

Output Document

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Lab 3: Asterix and Double Trouble -- Replication, Caching, and Fault Tolerance

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Frontend Service

The frontend has started and has chosen 9094 order replica as the leader. It is serving client requests.

```
umass-cs677-current > lab-3-asterix-and-double-trouble-sahil-n-ash > src > logs > ⌵ frontend.log
1 MainThread : Redis config : {'maxmemory': '10485760'} - {'maxmemory-policy': 'volatile-ttl'}
2 MainThread : Calling ping (health check) service for 9094 order
3 MainThread : Order service leader found - 9094 order
4 MainThread : Notifying 9090 replica of order leader
5 MainThread : Notifying 9092 replica of order leader
6 MainThread : Notifying 9094 replica of order leader
7 MainThread : Starting threaded httpd server on 0.0.0.0:8000
8
9 Thread-1 (process_request_thread) : Received GET request on url /stocks/FishCo
10 Thread-1 (process_request_thread) : Checking Cache
11 Thread-1 (process_request_thread) : Cache response - None
12 Thread-1 (process_request_thread) : Calling lookup service
13 Thread-1 (process_request_thread) : Adding lookup response to cache
14 Thread-1 (process_request_thread) : Received lookup response - 200 {'data': {'name': 'FishCo', 'price': 17.99, 'quantity': 506}}
15 127.0.0.1 - - [01/May/2023 18:54:43] "GET /stocks/FishCo HTTP/1.1" 200 -
16 Thread-1 (process_request_thread) : Finished GET request
17
18 Thread-1 (process_request_thread) : Received POST request on url /orders
19 Thread-1 (process_request_thread) : data - {'name': 'FishCo', 'quantity': 43, 'type': 'sell'} <class 'dict'>
20 Thread-1 (process_request_thread) : Calling trade service
21 Thread-2 (process_request_thread) : Received GET request on url /cache_invalid/FishCo
22 Thread-2 (process_request_thread) : Making Cache invalid
23 Thread-2 (process_request_thread) : Cache Invalidated in memory
24 127.0.0.1 - - [01/May/2023 18:54:43] "GET /cache_invalid/FishCo HTTP/1.1" 200 -
25 Thread-2 (process_request_thread) : Finished GET request
26
27 Thread-1 (process_request_thread) : Received trade response - 200 {'data': {'transaction_number': 11}}
28 127.0.0.1 - - [01/May/2023 18:54:43] "POST /orders HTTP/1.1" 200 -
29 Thread-1 (process_request_thread) : Finished POST request
30
31 Thread-1 (process_request_thread) : Received GET request on url /stocks/BoarCo
32 Thread-1 (process_request_thread) : Checking Cache
33 Thread-1 (process_request_thread) : Cache response - None
```

Catalog Service

PyRO Name Server

```
umass-cs677-current > lab-3-asterix-and-double-trouble-sahil-n-ash > src > logs > ≡ pyro_ns_9096.log
1 Broadcast server running on 0.0.0.0:9097
2 NS running on 0.0.0.0:9096 (0.0.0.0)
3 URI = PYRO:Pyro.NameServer@0.0.0.0:9096
4
```

Service

```
umass-cs677-current > lab-3-asterix-and-double-trouble-sahil-n-ash > src > logs > ≡ catalog_9096.log
1 MainThread : Existing Stock DB File Found.
2 MainThread : Loading stock db
3 MainThread : Catalog service ready
4 Pyro-Worker-4959286544 : Received lookup request for - MenhirCo
5 Pyro-Worker-4959286544 : Read lock - acquired
6 Pyro-Worker-4959286544 : MenhirCo present in db
7 Pyro-Worker-4959286544 : Read lock - released
8 Pyro-Worker-4959279376 : Received lookup request for - MenhirCo
9 Pyro-Worker-4959279376 : Read lock - acquired
10 Pyro-Worker-4959279376 : MenhirCo present in db
11 Pyro-Worker-4959279376 : Read lock - released
12 Pyro-Worker-4959287248 : Received update request for - MenhirCo
13 Pyro-Worker-4959287248 : Write lock - acquired
14 Pyro-Worker-4959287248 : Write lock - released
15 Pyro-Worker-4959287248 : Updated MenhirCo quantity by 11 in db
16 Pyro-Worker-4959287248 : Making cache invalid
17 Pyro-Worker-4959287248 : Starting new HTTP connection (1): 0.0.0.0:8000
18 Pyro-Worker-4959287248 : http://0.0.0.0:8000 "GET /cache_invalid/MenhirCo HTTP/1.1" 200 41
19 Pyro-Worker-4959287248 : Cache invalidated
20 Pyro-Worker-4959285840 : Received lookup request for - BoarCo
21 Pyro-Worker-4959285840 : Read lock - acquired
22 Pyro-Worker-4959285840 : BoarCo present in db
23 Pyro-Worker-4959285840 : Read lock - released
24 Pyro-Worker-4959286544 : Received lookup request for - BoarCo
25 Pyro-Worker-4959286544 : Read lock - acquired
26 Pyro-Worker-4959286544 : BoarCo present in db
27 Pyro-Worker-4959286544 : Read lock - released
28 Pyro-Worker-4959279376 : Received update request for - BoarCo
29 Pyro-Worker-4959279376 : Write lock - acquired
30 Pyro-Worker-4959279376 : Write lock - released
31 Pyro-Worker-4959279376 : Updated BoarCo quantity by -39 in db
32 Pyro-Worker-4959279376 : Making cache invalid
33 Pyro-Worker-4959279376 : Starting new HTTP connection (1): 0.0.0.0:8000
34 Pyro-Worker-4959279376 : http://0.0.0.0:8000 "GET /cache_invalid/BoarCo HTTP/1.1" 200 41
35 Pyro-Worker-4959279376 : Cache invalidated
```

Order Service (PyRO)

PyRO Name Server


```
umass-cs677-current > lab-3-asterix-and-double-trouble-sahil-n-ash > src > logs > ≡ pyro_ns_9090.log
1 Broadcast server running on 0.0.0.0:9091
2 NS running on 0.0.0.0:9090 (0.0.0.0)
3 URI = PYRO:Pyro.NameServer@0.0.0.0:9090
4
```

```
umass-cs677-current > lab-3-asterix-and-double-trouble-sahil-n-ash > src > logs > ≡ pyro_ns_9092.log
1 Broadcast server running on 0.0.0.0:9093
2 NS running on 0.0.0.0:9092 (0.0.0.0)
3 URI = PYRO:Pyro.NameServer@0.0.0.0:9092
4
```

```
umass-cs677-current > lab-3-asterix-and-double-trouble-sahil-n-ash > src > logs > ≡ pyro_ns_9094.log
1 Broadcast server running on 0.0.0.0:9095
2 NS running on 0.0.0.0:9094 (0.0.0.0)
3 URI = PYRO:Pyro.NameServer@0.0.0.0:9094
4
```

Replicas

Leader is 9094 - and processing frontend requests

```
umass-cs677-current > lab-3-asterix-and-double-trouble-sahil-n-ash > src > logs >  order_9094.log
1  MainThread : Existing Order Log File Found.
2  MainThread : TXN_NUM is initialized as 10
3  MainThread : Loading order log
4  MainThread : Order replica just started. Trying to sync
5  MainThread : Checking for leader at startup time
6  MainThread : Starting new HTTP connection (1): 0.0.0.0:8000
7  MainThread : NewConnectionError - Aborting - Frontend is not up!
8  MainThread : No leader found at startup time, no sync required
9  MainThread : Order service ready
10 Pyro-Worker-4684656784 : This process is the leader of the replicated order pool - Flag is True
11 Pyro-Worker-4684648784 : Received trade request - {'name': 'FishCo', 'quantity': 43, 'type': 'sell'} <class 'dict'>
12 Pyro-Worker-4684648784 : Calling lookup service - FishCo
13 Pyro-Worker-4684648784 : Received lookup response - 200 {'data': {'name': 'FishCo', 'price': 17.99, 'quantity': 506}}
14 Pyro-Worker-4684648784 : FishCo present in db
15 Pyro-Worker-4684648784 : Calling update service - FishCo
16 Pyro-Worker-4684648784 : Received update response - FishCo
17 Pyro-Worker-4684648784 : Write lock - acquired
18 Pyro-Worker-4684648784 : Write lock - released
19 Pyro-Worker-4684648784 : Notifying 9092 replica of order leader - txn_num 11
20 Pyro-Worker-4684648784 : Response from replica - OK
21 Pyro-Worker-4684648784 : Notifying 9090 replica of order leader - txn_num 11
22 Pyro-Worker-4684648784 : Response from replica - OK
23 Pyro-Worker-4684648784 : Executing - trade_code 200 <class 'int'> - response {'data': {'transaction_number': 11}} <class 'dict'>
24 Pyro-Worker-4684648784 : Executing sell trade for FishCo with 43 quantity
25 Pyro-Worker-4684655440 : Received trade request - {'name': 'BoarCo', 'quantity': 6, 'type': 'sell'} <class 'dict'>
26 Pyro-Worker-4684655440 : Calling lookup service - BoarCo
27 Pyro-Worker-4684655440 : Received lookup response - 200 {'data': {'name': 'BoarCo', 'price': 28.59, 'quantity': 992}}
28 Pyro-Worker-4684655440 : BoarCo present in db
29 Pyro-Worker-4684655440 : Calling update service - BoarCo
30 Pyro-Worker-4684655440 : Received update response - BoarCo
31 Pyro-Worker-4684655440 : Write lock - acquired
32 Pyro-Worker-4684655440 : Write lock - released
33 Pyro-Worker-4684655440 : Notifying 9092 replica of order leader - txn_num 12
34 Pyro-Worker-4684655440 : Response from replica - OK
35 Pyro-Worker-4684655440 : Notifying 9090 replica of order leader - txn_num 12
```

Other replicas, 9092 and 9090, are just saving the forwarded order details from the leader

```
umass-cs677-current > lab-3-asterix-and-double-trouble-sahil-n-ash > src > logs > ≡ order_9092.log
```


```
1  MainThread : Existing Order Log File Found.
2  MainThread : TXN_NUM is initialized as 10
3  MainThread : Loading order log
4  MainThread : Order replica just started. Trying to sync
5  MainThread : Checking for leader at startup time
6  MainThread : Starting new HTTP connection (1): 0.0.0.0:8000
7  MainThread : NewConnectionError - Aborting - Frontend is not up!
8  MainThread : No leader found at startup time, no sync required
9  MainThread : Order service ready
10 Pyro-Worker-4561260176 : This process is a replica - Flag is False
11 Pyro-Worker-4561268432 : Writing trade data from leader - {'transaction_number': 11, 'stock_name': 'FishCo
12 Pyro-Worker-4561268432 : Write lock - acquired
13 Pyro-Worker-4561268432 : Write lock - released
14 Pyro-Worker-4561268432 : TXN_NUM is - 11
15 Pyro-Worker-4561267728 : Writing trade data from leader - {'transaction_number': 12, 'stock_name': 'BoarCo
16 Pyro-Worker-4561267728 : Write lock - acquired
17 Pyro-Worker-4561267728 : Write lock - released
18 Pyro-Worker-4561267728 : TXN_NUM is - 12
19
```

```
umass-cs677-current > lab-3-asterix-and-double-trouble-sahil-n-ash > src > logs > ≡ order_9090.log
```

```
1  MainThread : Existing Order Log File Found.
2  MainThread : TXN_NUM is initialized as 10
3  MainThread : Loading order log
4  MainThread : Order replica just started. Trying to sync
5  MainThread : Checking for leader at startup time
6  MainThread : Starting new HTTP connection (1): 0.0.0.0:8000
7  MainThread : NewConnectionError - Aborting - Frontend is not up!
8  MainThread : No leader found at startup time, no sync required
9  MainThread : Order service ready
10 Pyro-Worker-4841943952 : This process is a replica - Flag is False
11 Pyro-Worker-4841944656 : Writing trade data from leader - {'transaction_number': 11, 'stock_name': 'Fish
12 Pyro-Worker-4841944656 : Write lock - acquired
13 Pyro-Worker-4841944656 : Write lock - released
14 Pyro-Worker-4841944656 : TXN_NUM is - 11
15 Pyro-Worker-4692063312 : Writing trade data from leader - {'transaction_number': 12, 'stock_name': 'Boar
16 Pyro-Worker-4692063312 : Write lock - acquired
17 Pyro-Worker-4692063312 : Write lock - released
18 Pyro-Worker-4692063312 : TXN_NUM is - 12
19
```

Client

The following image shows a client's output who processes - lookup + trade request for 2 stocks. From line #24 onwards we can see the total orders executed by the client, and that it is verifying the local and server (by doing an order query request to frontend) order details match.

```
umass-cs677-current > lab-3-asterix-and-double-trouble-sahil-n-ash > src > client >  client.log
1 MainThread : Created new session
2 MainThread :
3 MainThread : Sending GET request to server - BoarCo
4 MainThread : Starting new HTTP connection (1): 0.0.0.0:8000
5 MainThread : http://0.0.0.0:8000 "GET /stocks/BoarCo HTTP/1.1" 200 62
6 MainThread : Lookup : Time 0.0332870483 sec ; GET response for BoarCo - {'data': {'name': 'BoarCo', 'price': 28.59, 'quantity': 1172}}
7 MainThread : GET request complete - 1
8 MainThread :
9 MainThread : Sending POST request to server - BoarCo {'name': 'BoarCo', 'quantity': 34, 'type': 'buy'}
10 MainThread : http://0.0.0.0:8000 "POST /orders HTTP/1.1" 200 36
11 MainThread : Trade : Time 0.0471129417 sec ; POST response for BoarCo - {'data': {'transaction_number': 33}}
12 MainThread : POST request complete - 1
13 MainThread :
14 MainThread : Sending GET request to server - MenhirCo
15 MainThread : http://0.0.0.0:8000 "GET /stocks/MenhirCo HTTP/1.1" 200 64
16 MainThread : Lookup : Time 0.0048940182 sec ; GET response for MenhirCo - {'data': {'name': 'MenhirCo', 'price': 38.69, 'quantity': 1507}}
17 MainThread : GET request complete - 2
18 MainThread :
19 MainThread : Sending POST request to server - MenhirCo {'name': 'MenhirCo', 'quantity': 13, 'type': 'sell'}
20 MainThread : http://0.0.0.0:8000 "POST /orders HTTP/1.1" 200 36
21 MainThread : Trade : Time 0.0166940689 sec ; POST response for MenhirCo - {'data': {'transaction_number': 34}}
22 MainThread : POST request complete - 2
23 MainThread :
24 MainThread : Orders executed by this client - [33, 34]
25 MainThread :
26 MainThread : Sending GET request to server for order query - 33
27 MainThread : http://0.0.0.0:8000 "GET /orders/33 HTTP/1.1" 200 73
28 MainThread : Query : Time 0.0042529106 sec ; GET response for query 33 - {'data': {'number': 33, 'name': 'BoarCo', 'type': 'buy', 'quantity': 34}}
29 MainThread : Local and server order details match for 33 order number
30 MainThread :
31 MainThread : Sending GET request to server for order query - 34
32 MainThread : http://0.0.0.0:8000 "GET /orders/34 HTTP/1.1" 200 76
33 MainThread : Query : Time 0.0032801628 sec ; GET response for query 34 - {'data': {'number': 34, 'name': 'MenhirCo', 'type': 'sell', 'quantity': 13}}
34 MainThread : Local and server order details match for 34 order number
35 MainThread :
36 MainThread : Session closed
```