

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] -----
[INFO] Building queuectl 1.0.0
[INFO]   from pom.xml
[INFO] -----
[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) chiragogi@Chirags-MacBook-Air: queuectl % alias queuectl="java -jar '/Users/chiragogi/PFS/Project/queuectl/target/queuectl-1.0.0.jar'"

Dashboard

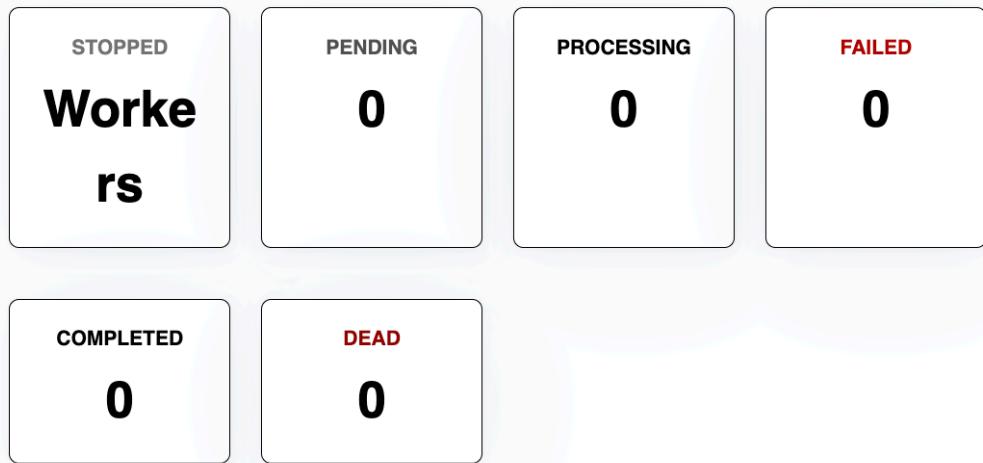
```
○ (base) chiragjogi@Chirags-MacBook-Air queueectl % queueectl dashboard
13:28:58.744 [main] INFO io.javalin.Javalin - Starting Javalin ...
13:28:58.745 [main] INFO org.eclipse.jetty.server.Server - jetty-11.0.20; built: 2024-01-29T21:04:22.394Z; git: 922f8dc188f7011e60d0361de585fd4ac4d63
064; jvm 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.handler.ContextHandler - Started o.e.j.s.ServletContextHandler@4612b856{/null,AVAILABLE}
13:28:58.779 [main] INFO o.e.jetty.server.AbstractConnector - Started ServerConnector@6cda6dc{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 -

  
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, precom-
press=false, aliasCheck=null, headers={Cache-Control=max-age=0}, mimeTypes={}).
File system location: 'jar:file:/Users/chiragjogi/PES/Project/queuectl-
/target/queueectl-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 c-
hecking for a newer version.).
Dashboard running at http://localhost:7070
█
```

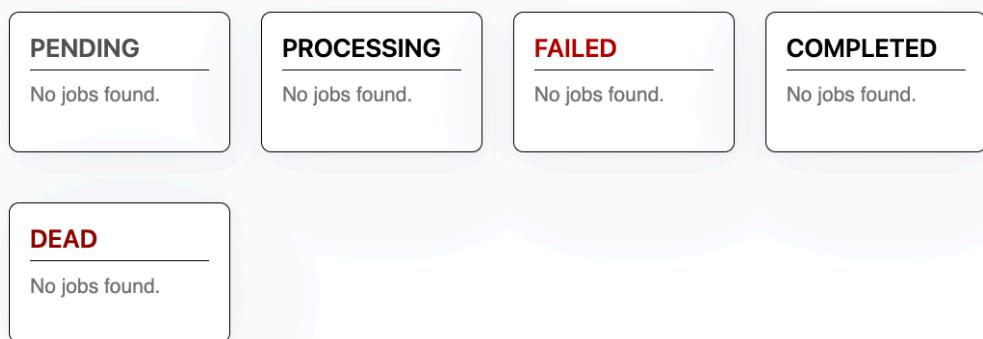
DashBoard GUI

QueueCTL Dashboard

System Status



Job Queues



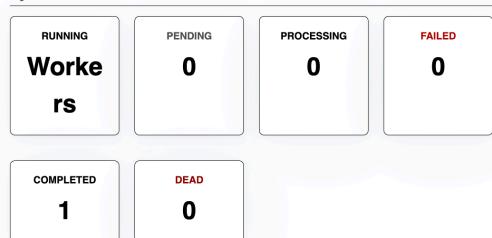
Working

```
(base) chiragjogi@Chirags-MacBook-Air 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
[]
```

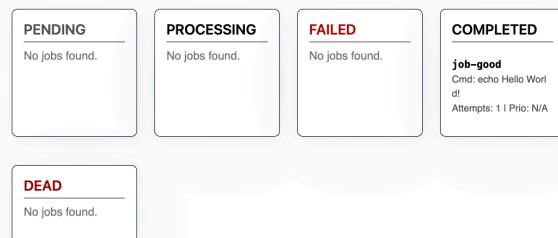
```
(base) chiragjogi@Chirags-MacBook-Air queuectl enqueue '{"id":"job-good", "command":"echo Hello World!"}'
Job enqueued with ID: job-good
(base) chiragjogi@Chirags-MacBook-Air queuectl % queuectl list --state COMPLETED
Jobs in COMPLETED state ---
ID: job-good
Command: echo Hello World!
Attempts: 1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

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:

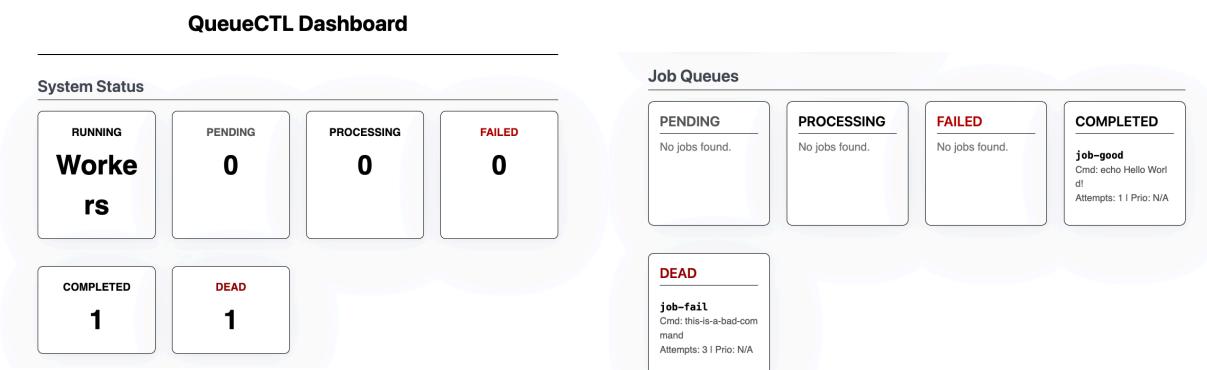
```
● (base) chiragjogi@Chirags-MacBook-Air queuectl % queuectl info job-good
--- Job Details ---
ID:      job-good
State:   COMPLETED
Command: echo Hello World!
Priority: 0
Attempts: 1 / 3
Timeout: 300 seconds
Created: 2025-11-12 13:35:35
Updated: 2025-11-12 13:35:35
--- Last Output ---
Hello World!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

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 200ms.
[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 400ms.
[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 %
```



```
● (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 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 ...
14:06:49.470 [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.s.DefaultSessionIdManager - Session workerName=node0
14:06:49.477 [main] INFO  o.e.j.s.s.DefaultSessionIdManager - Session workerName=node0
14:06:49.477 [main] INFO  o.e.j.s.s.DefaultSessionIdManager - Session workerName=node0
14:06:49.482 [main] INFO  o.e.j.s.s.DefaultSessionIdManager - Session workerName=node0
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 -
```



<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=null, 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 version.
Dashboard running at http://localhost:7070
□
```

QueueCTL Dashboard

System Status					
STOPPED	PENDING	PROCESSING	FAILED	COMPLETED	DEAD
Workers	0	0	0	0	0
COMPLETED	0	0			

Job Queues					
PENDING	PROCESSING	FAILED	COMPLETED	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	PENDING	PROCESSING	FAILED	COMPLETED	DEAD
Workers	3	0	0	0	0
COMPLETED					

Job Queues					
PENDING	PROCESSING	FAILED	COMPLETED	DEAD	
job-A Cmd: echo A Attempts: 0 Prio: N/A	job-B Cmd: echo B Attempts: 0 Prio: N/A	job-C Cmd: echo C Attempts: 0 Prio: N/A	No jobs found.	No jobs found.	
				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
```



QueueCTL Dashboard

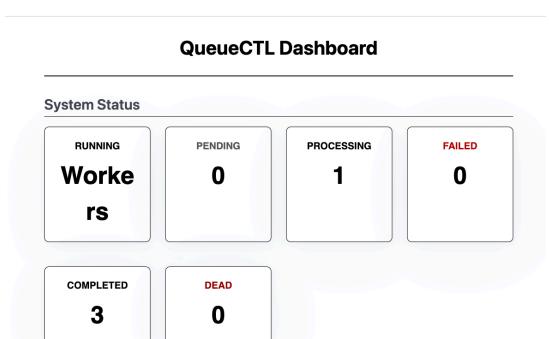
System Status	
RUNNING	PENDING
Workers	0
PROCESSING	FAILED
COMPLETED	0
3	DEAD

Job Queues

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

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 %
```



Job Queues

PENDING	PROCESSING	FAILED	COMPLETED
No jobs found.	job-long-run Cmd: sleep 30 Attempts: 1 Prio: N/A	No jobs found.	No jobs found.
DEAD			No jobs found.

```
[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	PROCESSING	FAILED	COMPLETED
No jobs found.	No jobs found.	No jobs found.	No jobs found.
			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