

# queueCTL: A Persistent CLI Job Queue

queueCTL is a robust, job queue system built in Java. It runs shell commands as background jobs, manages parallel workers, and gracefully handles failures with retries and a Dead Letter Queue (DLQ).

Tech Stack Used:

- **Java** - Core Programming Language
- **picocli** - Type-safe CLI framework.
- **Javalin** - Lightweight web framework for the dashboard.
- **SQLite-JDBC** - File-based database engine.
- **Jackson** - Fast JSON parsing library.
- **Maven** - Build Tool

## Working of queueCTL:

Build Project using Maven

```
(base) chiragjogi@Chirags-MacBook-Air queuectl % mvn clean package
[INFO] Scanning for projects...
[INFO]
[INFO] -----< com.queuectl:queuectl >-----
[INFO] Building queuectl 1.0.0
[INFO] from pom.xml
[INFO] -----[ jar ]-----
[INFO]
[INFO] BUILD SUCCESS
[INFO]
[INFO] Total time: 3.198 s
[INFO] Finished at: 2025-11-12T13:22:11+05:30
[INFO]
```

Renaming to queuectl

```
(base) chiragjogi@Chirags-MacBook-Air queuectl % alias queuectl="java -jar '/Users/chiragjogi/PES/Project/queuectl/target/queuectl-1.0.0.jar'"
```

Dashboard

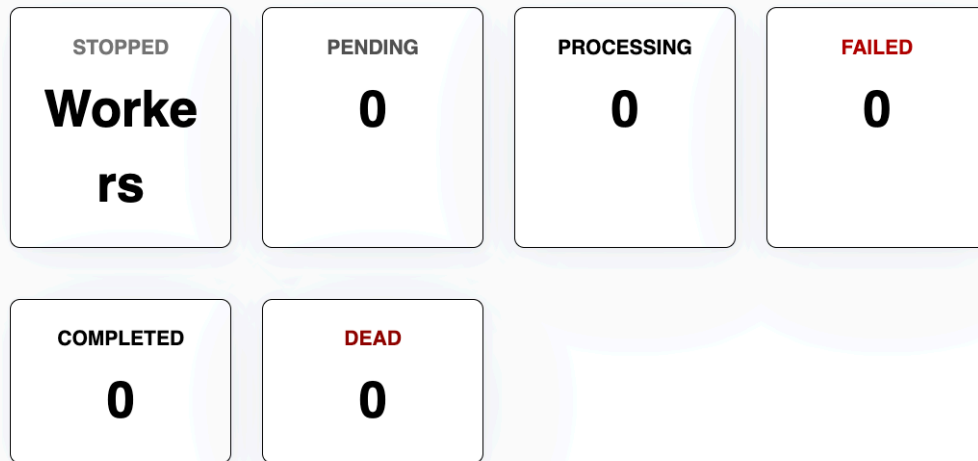
```
(base) chiragjogi@Chirags-MacBook-Air queuectl % queuectl dashboard
13:28:58.744 [main] INFO io.javalin.Javalin - Starting Javalin ...
13:28:58.745 [main] INFO org.eclipse.jetty.server.Server - jetty-11.0.20; built: 2024-01-29T21:04:22.394Z; git: 922f8dc188f7011e60d0361de585fd4ac4d63064; jvm 21.0.9+10-LTS
13:28:58.771 [main] INFO o.e.j.s.DefaultSessionIdManager - Session workerName=node0
13:28:58.776 [main] INFO o.e.j.s.h.ContextHandler - Started o.e.j.s.ServletContextHandler@4612b856{/,null,AVAILABLE}
13:28:58.779 [main] INFO o.e.jetty.server.AbstractConnector - Started ServerConnector@6cdda6dc{HTTP/1.1, (http/1.1)}{0.0.0.0:7070}
13:28:58.787 [main] INFO org.eclipse.jetty.server.Server - Started Server@41005828{STARTING}[11.0.20,sto=0] @804ms
13:28:58.788 [main] INFO io.javalin.Javalin -

Javalin 6
https://javalin.io/documentation

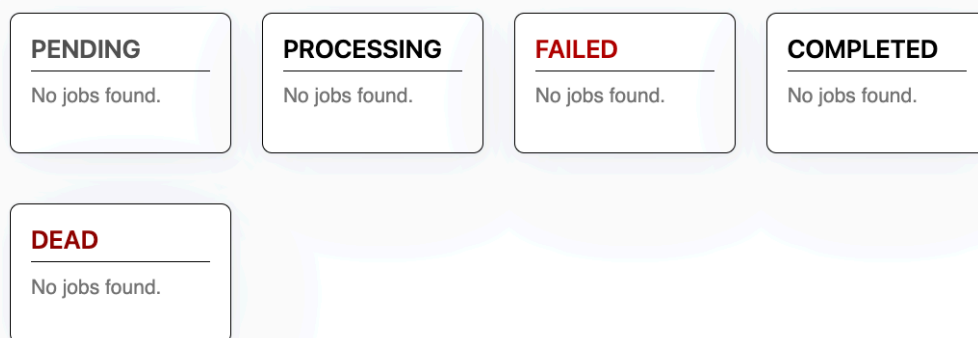
13:28:58.788 [main] INFO io.javalin.Javalin - Javalin started in 78ms \o/
13:28:58.875 [main] INFO io.javalin.Javalin - Static file handler added: StaticFileConfig(hostedPath=/, directory=/public, location=CLASSPATH, precompress=false, aliasCheck=null, headers={Cache-Control=max-age=0}, mimeTypees={}). File system location: 'jar:file:/Users/chiragjogi/PES/Project/queuectl/target/queuectl-1.0.0.jar!/public'
13:28:58.877 [main] INFO io.javalin.Javalin - Listening on http://localhost:7070/
13:28:58.882 [main] INFO io.javalin.Javalin - You are running Javalin 6.1.3 (released March 2, 2024. Your Javalin version is 619 days old. Consider checking for a newer version.).
Dashboard running at http://localhost:7070
```

## QueueCTL Dashboard

### System Status



### Job Queues



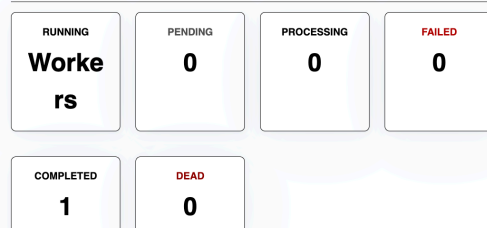
## Working

```
(base) chiragjogi@Chirags-MacBook-Air queuectl % queuectl worker start --count 2
Starting 2 workers...
Workers started. Press Ctrl+C to stop.
[Worker pool-1-thread-2] Starting...
[Worker pool-1-thread-1] Starting...
[Worker pool-1-thread-2] Processing Job job-good: echo Hello World!
[Worker pool-1-thread-2] Job job-good COMPLETED

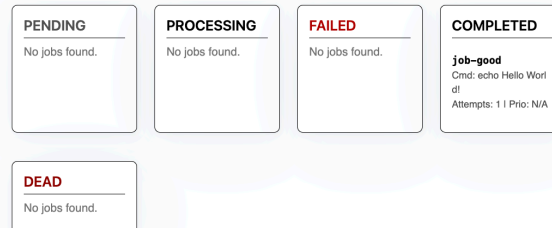
(base) chiragjogi@Chirags-MacBook-Air queuectl % queuectl enqueue '{"id":"job-good", "command":"echo Hello World!"}'
Job enqueued with ID: job-good
(base) chiragjogi@Chirags-MacBook-Air queuectl % queuectl list --state COMPLETED
--- Jobs in COMPLETED state ---
ID: job-good
Command: echo Hello World!
Attempts: 1
```

## QueueCTL Dashboard

### System Status



### Job Queues



Log of a job:

```
● (base) chiragjogi@Chirags-MacBook-Air queuectl % queuectl logs job-good
--- Logs for job-good ---

--- ATTEMPT 1 at Wed Nov 12 13:35:35 IST 2025 ---
Hello World!
```

Info of a job:

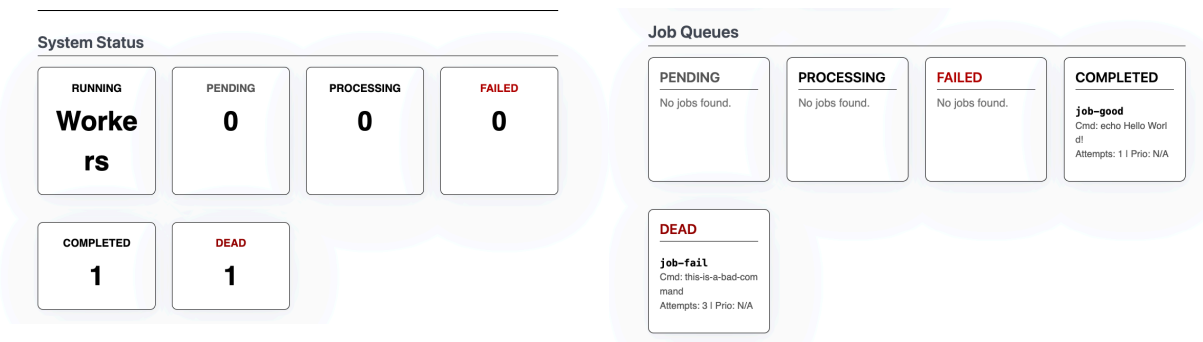
```
● (base) chiragjogi@Chirags-MacBook-Air queuectl % queuectl info job-good
--- Job Details ---
ID:      job-good
State:    COMPLETED
Command:  echo Hello World!
Priority:  0
Attempts: 1 / 3
Timeout:  300 seconds
Created:  2025-11-12 13:35:35
Updated:  2025-11-12 13:35:35
--- Last Output ---
Hello World!
```

Configure retries and working of failed/dead:(Failed State - Automatic retries)

```
○ (base) chiragjogi@Chirags-MacBook-Air queuectl % queuectl worker start --count 2
Starting 2 workers...
Workers started. Press Ctrl+C to stop.
[Worker pool-1-thread-2] Starting...
[Worker pool-1-thread-1] Starting...
[Worker pool-1-thread-2] Processing Job job-good: echo Hello World!
[Worker pool-1-thread-2] Job job-good COMPLETED
[Worker pool-1-thread-1] Processing Job job-fail: this-is-a-bad-command
[Worker pool-1-thread-1] Job job-fail FAILED. Retrying in 2000ms.
[Worker pool-1-thread-1] Processing Job job-fail: this-is-a-bad-command
[Worker pool-1-thread-1] Job job-fail FAILED. Retrying in 4000ms.
[Worker pool-1-thread-1] Processing Job job-fail: this-is-a-bad-command
[Worker pool-1-thread-1] Job job-fail FAILED (Max retries). Moved to DLQ.

● (base) chiragjogi@Chirags-MacBook-Air queuectl % queuectl config set max-retries 2
Config set: max-retries = 2
● (base) chiragjogi@Chirags-MacBook-Air queuectl % queuectl enqueue '{"id":"job-fail",
"command":"this-is-a-bad-command"}'
Job enqueued with ID: job-fail
○ (base) chiragjogi@Chirags-MacBook-Air queuectl %
```

### QueueCTL Dashboard



```
● (base) chiragjogi@Chirags-MacBook-Air queuectl % queuectl dlq list
--- Jobs in DEAD state ---
ID: job-fail
Command: this-is-a-bad-command
Attempts: 3
Last Output: [ERROR] sh: this-is-a-bad-command: command not found

[ERROR] Exited with code 1...
```

DLQ retry:

```
• (base) chiragjogi@Chirags-MacBook-Air queuectl % queuectl dlq retry job-fail
Job job-fail has been requeued.
```

```
[Worker pool-1-thread-2] Processing Job job-fail: this-is-a-bad-command
[Worker pool-1-thread-2] Job job-fail FAILED. Retrying in 2000ms.
[Worker pool-1-thread-1] Processing Job job-fail: this-is-a-bad-command
[Worker pool-1-thread-1] Job job-fail FAILED. Retrying in 4000ms.
[Worker pool-1-thread-2] Processing Job job-fail: this-is-a-bad-command
[Worker pool-1-thread-2] Job job-fail FAILED (Max retries). Moved to DLQ.
```

Priority Enqueue:

```
• (base) chiragjogi@Chirags-MacBook-Air queuectl % queuectl enqueue '{"id":"clog-1", "command":"sleep 20"}'
queuectl enqueue '{"id":"clog-2", "command":"sleep 20"}'
Job enqueued with ID: clog-1
Job enqueued with ID: clog-2
• (base) chiragjogi@Chirags-MacBook-Air queuectl % queuectl enqueue '{"id":"job-low-prio", "command":"echo I am low priority"}'
Job enqueued with ID: job-low-prio
• (base) chiragjogi@Chirags-MacBook-Air queuectl % queuectl enqueue '{"id":"job-high-prio", "command":"echo I AM HIGH PRIORITY", "priority": 20}'
Job enqueued with ID: job-high-prio
• (base) chiragjogi@Chirags-MacBook-Air queuectl %
```

Higher priority one was completed first even tho the lower priority one was executed first.

```
[Worker pool-1-thread-1] Processing Job clog-1: sleep 20
[Worker pool-1-thread-2] Processing Job clog-2: sleep 20
[Worker pool-1-thread-1] Job clog-1 COMPLETED
[Worker pool-1-thread-2] Job clog-2 COMPLETED
[Worker pool-1-thread-1] Processing Job job-high-prio: echo I AM HIGH PRIORITY
[Worker pool-1-thread-2] Processing Job job-low-prio: echo I am low priority
[Worker pool-1-thread-1] Job job-high-prio COMPLETED
[Worker pool-1-thread-2] Job job-low-prio COMPLETED
```

Timeout:

```
• (base) chiragjogi@Chirags-MacBook-Air queuectl % queuectl enqueue '{"id":"job-timeout", "command":"sleep 20", "timeout": 2}'
Job enqueued with ID: job-timeout
• (base) chiragjogi@Chirags-MacBook-Air queuectl % queuectl logs job-timeout
--- Logs for job-timeout ---

--- ATTEMPT 1 at Wed Nov 12 13:59:13 IST 2025 ---
--- ATTEMPT 2 at Wed Nov 12 13:59:19 IST 2025 ---
--- ATTEMPT 3 at Wed Nov 12 13:59:27 IST 2025 ---

• (base) chiragjogi@Chirags-MacBook-Air queuectl % queuectl info job-timeout
--- Job Details ---
ID:      job-timeout
State:   DEAD
Command: sleep 20
Priority: 0
Attempts: 3 / 3
Timeout: 2 seconds
Created: 2025-11-12 13:59:13
Updated: 2025-11-12 13:59:31
--- Last Output ---

[ERROR] Job timed out after 2 seconds.
```

**DEAD**

**job-fail**

Cmd: this-is-a-bad-command  
Attempts: 3 | Prio: N/A

**job-timeout**

Cmd: sleep 20  
Attempts: 3 | Prio: N/A

```

[Worker pool-1-thread-1] Processing Job job-timeout: sleep 20
[Worker pool-1-thread-1] Job job-timeout FAILED. Retrying in 2000ms.
[Worker pool-1-thread-2] Processing Job job-timeout: sleep 20
[Worker pool-1-thread-2] Job job-timeout FAILED. Retrying in 4000ms.
[Worker pool-1-thread-1] Processing Job job-timeout: sleep 20
[Worker pool-1-thread-1] Job job-timeout FAILED (Max retries). Moved to DLQ.

```

Other states examples:  
(New Database)

```

(base) chiragjogi@Chirags-MacBook-Air queuectl % queuectl dashboard
14:06:49.450 [main] INFO io.javalin.Javalin - Starting Javalin ...
14:06:49.451 [main] INFO org.eclipse.jetty.server.Server - jetty-11.0.20; built: 2024-01-29T21:04:22.394Z; git: 922f8dc188f7011e60d0361de585fd4ac4d63064; jvm 21.0.9+10-LTS
14:06:49.470 [main] INFO o.e.j.s.s.DefaultSessionIdManager - Session workerName=node0
14:06:49.473 [main] INFO o.e.j.s.server.handler.ContextHandler - Started o.e.j.s.ServletContextHandler@79c7532f{/,null,AVAILABLE}
14:06:49.477 [main] INFO o.e.jetty.server.AbstractConnector - Started ServerConnector@85cdec700[HTTP/1.1, (http/1.1)]{0.0.0.0:7070}
14:06:49.482 [main] INFO org.eclipse.jetty.server.Server - Started Server@2141a12{STARTING}[11.0.20,sto=0] @1963ms
14:06:49.482 [main] INFO io.javalin.Javalin -
Javalin 6
https://javalin.io/documentation
14:06:49.482 [main] INFO io.javalin.Javalin - Javalin started in 56ms \o/
14:06:49.555 [main] INFO io.javalin.Javalin - Static file handler added: StaticFileConfig(hostedPath=/, directory=/public, location=CLASSPATH, precompress=false, aliasCheck=nu
ll, headers={Cache-Control=max-age=0}, mimeTypes={}). File system location: 'jar:file:/Users/chiragjogi/PES/Project/queuectl/target/queuectl-1.0.0.jar!/public'
14:06:49.557 [main] INFO io.javalin.Javalin - Listening on http://localhost:7070/
14:06:49.561 [main] INFO io.javalin.Javalin - You are running Javalin 6.1.3 (released March 2, 2024. Your Javalin version is 619 days old. Consider checking for a newer versio
n.).
Dashboard running at http://localhost:7070

```

#### QueueCTL Dashboard

##### System Status

STOPPED <b>Workers</b>	PENDING <b>0</b>	PROCESSING <b>0</b>	FAILED <b>0</b>
COMPLETED <b>0</b>	DEAD <b>0</b>		

##### Job Queues

PENDING No jobs found.	PROCESSING No jobs found.	FAILED No jobs found.	COMPLETED No jobs found.
DEAD No jobs found.			

```

(base) chiragjogi@Chirags-MacBook-Air queuectl % queuectl enqueue '{"id":"job-A", "command":"echo A"}'
queuectl enqueue '{"id":"job-B", "command":"echo B"}'
queuectl enqueue '{"id":"job-C", "command":"echo C"}'
Job enqueued with ID: job-A
Job enqueued with ID: job-B
Job enqueued with ID: job-C
(base) chiragjogi@Chirags-MacBook-Air queuectl %

```

Without any workers:(Pending State)

#### QueueCTL Dashboard

##### System Status

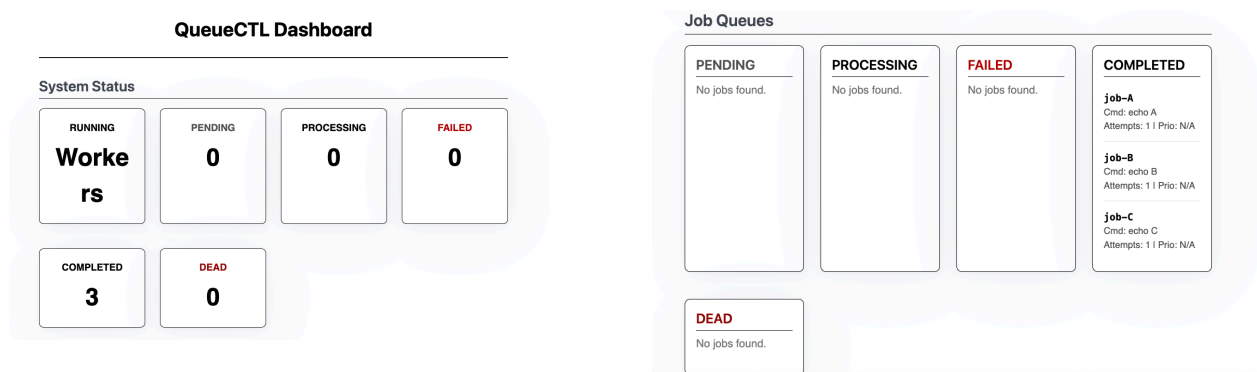
STOPPED <b>Workers</b>	PENDING <b>3</b>	PROCESSING <b>0</b>	FAILED <b>0</b>
COMPLETED <b>0</b>	DEAD <b>0</b>		

##### Job Queues

<b>PENDING</b> <b>job-A</b> Cmd: echo A Attempts: 0   Prio: N/A <b>job-B</b> Cmd: echo B Attempts: 0   Prio: N/A <b>job-C</b> Cmd: echo C Attempts: 0   Prio: N/A	PROCESSING No jobs found.	FAILED No jobs found.	COMPLETED No jobs found.
DEAD No jobs found.			

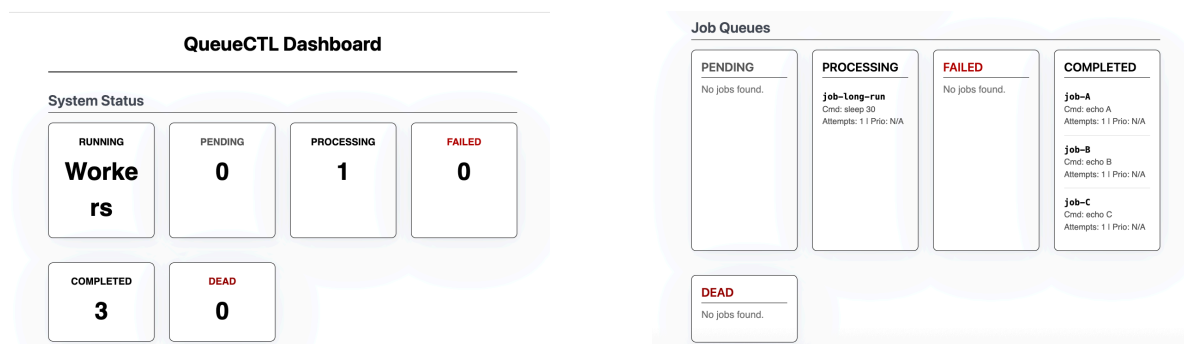
Start one worker:(Completed State)

```
(base) chiragjogi@Chirags-MacBook-Air queuectl % queuectl worker start --count 1
Starting 1 workers...
Workers started. Press Ctrl+C to stop.
[Worker pool-1-thread-1] Starting...
[Worker pool-1-thread-1] Processing Job job-A: echo A
[Worker pool-1-thread-1] Job job-A COMPLETED
[Worker pool-1-thread-1] Processing Job job-B: echo B
[Worker pool-1-thread-1] Job job-B COMPLETED
[Worker pool-1-thread-1] Processing Job job-C: echo C
[Worker pool-1-thread-1] Job job-C COMPLETED
```



Processing State:

```
(base) chiragjogi@Chirags-MacBook-Air queuectl % queuectl enqueue '{"id":"job-long-run", "command":"sleep 30"}'
Job enqueued with ID: job-long-run
(base) chiragjogi@Chirags-MacBook-Air queuectl %
```



```
[Worker pool-1-thread-1] Job job-C COMPLETED
[Worker pool-1-thread-1] Processing Job job-long-run: sleep 30
[Worker pool-1-thread-1] Job job-long-run COMPLETED
```

QueueCTL Dashboard

System Status

RUNNING

Workers

PENDING

0

PROCESSING

0

FAILED

0

COMPLETED

4

DEAD

0

Job Queues

PENDING

No jobs found.

PROCESSING

No jobs found.

FAILED

No jobs found.

COMPLETED

job-B

Cmd: echo B

Attempts: 1 | Prio: N/A

job-C

Cmd: echo C

Attempts: 1 | Prio: N/A

job-long-run

Cmd: sleep 30

Attempts: 1 | Prio: N/A

DEAD

No jobs found.