

Tugas Individu 2

Sistem Paralel dan Terdistribusi A Sinkronisasi dan Distributed Systems



Disusun Oleh :

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DOKUMENTASI

Build and Run Docker File

```
PS E:\Semester 5\Parallel and Distributed System\Tugas Individu 2\distributed-sync-system> docker compose -f docker/docker-compose.yml up --build
✓ Network docker-raft-net Created
✓ Volume "docker-node1" Created
✓ Volume "docker-cache1" Created
✓ Volume "docker-cache2" Created
✓ Volume "docker-node2" Created
✓ Volume "docker-queue1" Created
✓ Volume "docker-queue2" Created
✓ Volume "docker-node3" Created
✓ Volume "docker-cache3" Created
✓ Volume "docker-queue3" Created
✓ Container redis Created
✓ Container queue1 Created
✓ Container cache3 Created
✓ Container queue2 Created
✓ Container cache1 Created
✓ Container cache2 Created
✓ Container node1 Created
✓ Container node3 Created
✓ Container node2 Created
✓ Container queue3 Created
Attaching to cache1, cache2, cache3, node1, node2, node3, queue1, queue2, queue3, redis
redis | 1:C 27 Oct 2025 15:06:37.114 * o000o000o000o Redis is starting o000o000o000o
redis | 1:C 27 Oct 2025 15:06:37.114 * Redis version=7.4.6, bits=64, commit=00000000, modified=0, pid=1, just started
redis | 1:C 27 Oct 2025 15:06:37.114 # Warning: no config file specified, using the default config. In order to specify a config file use redis-server /path/to/redis.conf
redis | 1:M 27 Oct 2025 15:06:37.115 * monotonic clock: POSIX clock_gettime
redis | 1:M 27 Oct 2025 15:06:37.115 * Running mode=standalone, port=6379.
redis | 1:M 27 Oct 2025 15:06:37.116 * Server initialized
redis | 1:M 27 Oct 2025 15:06:37.116 * Ready to accept connections tcp
cache2 | Starting Distributed Cache Node...
cache2 | Node cache2 listening on
cache1 | Starting Distributed Cache Node...
cache1 | Node cache1 listening on
queue2 | Starting Distributed Queue Node...
queue3 | Starting Distributed Queue Node...
node3 | Starting Raft Distributed Lock Node...
node3 | Node node3 initialized, listening on port 8002
node2 | Starting Raft Distributed Lock Node...
node2 | Node node2 initialized, listening on port 8001
queue1 | Starting Distributed Queue Node...
cache3 | Starting Distributed Cache Node...
cache3 | Node cache3 listening on
node1 | Starting Raft Distributed Lock Node...
node1 | Node node1 initialized, listening on port 8000
node1 | Node node1 listening on 8000
node1 | Node node1 memulai election di term 0
node1 | 🗡 Node node1 elected as LEADER for term 1!
cache1 | Node cache1 listening on 8200
cache1 | Node cache1 memulai election di term 0
cache1 | 🗡 Node cache1 elected as LEADER for term 1!
queue1 | Node queue1 listening on 8100
queue1 | Node queue1 memulai election di term 0
queue1 | 🗡 Node queue1 elected as LEADER for term 1!
```

Cek Logs

```
PS E:\Semester 5\Parallel and Distributed System\Tugas Individu 2\distributed-sync-system>
-
PS E:\Semester 5\Parallel and Distributed System\Tugas Individu 2\distributed-sync-system>
PS E:\Semester 5\Parallel and Distributed System\Tugas Individu 2\distributed-sync-system> docker compose -f docker/docker-compose.yml logs -f
queue2 | Starting Distributed Queue Node...
cache2 | Starting Distributed Cache Node...
cache2 | Node cache2 listening on
node3 | Starting Raft Distributed Lock Node...
node1 | Starting Raft Distributed Lock Node...
queue3 | Starting Distributed Queue Node...
cache1 | Starting Distributed Cache Node...
redis | 1:C 27 Oct 2025 15:06:37.114 * 0000000000000000 Redis is starting 0000000000000000
cache3 | Starting Distributed Cache Node...
node2 | Starting Raft Distributed Lock Node...
node2 | Node node2 initialized, listening on port 8001
node3 | Node node3 initialized, listening on port 8002
node1 | Node node1 initialized, listening on port 8000
node1 | Node node1 listening on 8000
node1 | Node node1 memulai election di term 0
node1 | 🚩 Node node1 elected as LEADER for term 1!
queue1 | Starting Distributed Queue Node...
queue1 | Node queue1 listening on 8100
queue1 | Node queue1 memulai election di term 0
queue1 | 🚩 Node queue1 elected as LEADER for term 1!
cache1 | Node cache1 listening on
cache1 | Node cache1 listening on 8200
cache1 | Node cache1 memulai election di term 0
cache1 | 🚩 Node cache1 elected as LEADER for term 1!
cache3 | Node cache3 listening on
redis | 1:C 27 Oct 2025 15:06:37.114 * Redis version=7.4.0, bits=64, commit=00000000, modified=0, pid=1, just started
redis | 1:C 27 Oct 2025 15:06:37.114 # Warning: no config file specified, using the default config. In order to specify a config file use redis-server /path/to/redis.conf
redis | 1:M 27 Oct 2025 15:06:37.115 * monotonic clock: POSIX clock_gettime
redis | 1:M 27 Oct 2025 15:06:37.115 * Running mode=standalone, port=6379.
redis | 1:M 27 Oct 2025 15:06:37.116 * Server initialized
redis | 1:M 27 Oct 2025 15:06:37.116 * Ready to accept connections tcp
```

Lock Cluster - Check Health and Leader

```
PS E:\Semester 5\Parallel and Distributed System\Tugas Individu 2\distributed-sync-system> curl http://localhost:8000/health
```

```
StatusCode      : 200
StatusDescription : OK
Content         : {"ok": true, "id": "node1", "role": 2, "term": 1}
RawContent      : HTTP/1.1 200 OK
                  Content-Length: 49
                  Content-Type: application/json; charset=utf-8
                  Date: Mon, 27 Oct 2025 15:08:40 GMT
                  Server: Python/3.11 aiohttp/3.10.5

                  {"ok": true, "id": "node1", "role": 2, "t...
Forms           : {}
Headers         : {[Content-Length, 49], [Content-Type, application/json; charset=utf-8], [Date, Mon, 27 Oct 2025 15:08:40 GMT], [Server, Python/3.11 aiohttp/3.10.5]}
Images          : {}
InputFields     : {}
Links           : {}
ParsedHtml      : mshtml.HTMLDocumentClass
RawContentLength : 49
```

```
PS E:\Semester 5\Parallel and Distributed System\Tugas Individu 2\distributed-sync-system> curl http://localhost:8001/health
```

```
StatusCode      : 200
StatusDescription : OK
Content         : {"ok": true, "id": "node2", "role": 0, "term": 1}
RawContent      : HTTP/1.1 200 OK
                  Content-Length: 49
                  Content-Type: application/json; charset=utf-8
                  Date: Mon, 27 Oct 2025 15:09:03 GMT
                  Server: Python/3.11 aiohttp/3.10.5

                  {"ok": true, "id": "node2", "role": 0, "t...
Forms           : {}
Headers         : {[Content-Length, 49], [Content-Type, application/json; charset=utf-8], [Date, Mon, 27 Oct 2025 15:09:03 GMT], [Server, Python/3.11 aiohttp/3.10.5]}
Images          : {}
InputFields     : {}
Links           : {}
ParsedHtml      : mshtml.HTMLDocumentClass
RawContentLength : 49
```

```
PS E:\Semester 5\Parallel and Distributed System\Tugas Individu 2\distributed-sync-system> curl http://localhost:8002/health
```

```
StatusCode      : 200
StatusDescription : OK
Content         : {"ok": true, "id": "node3", "role": 0, "term": 1}
RawContent      : HTTP/1.1 200 OK
                  Content-Length: 49
                  Content-Type: application/json; charset=utf-8
                  Date: Mon, 27 Oct 2025 15:09:15 GMT
                  Server: Python/3.11 aiohttp/3.10.5

                  {"ok": true, "id": "node3", "role": 0, "t...
Forms           : {}
Headers         : {[Content-Length, 49], [Content-Type, application/json; charset=utf-8], [Date, Mon, 27 Oct 2025 15:09:15 GMT], [Server, Python/3.11 aiohttp/3.10.5]}
Images          : {}
InputFields     : {}
Links           : {}
ParsedHtml      : mshtml.HTMLDocumentClass
RawContentLength : 49
```

Lock Cluster - Acquire Lock

```
>> Invoke-WebRequest -Uri "http://localhost:8000/lock/acquire" -Method POST -ContentType "application/json" -Body $body

StatusCode      : 200
StatusDescription : OK
Content         : {"ok": true}
RawContent      : HTTP/1.1 200 OK
                  Content-Length: 12
                  Content-Type: application/json; charset=utf-8
                  Date: Mon, 27 Oct 2025 15:09:39 GMT
                  Server: Python/3.11 aiohttp/3.10.5

                  {"ok": true}
Forms           : {}
Headers         : {[Content-Length, 12], [Content-Type, application/json; charset=utf-8], [Date, Mon, 27 Oct 2025 15:09:39 GMT], [Server, Python/3.11 aiohttp/3.10.5]}
Images          : {}
InputFields     : {}
Links           : {}
ParsedHtml      : mshtml.HTMLDocumentClass
RawContentLength : 12
```

Lock Cluster - Release Lock

```
PS E:\Semester 5\Parallel and Distributed System\Tugas Individu 2\distributed-sync-system> $body = '{"key":"A","client_id":"client1"}'
>> Invoke-WebRequest -Uri "http://localhost:8080/lock/release" -Method POST -ContentType "application/json" -Body $body

StatusCode      : 200
StatusDescription : OK
Content         : {"ok": true}
RawContent      : HTTP/1.1 200 OK
                  Content-Length: 12
                  Content-Type: application/json; charset=utf-8
                  Date: Mon, 27 Oct 2025 15:10:29 GMT
                  Server: Python/3.11 aiohttp/3.10.5

                  {"ok": true}
Forms           : {}
Headers         : [[Content-Length, 12], [Content-Type, application/json; charset=utf-8], [Date, Mon, 27 Oct 2025 15:10:29 GMT], [Server, Python/3.11 aiohttp/3.10.5]]
Images          : {}
InputFields     : {}
Links           : {}
ParsedHtml      : mshtml.HTMLDocumentClass
RawContentLength : 12
```

Queue Cluster - Check Health and Leader

```
PS E:\Semester 5\Parallel and Distributed System\Tugas Individu 2\distributed-sync-system> curl http://localhost:8100/health

StatusCode      : 200
StatusDescription : OK
Content         : {"ok": true, "id": "queue1", "role": 2, "term": 1}
RawContent      : HTTP/1.1 200 OK
                  Content-Length: 50
                  Content-Type: application/json; charset=utf-8
                  Date: Mon, 27 Oct 2025 15:11:40 GMT
                  Server: Python/3.11 aiohttp/3.10.5

                  {"ok": true, "id": "queue1", "role": 2, "...
Forms           : {}
Headers         : [{"Content-Length", 50}, [{"Content-Type", application/json; charset=utf-8}, [{"Date", Mon, 27 Oct 2025 15:11:40 GMT}, [{"Server", Python/3.11 aiohttp/3.10.5}]]
Images          : {}
InputFields     : {}
Links           : {}
ParsedHtml      : mshtml.HTMLDocumentClass
RawContentLength : 50

PS E:\Semester 5\Parallel and Distributed System\Tugas Individu 2\distributed-sync-system> curl http://localhost:8101/health

StatusCode      : 200
StatusDescription : OK
Content         : {"ok": true, "id": "queue2", "role": 0, "term": 1}
RawContent      : HTTP/1.1 200 OK
                  Content-Length: 50
                  Content-Type: application/json; charset=utf-8
                  Date: Mon, 27 Oct 2025 15:11:58 GMT
                  Server: Python/3.11 aiohttp/3.10.5

                  {"ok": true, "id": "queue2", "role": 0, "...
Forms           : {}
Headers         : [{"Content-Length", 50}, [{"Content-Type", application/json; charset=utf-8}, [{"Date", Mon, 27 Oct 2025 15:11:58 GMT}, [{"Server", Python/3.11 aiohttp/3.10.5}]]
Images          : {}
InputFields     : {}
Links           : {}
ParsedHtml      : mshtml.HTMLDocumentClass
RawContentLength : 50

PS E:\Semester 5\Parallel and Distributed System\Tugas Individu 2\distributed-sync-system> curl http://localhost:8102/health

StatusCode      : 200
StatusDescription : OK
Content         : {"ok": true, "id": "queue3", "role": 0, "term": 1}
RawContent      : HTTP/1.1 200 OK
                  Content-Length: 50
                  Content-Type: application/json; charset=utf-8
                  Date: Mon, 27 Oct 2025 15:12:11 GMT
                  Server: Python/3.11 aiohttp/3.10.5

                  {"ok": true, "id": "queue3", "role": 0, "...
Forms           : {}
Headers         : [{"Content-Length", 50}, [{"Content-Type", application/json; charset=utf-8}, [{"Date", Mon, 27 Oct 2025 15:12:11 GMT}, [{"Server", Python/3.11 aiohttp/3.10.5}]]
Images          : {}
InputFields     : {}
Links           : {}
ParsedHtml      : mshtml.HTMLDocumentClass
RawContentLength : 50
```

Queue Cluster - Enqueue

```
PS E:\Semester 5\Parallel and Distributed System\Tugas Individu 2\distributed-sync-system> $body = '{"key":"user:42","value":"hello"}'
>> Invoke-WebRequest -Uri "http://localhost:8100/queue/enq" -Method POST -ContentType "application/json" -Body $body

StatusCode      : 200
StatusDescription : OK
Content         : {"ok": true}
RawContent      : HTTP/1.1 200 OK
                  Content-Length: 12
                  Content-Type: application/json; charset=utf-8
                  Date: Mon, 27 Oct 2025 15:12:57 GMT
                  Server: Python/3.11 aiohttp/3.10.5

                  {"ok": true}
Forms           : {}
Headers         : [[Content-Length, 12], [Content-Type, application/json; charset=utf-8], [Date, Mon, 27 Oct 2025 15:12:57 GMT], [Server, Python/3.11 aiohttp/3.10.5]]
Images          : {}
InputFields     : {}
Links           : {}
ParsedHtml      : mshtml.HTMLDocumentClass
RawContentLength : 12
```


Queue Cluster - Dequeue

```
PS E:\Semester 5\Parallel and Distributed System\Tugas Individu 2\distributed-sync-system> Invoke-WebRequest -Uri "http://localhost:8100/queue/deq" -Method POST

StatusCode      : 200
StatusDescription : OK
Content          : {"msg_id": "1761578009400838721", "payload": {"key": "user:42", "value": "hello"}}
RawContent       : HTTP/1.1 200 OK
                   Content-Length: 82
                   Content-Type: application/json; charset=utf-8
                   Date: Mon, 27 Oct 2025 15:13:29 GMT
                   Server: Python/3.11 aiohttp/3.10.5

                   {"msg_id": "1761578009400838721", "payload...
Forms            : {}
Headers          : {[Content-Length, 82], [Content-Type, application/json; charset=utf-8], [Date, Mon, 27 Oct 2025 15:13:29 GMT], [Server, Python/3.11 aiohttp/3.10.5]}
Images           : {}
InputFields      : {}
Links            : {}
ParsedHtml       : mshtml.HTMLDocumentClass
RawContentLength : 82
```

Queue Cluster - Ack Message

```
PS E:\Semester 5\Parallel and Distributed System\Tugas Individu 2\distributed-sync-system> $ack = '{"msg_id":"<MSG_ID_DARI_DEQ>"}'
>> Invoke-WebRequest -Uri "http://localhost:8100/queue/ack" -Method POST -ContentType "application/json" -Body $ack

StatusCode      : 200
StatusDescription : OK
Content          : {"ok": true}
RawContent       : HTTP/1.1 200 OK
                  Content-Length: 12
                  Content-Type: application/json; charset=utf-8
                  Date: Mon, 27 Oct 2025 15:13:51 GMT
                  Server: Python/3.11 aiohttp/3.10.5

                  {"ok": true}
Forms           : {}
Headers         : {[Content-Length, 12], [Content-Type, application/json; charset=utf-8], [Date, Mon, 27 Oct 2025 15:13:51 GMT], [Server, Python/3.11 aiohttp/3.10.5]}
Images          : {}
InputFields     : {}
Links           : {}
ParsedHtml      : mshtml.HTMLDocumentClass
RawContentLength : 12
```

Cache Cluster - Check Health and Leader

```
PS E:\Semester 5\Parallel and Distributed System\Tugas Individu 2\distributed-sync-system> curl http://localhost:8200/health
```

```
StatusCode      : 200
StatusDescription : OK
Content         : {"ok": true, "id": "cache1", "role": 2, "term": 1}
RawContent      : HTTP/1.1 200 OK
                  Content-Length: 50
                  Content-Type: application/json; charset=utf-8
                  Date: Mon, 27 Oct 2025 15:14:37 GMT
                  Server: Python/3.11 aiohttp/3.10.5

                  {"ok": true, "id": "cache1", "role": 2, "...
Forms           : {}
Headers         : [[Content-Length, 50], [Content-Type, application/json; charset=utf-8], [Date, Mon, 27 Oct 2025 15:14:37 GMT], [Server, Python/3.11 aiohttp/3.10.5]]
Images          : {}
InputFields     : {}
Links           : {}
ParsedHtml      : mshtml.HTMLDocumentClass
RawContentLength : 50
```

```
PS E:\Semester 5\Parallel and Distributed System\Tugas Individu 2\distributed-sync-system> curl http://localhost:8201/health
```

```
StatusCode      : 200
StatusDescription : OK
Content         : {"ok": true, "id": "cache2", "role": 0, "term": 1}
RawContent      : HTTP/1.1 200 OK
                  Content-Length: 50
                  Content-Type: application/json; charset=utf-8
                  Date: Mon, 27 Oct 2025 15:14:52 GMT
                  Server: Python/3.11 aiohttp/3.10.5

                  {"ok": true, "id": "cache2", "role": 0, "...
Forms           : {}
Headers         : [[Content-Length, 50], [Content-Type, application/json; charset=utf-8], [Date, Mon, 27 Oct 2025 15:14:52 GMT], [Server, Python/3.11 aiohttp/3.10.5]]
Images          : {}
InputFields     : {}
Links           : {}
ParsedHtml      : mshtml.HTMLDocumentClass
RawContentLength : 50
```

```
PS E:\Semester 5\Parallel and Distributed System\Tugas Individu 2\distributed-sync-system> curl http://localhost:8202/health
```

```
StatusCode      : 200
StatusDescription : OK
Content         : {"ok": true, "id": "cache3", "role": 0, "term": 1}
RawContent      : HTTP/1.1 200 OK
                  Content-Length: 50
                  Content-Type: application/json; charset=utf-8
                  Date: Mon, 27 Oct 2025 15:16:00 GMT
                  Server: Python/3.11 aiohttp/3.10.5

                  {"ok": true, "id": "cache3", "role": 0, "...
Forms           : {}
Headers         : [[Content-Length, 50], [Content-Type, application/json; charset=utf-8], [Date, Mon, 27 Oct 2025 15:16:00 GMT], [Server, Python/3.11 aiohttp/3.10.5]]
Images          : {}
InputFields     : {}
Links           : {}
ParsedHtml      : mshtml.HTMLDocumentClass
RawContentLength : 50
```

Cache Cluster - PUT Data

```
PS E:\Semester 5\Parallel and Distributed System\Tugas Individu 2\distributed-sync-system> $body = @'
>> {"key":"user:42","val":{"name":"Arya","score":99}}
>> '@
>> Invoke-WebRequest -Uri "http://localhost:8200/cache/put" -Method POST -ContentType "application/json" -Body $body

StatusCode      : 200
StatusDescription : OK
Content         : {"ok": true}
RawContent      : HTTP/1.1 200 OK
                  Content-Length: 12
                  Content-Type: application/json; charset=utf-8
                  Date: Mon, 27 Oct 2025 15:16:39 GMT
                  Server: Python/3.11 aiohttp/3.10.5

Forms           : {"ok": true}
Headers         : {[Content-Length, 12], [Content-Type, application/json; charset=utf-8], [Date, Mon, 27 Oct 2025 15:16:39 GMT], [Server, Python/3.11 aiohttp/3.10.5]}
Images          : {}
InputFields     : {}
Links           : {}
ParsedHtml      : mshtml.HTMLDocumentClass
RawContentLength : 12
```

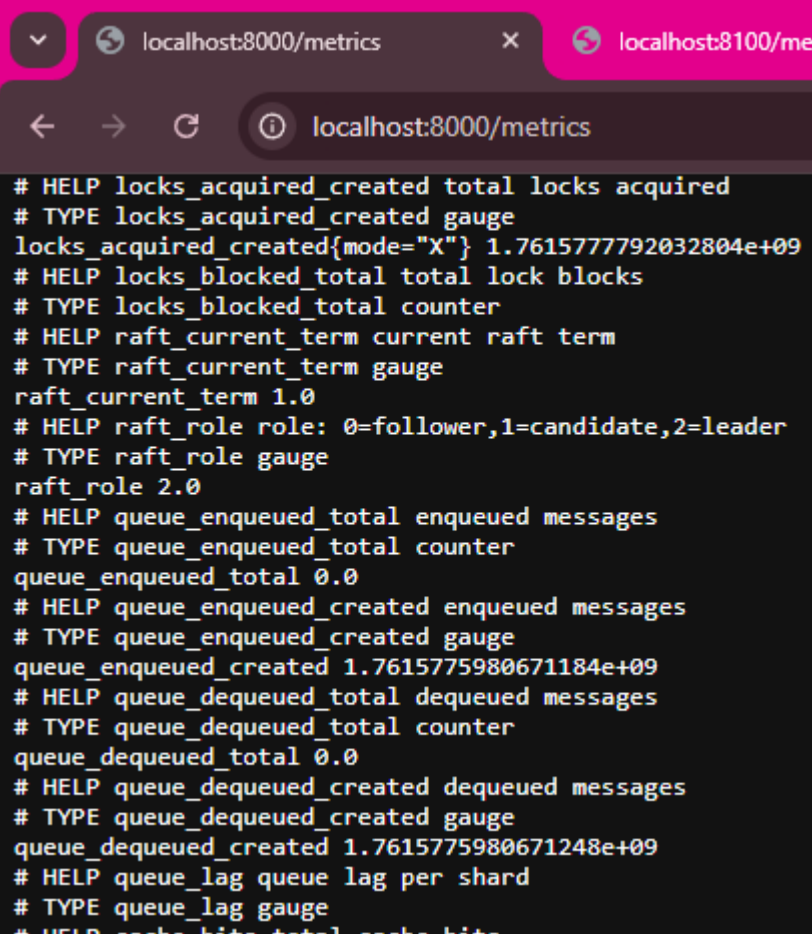
Cache Cluster - GET Data

```
PS E:\Semester 5\Parallel and Distributed System\Tugas Individu 2\distributed-sync-system> $body = @'
>> {"key": "user:42"}
'
>> @
>> Invoke-WebRequest -Uri "http://localhost:8200/cache/get" -Method POST -ContentType "application/json" -Body $body

StatusCode      : 200
StatusDescription: OK
Content          : {"hit": true, "val": {"name": "Arya", "score": 99}, "state": "M"}
RawContent       : HTTP/1.1 200 OK
                  Content-Length: 65
                  Content-Type: application/json; charset=utf-8
                  Date: Mon, 27 Oct 2025 15:17:08 GMT
                  Server: Python/3.11 aiohttp/3.10.5

                  {"hit": true, "val": {"name": "Arya", "sc...
Forms            : {}
Headers          : {[Content-Length, 65], [Content-Type, application/json; charset=utf-8], [Date, Mon, 27 Oct 2025 15:17:08 GMT], [Server, Python/3.11 aiohttp/3.10.5]}
Images           : {}
InputFields      : {}
Links            : {}
ParsedHtml       : mshtml.HTMLDocumentClass
RawContentLength : 65
```

Metrics Monitoring - Lock Node

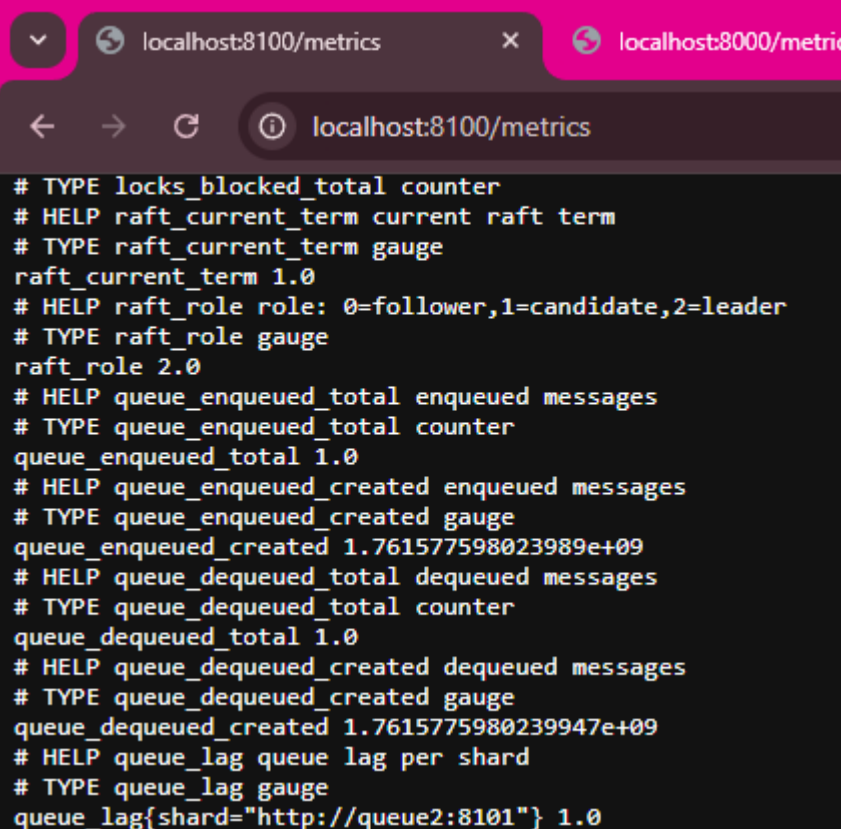


The screenshot shows a web browser with two tabs. The active tab is titled 'localhost:8000/metrics' and displays a list of Prometheus-style metrics. The metrics are grouped by help text and type. The visible metrics include:

- `locks_acquired_created`: total locks acquired (gauge, value 1.761577792032804e+09)
- `locks_blocked_total`: total lock blocks (counter)
- `raft_current_term`: current raft term (gauge, value 1.0)
- `raft_role`: role: 0=follower,1=candidate,2=leader (gauge, value 2.0)
- `queue_enqueued_total`: enqueued messages (counter, value 0.0)
- `queue_enqueued_created`: enqueued messages (gauge, value 1.7615775980671184e+09)
- `queue_dequeued_total`: dequeued messages (counter, value 0.0)
- `queue_dequeued_created`: dequeued messages (gauge, value 1.7615775980671248e+09)
- `queue_lag`: queue lag per shard (gauge)

```
# HELP locks_acquired_created total locks acquired
# TYPE locks_acquired_created gauge
locks_acquired_created{mode="X"} 1.761577792032804e+09
# HELP locks_blocked_total total lock blocks
# TYPE locks_blocked_total counter
# HELP raft_current_term current raft term
# TYPE raft_current_term gauge
raft_current_term 1.0
# HELP raft_role role: 0=follower,1=candidate,2=leader
# TYPE raft_role gauge
raft_role 2.0
# HELP queue_enqueued_total enqueued messages
# TYPE queue_enqueued_total counter
queue_enqueued_total 0.0
# HELP queue_enqueued_created enqueued messages
# TYPE queue_enqueued_created gauge
queue_enqueued_created 1.7615775980671184e+09
# HELP queue_dequeued_total dequeued messages
# TYPE queue_dequeued_total counter
queue_dequeued_total 0.0
# HELP queue_dequeued_created dequeued messages
# TYPE queue_dequeued_created gauge
queue_dequeued_created 1.7615775980671248e+09
# HELP queue_lag queue lag per shard
# TYPE queue_lag gauge
# HELP cache_hits_total cache hits
```

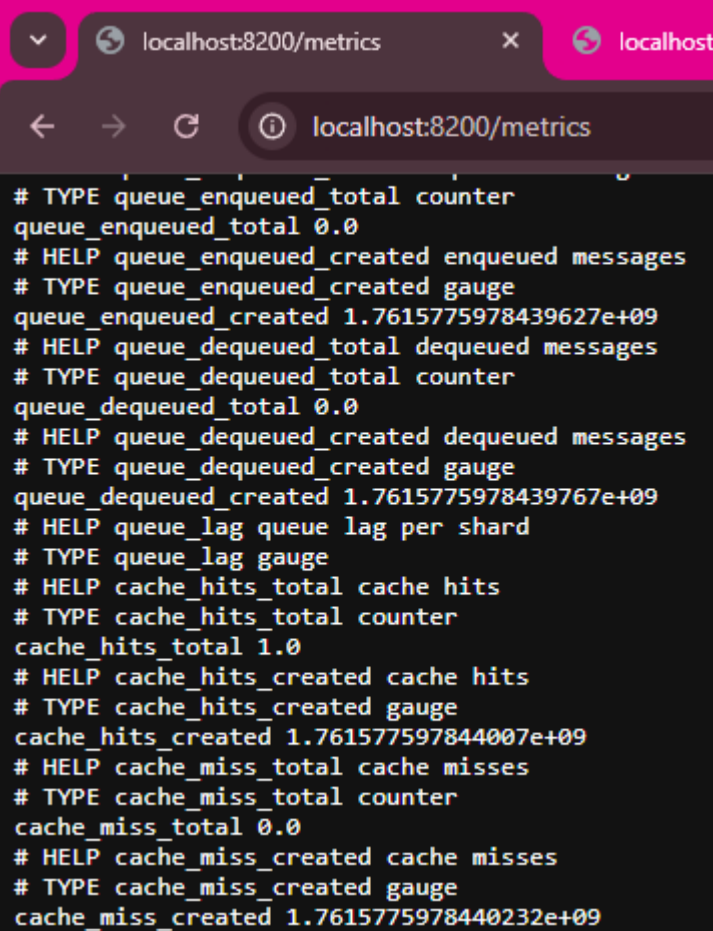
Metrics Monitoring - Queue Node



The screenshot shows a web browser with two tabs. The active tab is titled 'localhost:8100/metrics' and displays a list of Prometheus-style metrics for a Queue Node. The metrics include raft-related information (locks_blocked_total, raft_current_term, raft_role) and queue-related information (queue_enqueued_total, queue_enqueued_created, queue_dequeued_total, queue_dequeued_created, queue_lag). The values for the queue metrics are significantly higher than the raft metrics, indicating active queue processing.

```
# TYPE locks_blocked_total counter
# HELP raft_current_term current raft term
# TYPE raft_current_term gauge
raft_current_term 1.0
# HELP raft_role role: 0=follower,1=candidate,2=leader
# TYPE raft_role gauge
raft_role 2.0
# HELP queue_enqueued_total enqueued messages
# TYPE queue_enqueued_total counter
queue_enqueued_total 1.0
# HELP queue_enqueued_created enqueued messages
# TYPE queue_enqueued_created gauge
queue_enqueued_created 1.761577598023989e+09
# HELP queue_dequeued_total dequeued messages
# TYPE queue_dequeued_total counter
queue_dequeued_total 1.0
# HELP queue_dequeued_created dequeued messages
# TYPE queue_dequeued_created gauge
queue_dequeued_created 1.7615775980239947e+09
# HELP queue_lag queue lag per shard
# TYPE queue_lag gauge
queue_lag{shard="http://queue2:8101"} 1.0
```

Metrics Monitoring - Cache Node



The screenshot shows a web browser window with two tabs. The active tab is titled 'localhost:8200/metrics' and displays a list of metrics for a cache node. The metrics are presented in a text-based format, including their type (counter or gauge), help text, and current values. The metrics shown are:

- `queue_enqueued_total`: counter, value 0.0
- `queue_enqueued_created`: gauge, value 1.7615775978439627e+09
- `queue_dequeued_total`: counter, value 0.0
- `queue_dequeued_created`: gauge, value 1.7615775978439767e+09
- `queue_lag`: gauge, value 0.0
- `cache_hits_total`: counter, value 1.0
- `cache_hits_created`: gauge, value 1.761577597844007e+09
- `cache_miss_total`: counter, value 0.0
- `cache_miss_created`: gauge, value 1.7615775978440232e+09

Metrics Monitoring - RPC Latency

```
rpc_latency_seconds_bucket{le="0.005",op="request_vote"} 0.0
rpc_latency_seconds_bucket{le="0.01",op="request_vote"} 0.0
rpc_latency_seconds_bucket{le="0.025",op="request_vote"} 2.0
rpc_latency_seconds_bucket{le="0.05",op="request_vote"} 2.0
rpc_latency_seconds_bucket{le="0.075",op="request_vote"} 2.0
rpc_latency_seconds_bucket{le="0.1",op="request_vote"} 2.0
rpc_latency_seconds_bucket{le="0.25",op="request_vote"} 2.0
rpc_latency_seconds_bucket{le="0.5",op="request_vote"} 2.0
rpc_latency_seconds_bucket{le="0.75",op="request_vote"} 2.0
rpc_latency_seconds_bucket{le="1.0",op="request_vote"} 2.0
rpc_latency_seconds_bucket{le="2.5",op="request_vote"} 2.0
rpc_latency_seconds_bucket{le="5.0",op="request_vote"} 2.0
rpc_latency_seconds_bucket{le="7.5",op="request_vote"} 2.0
rpc_latency_seconds_bucket{le="10.0",op="request_vote"} 2.0
rpc_latency_seconds_bucket{le="+Inf",op="request_vote"} 2.0
rpc_latency_seconds_count{op="request_vote"} 2.0
rpc_latency_seconds_sum{op="request_vote"} 0.022359041000072466
rpc_latency_seconds_bucket{le="0.005",op="append_entries"} 1372.0
rpc_latency_seconds_bucket{le="0.01",op="append_entries"} 1428.0
rpc_latency_seconds_bucket{le="0.025",op="append_entries"} 1428.0
rpc_latency_seconds_bucket{le="0.05",op="append_entries"} 1428.0
rpc_latency_seconds_bucket{le="0.075",op="append_entries"} 1428.0
rpc_latency_seconds_bucket{le="0.1",op="append_entries"} 1428.0
rpc_latency_seconds_bucket{le="0.25",op="append_entries"} 1428.0
rpc_latency_seconds_bucket{le="0.5",op="append_entries"} 1428.0
rpc_latency_seconds_bucket{le="0.75",op="append_entries"} 1428.0
rpc_latency_seconds_bucket{le="1.0",op="append_entries"} 1428.0
rpc_latency_seconds_bucket{le="2.5",op="append_entries"} 1428.0
rpc_latency_seconds_bucket{le="5.0",op="append_entries"} 1428.0
rpc_latency_seconds_bucket{le="7.5",op="append_entries"} 1428.0
rpc_latency_seconds_bucket{le="10.0",op="append_entries"} 1428.0
rpc_latency_seconds_bucket{le="+Inf",op="append_entries"} 1428.0
rpc_latency_seconds_count{op="append_entries"} 1428.0
rpc_latency_seconds_sum{op="append_entries"} 4.130925122989993
# HELP rpc_latency_seconds_created rpc latency
# TYPE rpc_latency_seconds_created gauge
rpc_latency_seconds_created{op="request_vote"} 1.7615776004230604e+09
rpc_latency_seconds_created{op="append_entries"} 1.7615776014266803e+09
```

Test Monitoring - Cluster Node

```
PS E:\Semester 5\Parallel and Distributed System\Tugas Individu 2\distributed-sync-system> python perf_test.py
🚀 Starting performance test (ping all nodes 100x)...

✅ Total Success: 100/100
⌚ Total Time: 0.10 s
⚡ Throughput: 1049.10 req/sec
🌿 Average Latency: 0.0010 s per request
❖ PS E:\Semester 5\Parallel and Distributed System\Tugas Individu 2\distributed-sync-system> |
```

Test Monitoring - Single Node

```
PS E:\Semester 5\Parallel and Distributed System\Tugas Individu 2\distributed-sync-system> docker compose -f docker/docker-compose.yml down -v
[+] Running 20/20
✓ Container queue3      Removed
✓ Container cache1      Removed
✓ Container cache2      Removed
✓ Container queue2      Removed
✓ Container node3       Removed
✓ Container node1       Removed
✓ Container node2       Removed
✓ Container queue1      Removed
✓ Container cache3      Removed
✓ Container redis       Removed
✓ Volume docker_cache3  Removed
✓ Volume docker_queue3  Removed
✓ Volume docker_cache2  Removed
✓ Volume docker_queue1  Removed
✓ Volume docker_queue2  Removed
✓ Volume docker_node3   Removed
✓ Network docker_raft_net Removed
✓ Volume docker_node1   Removed
✓ Volume docker_cache1  Removed
✓ Volume docker_node2   Removed
❖ PS E:\Semester 5\Parallel and Distributed System\Tugas Individu 2\distributed-sync-system> docker run -p 8000:8000 docker-node1
Starting Raft Distributed Lock Node...
Node node-1 initialized, listening on port 8000
Node node-1 listening on 8000
Node node-1 memulai election di term 0
🔥 Node node-1 elected as LEADER for term 1!
[node-1] Became LEADER at term 1, starting heartbeat loop
```

```
PS E:\Semester 5\Parallel and Distributed System\Tugas Individu 2\distributed-sync-system> python perf_test.py
🔥 Starting performance test (ping all nodes 100x)...

✅ Total Success: 34/100
⌚ Total Time: 2.34 s
⚡ Throughput: 14.55 req/sec
🌿 Average Latency: 0.0234 s per request
❖ PS E:\Semester 5\Parallel and Distributed System\Tugas Individu 2\distributed-sync-system> |
```

Video

Link Video Youtube:

The screenshot displays a YouTube video player with a dark theme. The video content is a technical tutorial titled "Sinkronisasi dan Distributed Systems - Tugas 2 Individu Sistem Paralel dan Terdistribusi A ITK" by Zakaria Fattawari. The video player interface includes a search bar at the top, a video player area showing a code editor with a README.md file, and a video player controls bar at the bottom. The README.md file content is as follows:

```
1 Zakaria Fattawari
2 11211092 - Informatika ITK
3 Tugas Individu 2 - Parallel and Distributed System A
4 Overview
5
6 Distributed Sync System adalah sistem terdistribusi berbasis Raft Consensus Algorithm yang terdiri dari tiga service utama:
7
8 1. Lock Node (Port 8000) - Distributed Lock Manager berbasis Raft.
9 2. Queue Node (Port 8100) - Distributed Queue dengan mekanisme acknowledgment (ACK).
10 3. Cache Node (Port 8200) - Distributed Cache dengan protokol MESI (Modified, Exclusive, Shared, Invalid) untuk menjaga konsistensi data antar node.
11
12 Ketiganya dikoordinasikan melalui leader election, replication, dan heartbeat untuk memastikan konsistensi & fault tolerance.
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```

The video player controls bar shows the video is at 0:04 / 18:39. The video title is "Sinkronisasi dan Distributed Systems - Tugas 2 Individu Sistem Paralel dan Terdistribusi A ITK". The video is by Zakaria Fattawari, who has 6 subscribers. The video player interface also includes a share button, a download button, and a video player settings menu.

<https://youtu.be/smnjEYT1LxM>.