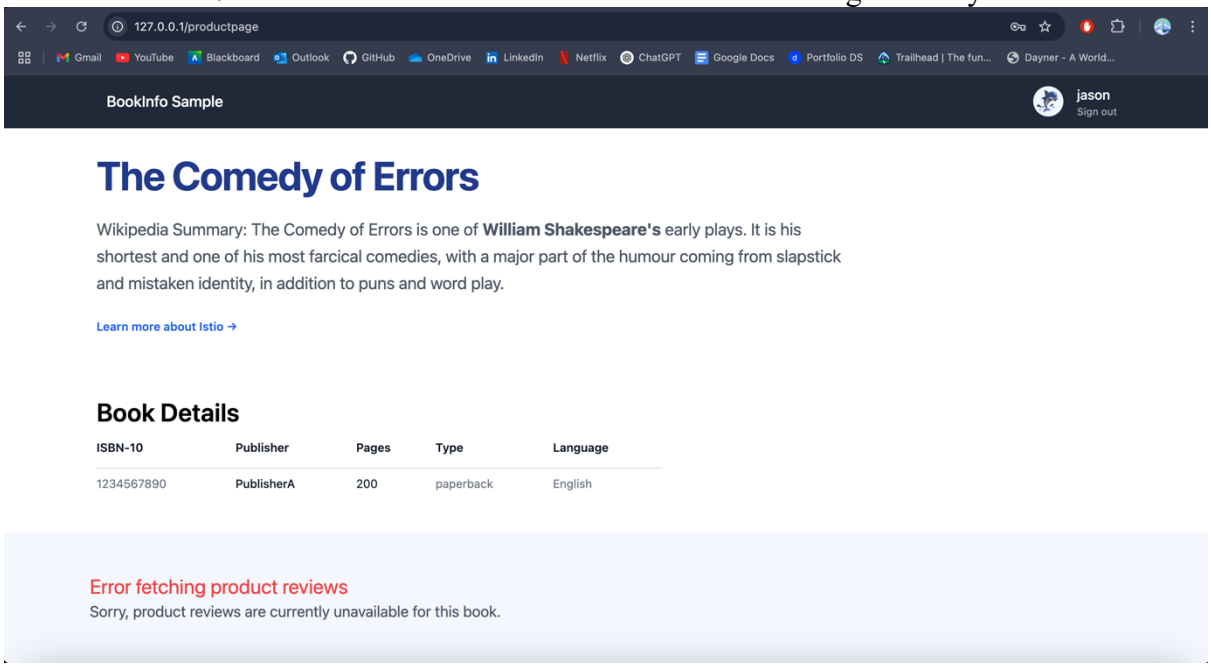
Here I am creating a fault injection rule to delay traffic for users called jason

```
aaron@Aarons-MacBook-Air istio-1.25.0 % kubectl apply -f samples/bookinfo/networ
king/virtual-service-ratings-test-delay.yaml

virtualservice.networking.istio.io/ratings configured
aaron@Aarons-MacBook-Air istio-1.25.0 %
```

We can see its working here with the fixed delay

```
spec:
  hosts:
  - ratings
  http:
  - fault:
      delay:
        fixedDelay: 7s
        percentage:
          value: 100
```

This took about 7 seconds to load which indicates that it's working correctly.



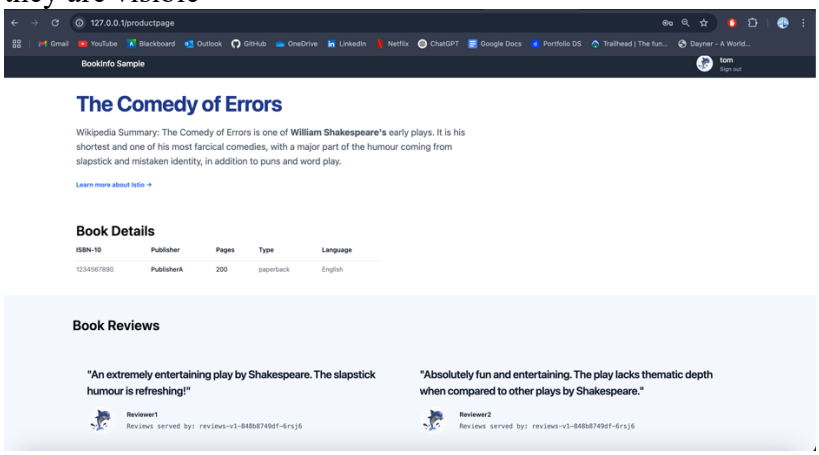
Then I am going to use the following command to create a fault injection rule to send a HTTP abort for users called Jason:

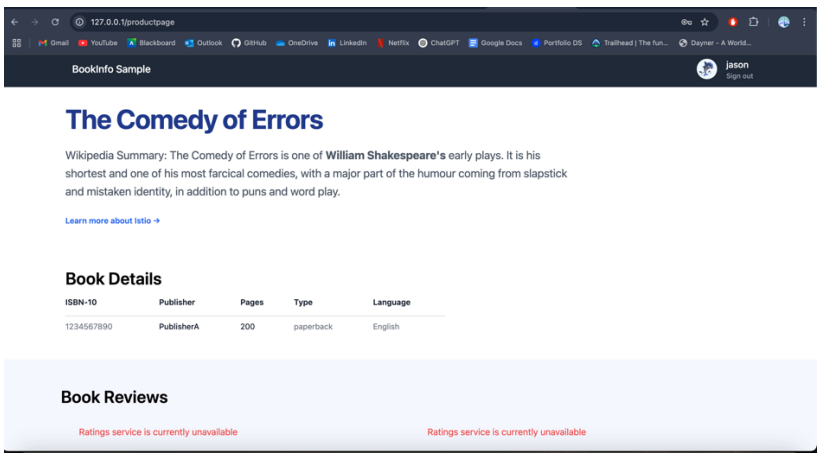
```
aaron@Aarons-MacBook-Air istio-1.25.0 % kubectl apply -f samples/bookinfo/networ
king/virtual-service-ratings-test-abort.yaml

virtualservice.networking.istio.io/ratings configured
aaron@Aarons-MacBook-Air istio-1.25.0 %
```

As can be seen here this gives the user Jason a 500 fault:

```
spec:
  hosts:
  - ratings
  http:
  - fault:
      abort:
        httpStatus: 500
        percentage:
          value: 100
```

Now when logged in as Jason you can't see the reviews but when I log in as any other user they are visible





Circuit Breaking

First of all I am creating a destination rule to apply circuit breaking settings when calling the httpbin service

```
aaron@Aarons-MacBook-Air istio-1.25.0 % kubectl apply -f - <<EOF
apiVersion: networking.istio.io/v1
kind: DestinationRule
metadata:
  name: httpbin
spec:
  host: httpbin
  trafficPolicy:
    connectionPool:
      tcp:
        maxConnections: 1
      http:
        http1MaxPendingRequests: 1
        maxRequestsPerConnection: 1
    outlierDetection:
      consecutive5xxErrors: 1
      interval: 1s
      baseEjectionTime: 3m
      maxEjectionPercent: 100
EOF

destinationrule.networking.istio.io/httpbin created
aaron@Aarons-MacBook-Air istio-1.25.0 %
```

Now I am going to inject the client with the istio sidecar proxy

```
aaron@Aarons-MacBook-Air istio-1.25.0 % kubectl apply -f samples/httpbin/sample-
client/fortio-deploy.yaml

service/fortio created
deployment.apps/fortio-deploy created
```

Now I’m logging into client pod and using the fortio tool to use httpbin

```
aaron@Aarons-MacBook-Air istio-1.25.0 % export FORTIO_POD=$(kubectl get pods -l app=fortio -o 'jsonpath={.items[0].metadata.name}')
kubectl exec "$FORTIO_POD" -c fortio -- /usr/bin/fortio curl -quiet http://httpbin:8000/get

HTTP/1.1 200 OK
access-control-allow-credentials: true
access-control-allow-origin: *
content-type: application/json; charset=utf-8
date: Wed, 26 Mar 2025 14:16:18 GMT
content-length: 621
x-envoy-upstream-service-time: 17
server: envoy

{
  "args": {},
  "headers": {
    "Host": [
      "httpbin:8000"
    ],
    "User-Agent": [
      "fortio.org/fortio-1.66.5"
    ],
    "X-Envoy-Attempt-Count": [
      "1"
    ],
    "X-Forwarded-Client-Cert": [
      "By=spiffe://cluster.local/ns/default/sa/httpbin;Hash=b6b3f57c73b08c5d09f8444ea984bb8c7f4f582829b4dd678354591a9d84d8d5;Subject=\"\";URI=spiffe://cluster.local/ns/default/sa/default"
    ],
    "X-Forwarded-Proto": [
      "http"
    ],
    "X-Request-Id": [
      "b1e1ced5-919b-94eb-920f-1bc2118a8299"
    ]
  },
  "method": "GET",
  "origin": "127.0.0.6:49153",
  "url": "http://httpbin:8000/get"
}
aaron@Aarons-MacBook-Air istio-1.25.0 %
```

Now I’m going to call the service with 2 concurrent connections and send 20 requests

```
aaron@Aarons-MacBook-Air istio-1.25.0 % kubectl exec "$FORTIO_POD" -c fortio -- /usr/bin/fortio load -c 2 -qps 0 -n 20 -loglevel Warning http://httpbin:8000/get

{"ts":1742998685.317694,"level":"info","r":1,"file":"logger.go","line":290,"msg":"Log level is now 3 Warning (was 2 Info)"}
Fortio 1.66.5 running at 0 queries per second, 8->8 procs, for 20 calls: http://httpbin:8000/get
Starting at max qps with 2 thread(s) [gomax 8] for exactly 20 calls (10 per thread + 0)
{"ts":1742998685.335738,"level":"warn","r":24,"file":"http_client.go","line":1151,"msg":"Non ok http code","code":503,"status":"HTTP/1.1 503","thread":1,"run":0}
{"ts":1742998685.337209,"level":"warn","r":23,"file":"http_client.go","line":1151,"msg":"Non ok http code","code":503,"status":"HTTP/1.1 503","thread":0,"run":0}
{"ts":1742998685.338926,"level":"warn","r":23,"file":"http_client.go","line":1151,"msg":"Non ok http code","code":503,"status":"HTTP/1.1 503","thread":0,"run":0}
{"ts":1742998685.341891,"level":"warn","r":24,"file":"http_client.go","line":1151,"msg":"Non ok http code","code":503,"status":"HTTP/1.1 503","thread":1,"run":0}
{"ts":1742998685.342809,"level":"warn","r":23,"file":"http_client.go","line":1151,"msg":"Non ok http code","code":503,"status":"HTTP/1.1 503","thread":0,"run":0}
{"ts":1742998685.343908,"level":"warn","r":24,"file":"http_client.go","line":1151,"msg":"Non ok http code","code":503,"status":"HTTP/1.1 503","thread":1,"run":0}
{"ts":1742998685.344415,"level":"warn","r":24,"file":"http_client.go","line":1151,"msg":"Non ok http code","code":503,"status":"HTTP/1.1 503","thread":1,"run":0}
{"ts":1742998685.346212,"level":"warn","r":23,"file":"http_client.go","line":1151,"msg":"Non ok http code","code":503,"status":"HTTP/1.1 503","thread":0,"run":0}
{"ts":1742998685.347313,"level":"warn","r":24,"file":"http_client.go","line":1151,"msg":"Non ok http code","code":503,"status":"HTTP/1.1 503","thread":1,"run":0}
Ended after 23.485ms : 20 calls. qps=851.61
Aggregated Function Time : count 20 avg 0.0021445499 +/- 0.002245 min 0.000154375 max 0.009770667 sum 0.042890998
# range, mid point, percentile, count
>= 0.000154375 <= 0.001 , 0.000577188 , 35.00, 7
> 0.001 <= 0.002 , 0.0015 , 65.00, 6
> 0.002 <= 0.003 , 0.0025 , 80.00, 3
> 0.003 <= 0.004 , 0.0035 , 90.00, 2
> 0.005 <= 0.006 , 0.0055 , 95.00, 1
> 0.009 <= 0.00977067 , 0.00938533 , 100.00, 1
# target 50% 0.0015
# target 75% 0.00266667
# target 90% 0.004
# target 99% 0.00961653
# target 99.9% 0.00975525
Error cases : count 9 avg 0.00089863422 +/- 0.000945 min 0.000154375 max 0.002908875 sum 0.008087708
# range, mid point, percentile, count
>= 0.000154375 <= 0.001 , 0.000577188 , 66.67, 6
> 0.001 <= 0.002 , 0.0015 , 88.89, 2
> 0.002 <= 0.00290888 , 0.00245444 , 100.00, 1
# target 50% 0.000746313
# target 75% 0.001375
# target 90% 0.00209089
# target 99% 0.00282708
# target 99.9% 0.0029007
# Socket and IP used for each connection:
[0]   5 socket used, resolved to 10.108.18.5:8000, connection timing : count 5 avg 0.000578433 +/- 0.000642 min 2.825e-05 max 0.001544833 sum 0.002892165
[1]   5 socket used, resolved to 10.108.18.5:8000, connection timing : count 5 avg 5.54666e-05 +/- 2.905e-05 min 3.3459e-05 max 0.00011275 sum 0.000277333
Connection time (s) : count 10 avg 0.0003169498 +/- 0.0005243 min 2.825e-05 max 0.001544833 sum 0.003169498
Sockets used: 10 (for perfect keepalive, would be 2)
Uniform: false, Jitter: false, Catchup allowed: true
IP addresses distribution:
```

Now I’m bringing the connections up to 3

```
aaron@Aarons-MacBook-Air istio-1.25.0 % kubectl exec "$FORTIO_POD" -c fortio -- /usr/bin/fortio load -c 3 -qps 0 -n 30 -loglevel Warning http://httpbin:8000/get

{"ts":1742998743.727517,"level":"info","r":1,"file":"logger.go","line":290,"msg":"Log level is now 3 Warning (was 2 Info)"}
Fortio 1.66.5 running at 0 queries per second, 8->8 procs, for 30 calls: http://httpbin:8000/get
Starting at max qps with 3 thread(s) [gomax 8] for exactly 30 calls (10 per thread + 0)
{"ts":1742998743.737246,"level":"warn","r":13,"file":"http_client.go","line":1151,"msg":"Non ok http code","code":503,"status":"HTTP/1.1 503","thread":0,"run":0}
{"ts":1742998743.739243,"level":"warn","r":15,"file":"http_client.go","line":1151,"msg":"Non ok http code","code":503,"status":"HTTP/1.1 503","thread":2,"run":0}
{"ts":1742998743.739249,"level":"warn","r":13,"file":"http_client.go","line":1151,"msg":"Non ok http code","code":503,"status":"HTTP/1.1 503","thread":0,"run":0}
{"ts":1742998743.740191,"level":"warn","r":15,"file":"http_client.go","line":1151,"msg":"Non ok http code","code":503,"status":"HTTP/1.1 503","thread":2,"run":0}
{"ts":1742998743.740519,"level":"warn","r":14,"file":"http_client.go","line":1151,"msg":"Non ok http code","code":503,"status":"HTTP/1.1 503","thread":1,"run":0}
{"ts":1742998743.741105,"level":"warn","r":14,"file":"http_client.go","line":1151,"msg":"Non ok http code","code":503,"status":"HTTP/1.1 503","thread":1,"run":0}
{"ts":1742998743.741177,"level":"warn","r":15,"file":"http_client.go","line":1151,"msg":"Non ok http code","code":503,"status":"HTTP/1.1 503","thread":2,"run":0}
{"ts":1742998743.742310,"level":"warn","r":14,"file":"http_client.go","line":1151,"msg":"Non ok http code","code":503,"status":"HTTP/1.1 503","thread":1,"run":0}
{"ts":1742998743.743080,"level":"warn","r":14,"file":"http_client.go","line":1151,"msg":"Non ok http code","code":503,"status":"HTTP/1.1 503","thread":1,"run":0}
{"ts":1742998743.743419,"level":"warn","r":13,"file":"http_client.go","line":1151,"msg":"Non ok http code","code":503,"status":"HTTP/1.1 503","thread":0,"run":0}
{"ts":1742998743.743916,"level":"warn","r":13,"file":"http_client.go","line":1151,"msg":"Non ok http code","code":503,"status":"HTTP/1.1 503","thread":0,"run":0}
{"ts":1742998743.744594,"level":"warn","r":15,"file":"http_client.go","line":1151,"msg":"Non ok http code","code":503,"status":"HTTP/1.1 503","thread":2,"run":0}
{"ts":1742998743.744668,"level":"warn","r":13,"file":"http_client.go","line":1151,"msg":"Non ok http code","code":503,"status":"HTTP/1.1 503","thread":0,"run":0}
{"ts":1742998743.746171,"level":"warn","r":15,"file":"http_client.go","line":1151,"msg":"Non ok http code","code":503,"status":"HTTP/1.1 503","thread":2,"run":0}
{"ts":1742998743.747011,"level":"warn","r":15,"file":"http_client.go","line":1151,"msg":"Non ok http code","code":503,"status":"HTTP/1.1 503","thread":2,"run":0}
{"ts":1742998743.747161,"level":"warn","r":14,"file":"http_client.go","line":1151,"msg":"Non ok http code","code":503,"status":"HTTP/1.1 503","thread":1,"run":0}
{"ts":1742998743.747821,"level":"warn","r":15,"file":"http_client.go","line":1151,"msg":"Non ok http code","code":503,"status":"HTTP/1.1 503","thread":2,"run":0}
{"ts":1742998743.749139,"level":"warn","r":15,"file":"http_client.go","line":1151,"msg":"Non ok http code","code":503,"status":"HTTP/1.1 503","thread":2,"run":0}
{"ts":1742998743.750208,"level":"warn","r":14,"file":"http_client.go","line":1151,"msg":"Non ok http code","code":503,"status":"HTTP/1.1 503","thread":1,"run":0}
{"ts":1742998743.751415,"level":"warn","r":13,"file":"http_client.go","line":1151,"msg":"Non ok http code","code":503,"status":"HTTP/1.1 503","thread":0,"run":0}
Ended after 16.972875ms : 30 calls. qps=1767.5
Aggregated Function Time : count 30 avg 0.0014980889 +/- 0.001194 min 0.000202167 max 0.003989751 sum 0.044942667
# range, mid point, percentile, count
>= 0.000202167 <= 0.001 , 0.000601084 , 53.33, 16
> 0.001 <= 0.002 , 0.0015 , 63.33, 3
> 0.002 <= 0.003 , 0.0025 , 83.33, 6
> 0.003 <= 0.00398975 , 0.00349488 , 100.00, 5
# target 50% 0.000946811
# target 75% 0.00258333
# target 90% 0.0033959
# target 99% 0.00393037
# target 99.9% 0.00398381
Error cases : count 20 avg 0.0007462729 +/- 0.000495 min 0.000202167 max 0.002072208 sum 0.014925458
# range, mid point, percentile, count
>= 0.000202167 <= 0.001 , 0.000601084 , 80.00, 16
> 0.001 <= 0.002 , 0.0015 , 95.00, 3
> 0.002 <= 0.00207221 , 0.0020361 , 100.00, 1
# target 50% 0.000680867
# target 75% 0.000946811
# target 90% 0.00166667
```

Here is some more info from the istio proxy stats:

```
aaron@Aarons-MacBook-Air istio-1.25.0 % kubectl exec "$FORTIO_POD" -c istio-proxy -- pilot-agent request GET stats | grep httpbin | grep pending

cluster.outbound|8000||httpbin.default.svc.cluster.local;.circuit_breakers.default.remaining_pending: 1
cluster.outbound|8000||httpbin.default.svc.cluster.local;.circuit_breakers.default.rq_pending_open: 0
cluster.outbound|8000||httpbin.default.svc.cluster.local;.circuit_breakers.high.rq_pending_open: 0
cluster.outbound|8000||httpbin.default.svc.cluster.local;.upstream_rq_pending_active: 0
cluster.outbound|8000||httpbin.default.svc.cluster.local;.upstream_rq_pending_failure_eject: 0
cluster.outbound|8000||httpbin.default.svc.cluster.local;.upstream_rq_pending_overflow: 29
cluster.outbound|8000||httpbin.default.svc.cluster.local;.upstream_rq_pending_total: 22
aaron@Aarons-MacBook-Air istio-1.25.0 %
```