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CSCE 662

MP2.1

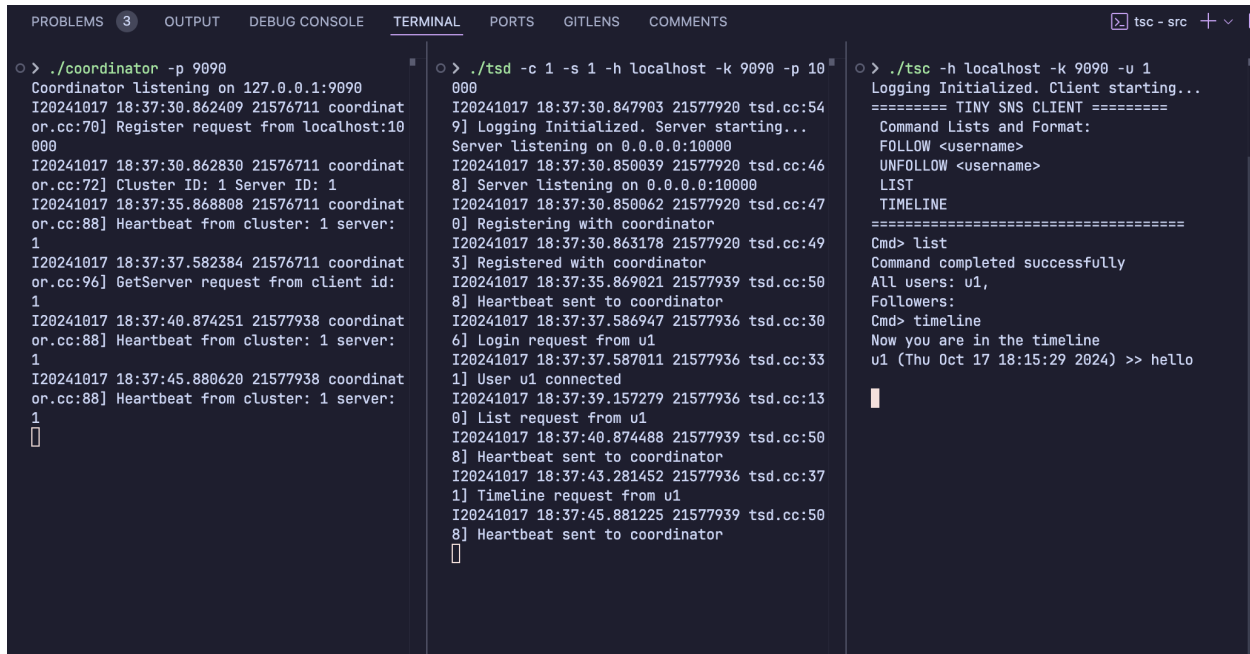
I made pretty sweeping changes to the coordination protocol buffer, discarding all but the fewest elements needed to complete MP2.1

```
You, 38 minutes ago | 1 author (You)
1  syntax = "proto3";
2  package csce662;
3  import "google/protobuf/empty.proto";
4  import "sns.proto";
5
6  service CoordService{
7      rpc Register (ServerRegistration) returns (google.protobuf.Empty);
8      rpc Heartbeat (HeartbeatMessage) returns (google.protobuf.Empty) {};
9      rpc GetServer (ClientID) returns (ServerInfo) {};
10 }
11
12 message ClientID{
13     int32 id = 1;
14 }
15
16 enum ServerCapability{
17     SNS = 0;
18 }
19
20 message HeartbeatMessage{
21     int32 cluster_id = 1;
22     int32 server_id = 2;
23 }
24
25 message ServerRegistration {
26     int32 cluster_id = 1;
27     ServerInfo info = 2;
28     repeated ServerCapability capabilities = 3;
29 }
30
31 message ServerInfo{
32     int32 id = 1;
33     string hostname = 2;
34     int32 port = 3;
35 }
```

Rather than rely on custom error messages and protobuf messages to communicate errors, I simply use the built in gRPC error codes where applicable.

This MP required very few code changes, mostly just parsing/passing additional command line args, having the client get ServerInfo before calling Login, and adding Registration and Heartbeat functionality to the server. Overall, it was pretty straightforward and a good intro to load balancing servers without synchronization. I think it would be neat if the client was completely unaware that it was reaching out to a different Server each time (something like a reverse proxy) but this approach seems to work just fine.

Test case 1



```
PROBLEMS 3 OUTPUT DEBUG CONSOLE TERMINAL PORTS GITLENS COMMENTS tsc - src + v [
○ > ./coordinator -p 9090
Coordinator listening on 127.0.0.1:9090
I20241017 18:37:30.862409 21576711 coordinat
or.cc:70] Register request from localhost:10
000
I20241017 18:37:30.862830 21576711 coordinat
or.cc:72] Cluster ID: 1 Server ID: 1
I20241017 18:37:35.868808 21576711 coordinat
or.cc:88] Heartbeat from cluster: 1 server:
1
I20241017 18:37:37.582384 21576711 coordinat
or.cc:96] GetServer request from client id:
1
I20241017 18:37:40.874251 21577938 coordinat
or.cc:88] Heartbeat from cluster: 1 server:
1
I20241017 18:37:45.880620 21577938 coordinat
or.cc:88] Heartbeat from cluster: 1 server:
1
[]

○ > ./tsd -c 1 -s 1 -h localhost -k 9090 -p 10
000
I20241017 18:37:30.847903 21577920 tsd.cc:54
9] Logging Initialized. Server starting...
Server listening on 0.0.0.0:10000
I20241017 18:37:30.850039 21577920 tsd.cc:46
8] Server listening on 0.0.0.0:10000
I20241017 18:37:30.850062 21577920 tsd.cc:47
0] Registering with coordinator
I20241017 18:37:30.863178 21577920 tsd.cc:49
3] Registered with coordinator
I20241017 18:37:35.869021 21577939 tsd.cc:50
8] Heartbeat sent to coordinator
I20241017 18:37:37.586947 21577936 tsd.cc:30
6] Login request from u1
I20241017 18:37:37.587011 21577936 tsd.cc:33
1] User u1 connected
I20241017 18:37:39.157279 21577936 tsd.cc:13
0] List request from u1
I20241017 18:37:40.874488 21577939 tsd.cc:50
8] Heartbeat sent to coordinator
I20241017 18:37:43.281452 21577936 tsd.cc:37
1] Timeline request from u1
I20241017 18:37:45.881225 21577939 tsd.cc:50
8] Heartbeat sent to coordinator
[]

○ > ./tsc -h localhost -k 9090 -u 1
Logging Initialized. Client starting...
===== TINY SNS CLIENT =====
Command Lists and Format:
FOLLOW <username>
UNFOLLOW <username>
LIST
TIMELINE
=====
Cmd> list
Command completed successfully
All users: u1,
Followers:
Cmd> timeline
Now you are in the timeline
u1 (Thu Oct 17 18:15:29 2024) >> hello
[]
```

This testcase demonstrates the client reaching out to the coordinator to get the Server information associated with its client ID (1) and subsequently establishing a connection to the cluster 1 server.

Test case 2

```
PROBLEMS 3 OUTPUT DEBUG CONSOLE TERMINAL PORTS GITLENS COMMENTS tsc - src + v []

or.cc:70] Register request from localhost:10000
I20241017 18:40:54.126582 21583623 coordinat
or.cc:72] Cluster ID: 1 Server ID: 1
I20241017 18:41:04.226074 21583623 coordinat
or.cc:96] GetServer request from client id:
1
I20241017 18:41:11.497192 21583623 coordinat
or.cc:96] GetServer request from client id:
1
I20241017 18:41:20.422525 21583845 coordinat
or.cc:70] Register request from localhost:10000
I20241017 18:41:20.422591 21583845 coordinat
or.cc:72] Cluster ID: 1 Server ID: 1
I20241017 18:41:25.428679 21583623 coordinat
or.cc:88] Heartbeat from cluster: 1 server:
1
I20241017 18:41:28.375783 21583623 coordinat
or.cc:96] GetServer request from client id:
1
I20241017 18:41:30.434497 21583845 coordinat
or.cc:88] Heartbeat from cluster: 1 server:
1
I20241017 18:41:35.440573 21583845 coordinat
or.cc:88] Heartbeat from cluster: 1 server:
1
I20241017 18:41:40.447002 21583623 coordinat
or.cc:88] Heartbeat from cluster: 1 server:
1
I20241017 18:40:54.127070 21583827 tsd.cc:49
3] Registered with coordinator
^C
I20241017 18:41:20.416100 21584963 tsd.cc:54
9] Logging Initialized. Server starting...
Server listening on 0.0.0.0:10000
I20241017 18:41:20.417858 21584963 tsd.cc:46
8] Server listening on 0.0.0.0:10000
I20241017 18:41:20.417881 21584963 tsd.cc:47
0] Registering with coordinator
I20241017 18:41:20.422691 21584963 tsd.cc:49
3] Registered with coordinator
I20241017 18:41:25.429070 21584981 tsd.cc:50
8] Heartbeat sent to coordinator
I20241017 18:41:28.378070 21584979 tsd.cc:30
6] Login request from u1
I20241017 18:41:28.378120 21584979 tsd.cc:33
1] User u1 connected
I20241017 18:41:30.255371 21584979 tsd.cc:13
0] List request from u1
I20241017 18:41:30.434654 21584981 tsd.cc:50
8] Heartbeat sent to coordinator
I20241017 18:41:32.339779 21584979 tsd.cc:37
1] Timeline request from u1
I20241017 18:41:35.441179 21584981 tsd.cc:50
8] Heartbeat sent to coordinator
I20241017 18:41:40.447464 21584981 tsd.cc:50
8] Heartbeat sent to coordinator

o> ./tsc -h localhost -k 9090 -u 1
Logging Initialized. Client starting...conn
ection failed
o> ./tsc -h localhost -k 9090 -u 1
Logging Initialized. Client starting...conn
ection failed
o> ./tsc -h localhost -k 9090 -u 1
Logging Initialized. Client starting...
===== TINY SNS CLIENT =====
Command Lists and Format:
FOLLOW <username>
UNFOLLOW <username>
LIST
TIMELINE
=====
Cmd> list
Command completed successfully
All users: u1,
Followers:
Cmd> timeline
Now you are in the timeline
u1 (Thu Oct 17 18:15:29 2024) >> hello
```

This test case demonstrated a server restarting and re-establishing itself with the coordinator before the client can get its information and connect to it.

Test case 3

```
PROBLEMS 5 OUTPUT DEBUG CONSOLE TERMINAL PORTS GITLENS COMMENTS tsc - src + v []

I20241017 20:26:18.640983 21747569 coord
inator.cc:88] Heartbeat from cluster: 2
server: 2
I20241017 20:26:20.644328 21747569 coord
inator.cc:88] Heartbeat from cluster: 1
server: 1
I20241017 20:26:23.648540 21747655 coord
inator.cc:88] Heartbeat from cluster: 2
server: 2
I20241017 20:26:25.650676 21747655 coord
inator.cc:88] Heartbeat from cluster: 1
server: 1
I20241017 20:26:28.654023 21747655 coord
inator.cc:88] Heartbeat from cluster: 2
server: 2
I20241017 20:26:30.653358 21747569 coord
inator.cc:88] Heartbeat from cluster: 1
server: 1
I20241017 20:26:33.661231 21747569 coord
inator.cc:88] Heartbeat from cluster: 2
server: 2
I20241017 20:26:35.659454 21747569 coord
inator.cc:88] Heartbeat from cluster: 1
server: 1
I20241017 20:26:38.667119 21747655 coord
inator.cc:88] Heartbeat from cluster: 2
server: 2
I20241017 20:26:40.665642 21747655 coord
inator.cc:88] Heartbeat from cluster: 1
server: 1
I20241017 20:26:43.673132 21747655 coord
inator.cc:88] Heartbeat from cluster: 2
server: 2

c:450] Registering with coordinator
I20241017 20:26:13.634495 21748562 tsd.c
c:473] Registered with coordinator
I20241017 20:26:15.638540 21747656 tsd.c
c:488] Heartbeat sent to coordinator
I20241017 20:26:18.641453 21748580 tsd.c
c:488] Heartbeat sent to coordinator
I20241017 20:26:20.644914 21747656 tsd.c
c:488] Heartbeat sent to coordinator
I20241017 20:26:23.649103 21748580 tsd.c
c:488] Heartbeat sent to coordinator
I20241017 20:26:25.651034 21747656 tsd.c
c:488] Heartbeat sent to coordinator
I20241017 20:26:27.698154 21748578 tsd.c
c:116] List request from u2
I20241017 20:26:28.654731 21748580 tsd.c
c:488] Heartbeat sent to coordinator
I20241017 20:26:30.653640 21747656 tsd.c
c:488] Heartbeat sent to coordinator
I20241017 20:26:32.129595 21748578 tsd.c
c:341] Timeline request from u2
I20241017 20:26:32.129667 21748578 tsd.c
c:351] Timeline request from u2
I20241017 20:26:33.661484 21748580 tsd.c
c:488] Heartbeat sent to coordinator
I20241017 20:26:35.659770 21747656 tsd.c
c:488] Heartbeat sent to coordinator
I20241017 20:26:38.667308 21748580 tsd.c
c:488] Heartbeat sent to coordinator
I20241017 20:26:40.665854 21747656 tsd.c
c:488] Heartbeat sent to coordinator
I20241017 20:26:43.673475 21748580 tsd.c
c:488] Heartbeat sent to coordinator

o> ./tsc -h localhost -k 9090 -u 1
Logging Initialized. Client starting...
===== TINY SNS CLIENT =====
Command Lists and Format:
FOLLOW <username>
UNFOLLOW <username>
LIST
TIMELINE
=====
Cmd> list
Invalid Command
Cmd> list
Command completed successfully
All users: u1,
Followers:
Cmd> timeline
Now you are in the timeline
u1 (Thu Oct 17 18:15:29 2024) >> hello

o> ./tsc -h localhost -k 9090 -u 2
Logging Initialized. Client starting...
===== TINY SNS CLIENT =====
Command Lists and Format:
FOLLOW <username>
UNFOLLOW <username>
LIST
TIMELINE
=====
Cmd> list
Command failed with unknown reason
Cmd> timeline
Command failed with unknown reason
Cmd> list
Command completed successfully
All users: u2,
Followers:
Cmd> timeline
Now you are in the timeline
```

The last test case demonstrates u1 having uninterrupted access to SNS using cluster 1 while u2 experiences failed commands due to the cluster 2 server going down and then restarting

I had to rework a significant portion of my client and server to get automatic “reconnection” up and working with u2 in this example