

CAPSTONE PROJECT

Utility Billing System

Project Overview

Utility Billing System uses a microservices architecture to manage end-to-end utility billing operations such as consumer management, tariff configuration, meter readings, bill generation, payments, and notifications.

The system supports multiple user roles with strict role-based access control, ensuring that each user interacts only with the functionalities relevant to their responsibilities. This application is designed to resemble real-world billing systems used by electricity, water, or gas utility providers.

Core Modules

- Auth Service: User registration, login, password management, JWT generation
- Consumer Service: Consumer profile and connection management
- Utility Service: Utility types and tariff plan management
- Meter Service: Meter reading submission and consumption tracking
- Billing Service: Bill generation, bill status management
- Payment Service: Payment processing and bill settlement
- Notification Service: Email notifications for user approval and bill overdue events

Roles & Responsibilities

ADMIN

Manages users, approves consumers, configures utilities and tariffs, and oversees system operations.

BILLING OFFICER

Generates bills based on meter readings, manages billing cycles, and tracks bill statuses.

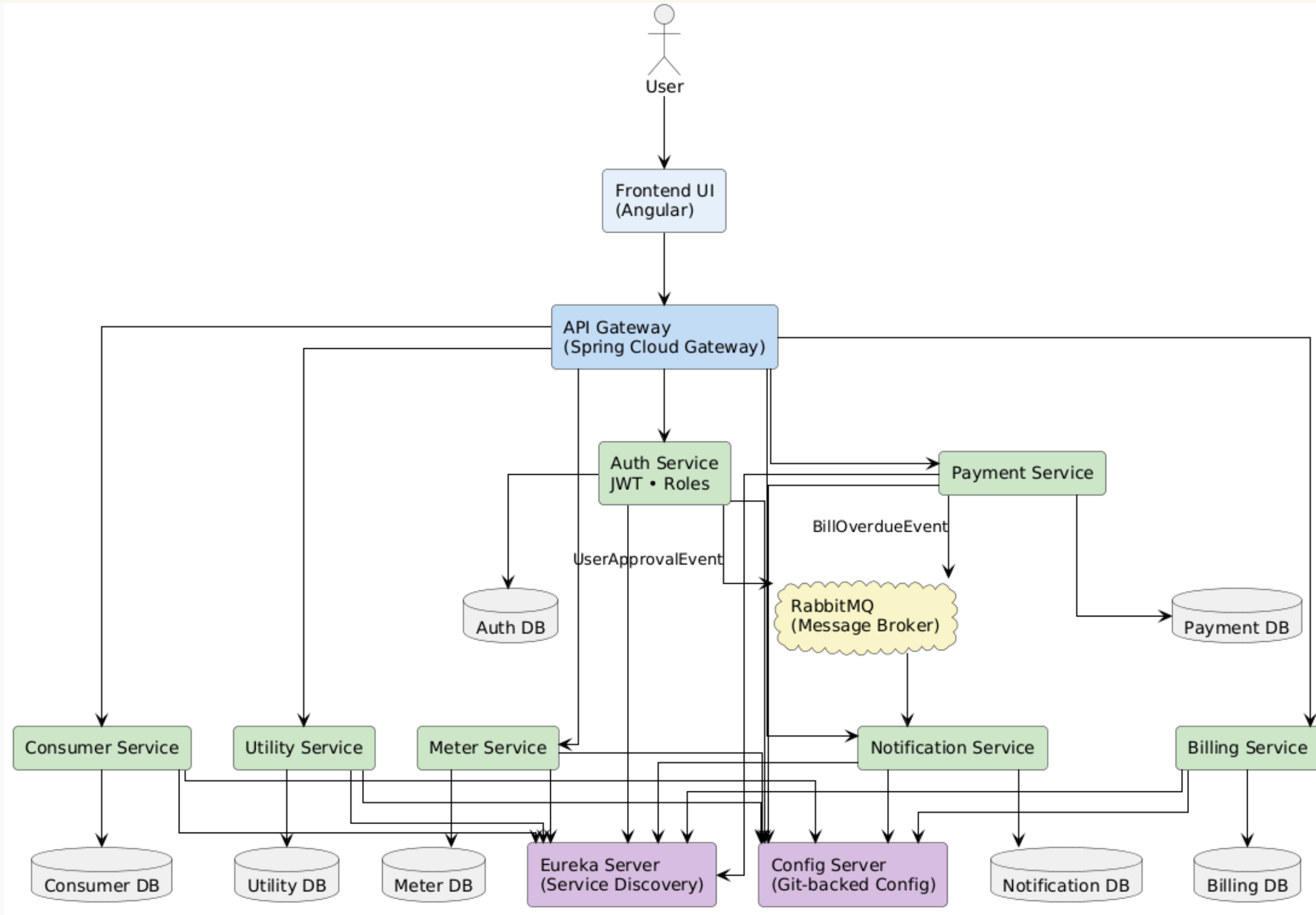
ACCOUNTS OFFICER

Handles payments, verifies transactions, and sends overdue reminders.

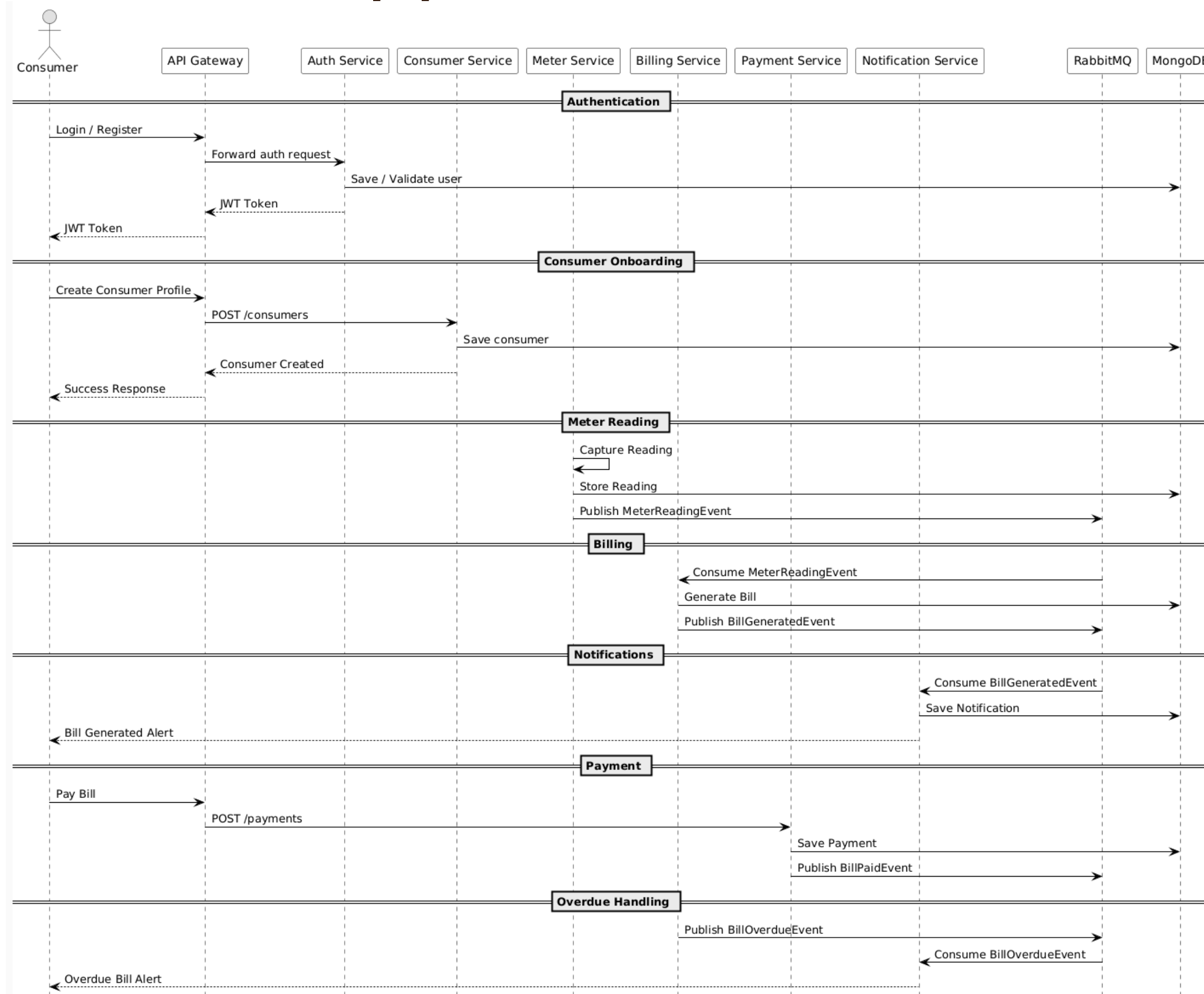
CONSUMER

Views bills, manages personal utility connections, makes payments, and receives notifications.

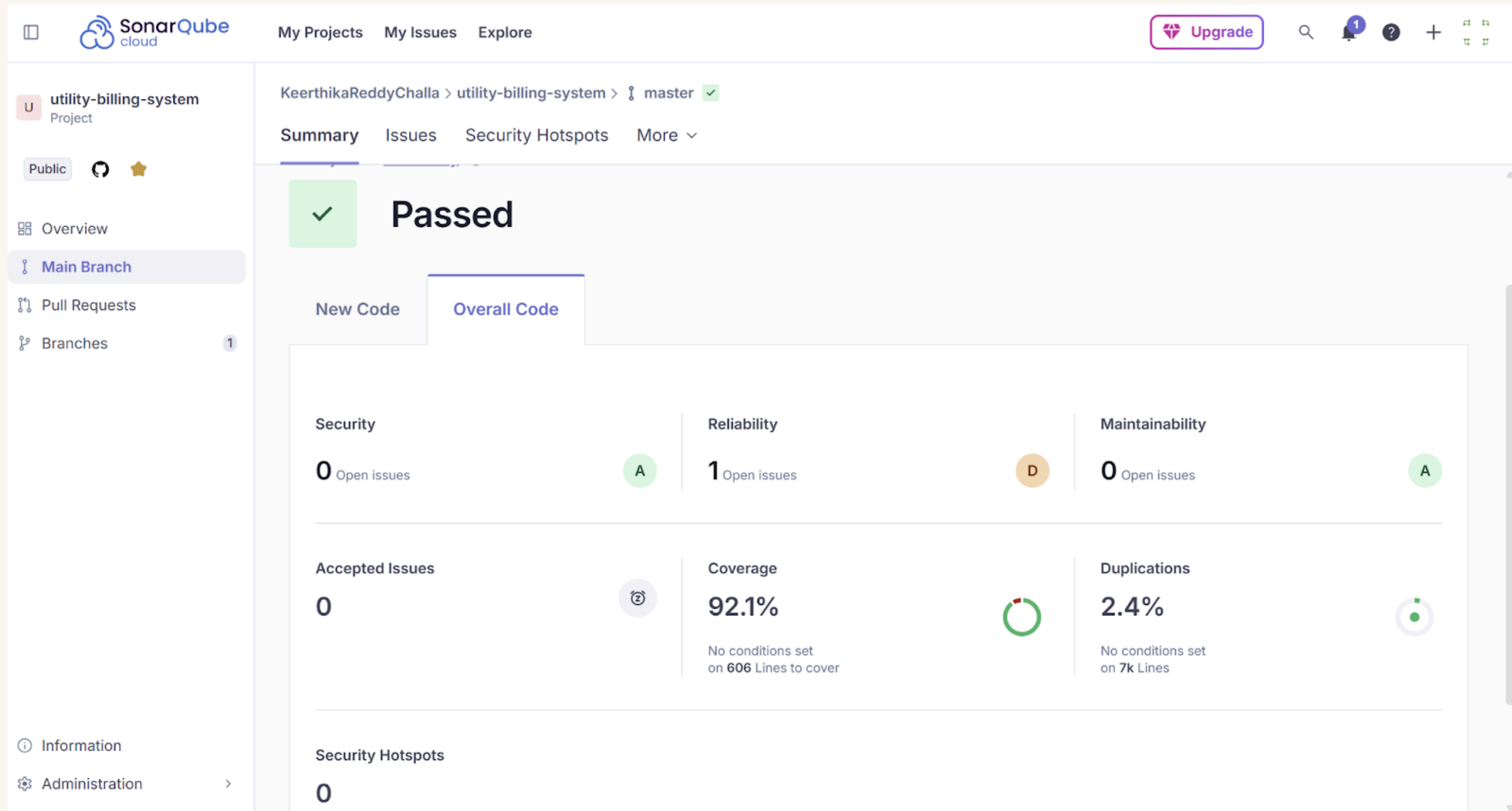
System Architecture




Application Flow








SonarQube Coverage Report






Docker Containers


 **docker.desktop** PERSONAL


Ctrl+K





Sign in





 Containers


 Images

 Volumes

 Builds

 Docker Hub

 Docker Scout

 Extensions

Containers

[Give feedback](#)

View all your running containers and applications. [Learn more](#)



Container CPU usage





































5.26% / 1200% (12 CPUs available)

Container memory usage

3.76GB / 7.43GB

Show charts

 Only show running containers

| <input type="checkbox"/> | | Name | Container ID | Image | Port(s) | CPU (%) | Last started | Actions |
|--------------------------|---|-----------------|--------------|----------------------------|---------------------------|---------|--------------|--|
| <input type="checkbox"/> |  | billing-service | 41d0c0d221f2 | backend-bi | 8086:8086 | 0.16% | 3 hours ago | <div></div> |
| <input type="checkbox"/> |  | api-gateway | 1eb641b640a0 | backend-ap | 9999:9999 | 0.14% | 3 hours ago | <div></div> |
| <input type="checkbox"/> |  | consumer-sei | bb8cafa95237 | backend-cc | 8081:8081 | 0.22% | 3 hours ago | <div></div> |
| <input type="checkbox"/> |  | meter-service | c62d76960196 | backend-m | 8085:8085 | 0.18% | 3 hours ago | <div></div> |
| <input type="checkbox"/> |  | payment-serv | 509bff7fd395 | backend-pe | 8087:8087 | 0.16% | 3 hours ago | <div></div> |
| <input type="checkbox"/> |  | auth-service | ca6a3a41fa55 | backend-al | 9000:9000 | 0.17% | 3 hours ago | <div></div> |
| <input type="checkbox"/> |  | utility-service | 91c1f2fa2d4d | backend-ut | 8083:8083 | 0.16% | 3 hours ago | <div></div> |
| <input type="checkbox"/> |  | eureka-server | 1bb8a76f86e4 | backend-el | 8761:8761 | 1.17% | 3 hours ago | <div></div> |
| <input type="checkbox"/> |  | config-server | 9ch37h06b622 | backend-cr | 8888:8888 | 0.25% | 3 hours ago | <div></div> |

Showing 13 items

Jenkins Pipeline



Jenkins

/ Utility-billing-system

/ #1



```
[INFO] --- spring-boot:3.2.0:repackage (default) @ notification-service ---
[INFO] Replacing main artifact C:\ProgramData\Jenkins\.jenkins\workspace\Utility-billing-system\backend\notification-
service\target\notification-service-1.0.0.jar with repackaged archive, adding nested dependencies in BOOT-INF/.
[INFO] The original artifact has been renamed to C:\ProgramData\Jenkins\.jenkins\workspace\Utility-billing-
system\backend\notification-service\target\notification-service-1.0.0.jar.original
[INFO] -----
[INFO] Reactor Summary for utility-billing-system 1.0.0:
[INFO]
[INFO] utility-billing-system ..... SUCCESS [ 0.449 s]
[INFO] config-server ..... SUCCESS [01:02 min]
[INFO] eureka-server ..... SUCCESS [ 14.277 s]
[INFO] api-gateway ..... SUCCESS [ 16.307 s]
[INFO] auth-service ..... SUCCESS [ 10.762 s]
[INFO] consumer-service ..... SUCCESS [ 6.648 s]
[INFO] utility-service ..... SUCCESS [ 6.039 s]
[INFO] meter-service ..... SUCCESS [ 7.886 s]
[INFO] billing-service ..... SUCCESS [ 14.074 s]
[INFO] payment-service ..... SUCCESS [ 12.325 s]
[INFO] notification-service ..... SUCCESS [ 12.273 s]
[INFO] -----
[INFO] BUILD SUCCESS
[INFO] -----
[INFO] Total time: 02:48 min
[INFO] Finished at: 2026-01-06T21:59:22+05:30
[INFO] -----
[Pipeline] }
[Pipeline] // dir
[Pipeline] }
[Pipeline] // withEnv
[Pipeline] }
```

Jenkins Pipeline



Jenkins

/ Utility-billing-system



/ #1



```
Container auth-service Starting
Container payment-service Started
Container notification-service Started
Container utility-service Started
Container consumer-service Started
Container meter-service Started
Container api-gateway Started
Container billing-service Started
Container auth-service Started
[Pipeline] }
[Pipeline] // dir
[Pipeline] }
[Pipeline] // withEnv
[Pipeline] }
[Pipeline] // stage
[Pipeline] stage
[Pipeline] { (Declarative: Post Actions)
[Pipeline] echo
Utility Billing System deployed successfully using Docker Compose!
[Pipeline] }
[Pipeline] // stage
[Pipeline] }
[Pipeline] // withEnv
[Pipeline] }
[Pipeline] // withEnv
[Pipeline] }
[Pipeline] // node
[Pipeline] End of Pipeline
Finished: SUCCESS
```

Swagger Documentation

auth-controller

| | | |
|------|------------------------------|---|
| PUT | /auth/users/{userId}/reject | ▼ |
| PUT | /auth/users/{userId}/approve | ▼ |
| PUT | /auth/change-password | ▼ |
| POST | /auth/reset-password | ▼ |
| POST | /auth/register | ▼ |
| POST | /auth/login | ▼ |
| POST | /auth/forgot-password | ▼ |
| GET | /auth/users | ▼ |
| GET | /auth/users/{userId} | ▼ |
| GET | /auth/users/pending | ▼ |
| GET | /auth/profile | ▼ |
| GET | /auth/pending-status | ▼ |

Swagger Documentation

Servers

http://localhost:8081 - Generated server url

▼

connection-controller



| | | |
|------|--------------------------------------|---|
| PUT | /connections/{connectionId} | ▼ |
| PUT | /connections/requests/{requestId} | ▼ |
| POST | /connections | ▼ |
| POST | /connections/request | ▼ |
| GET | /connections/{consumerId} | ▼ |
| GET | /connections/requests/pending | ▼ |
| GET | /connections/internal/{connectionId} | ▼ |
| GET | /connections/internal/billing-view | ▼ |
| GET | /connections/internal/all | ▼ |

consumer-controller

