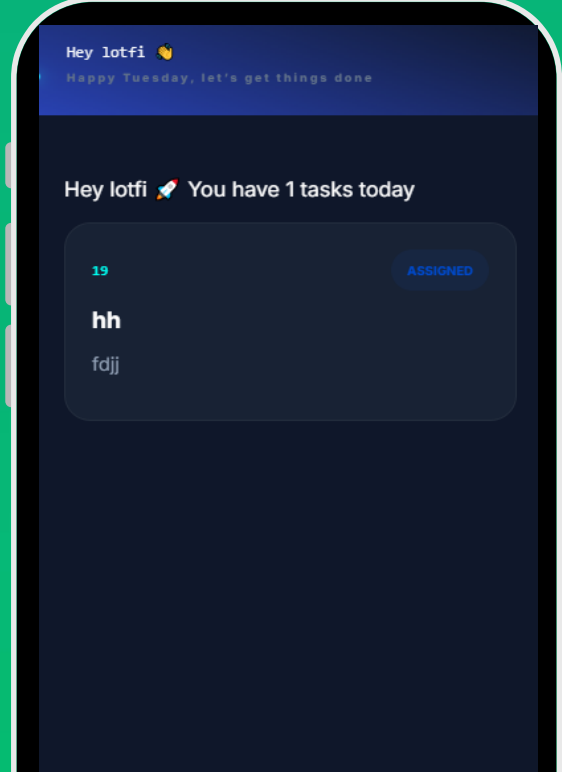
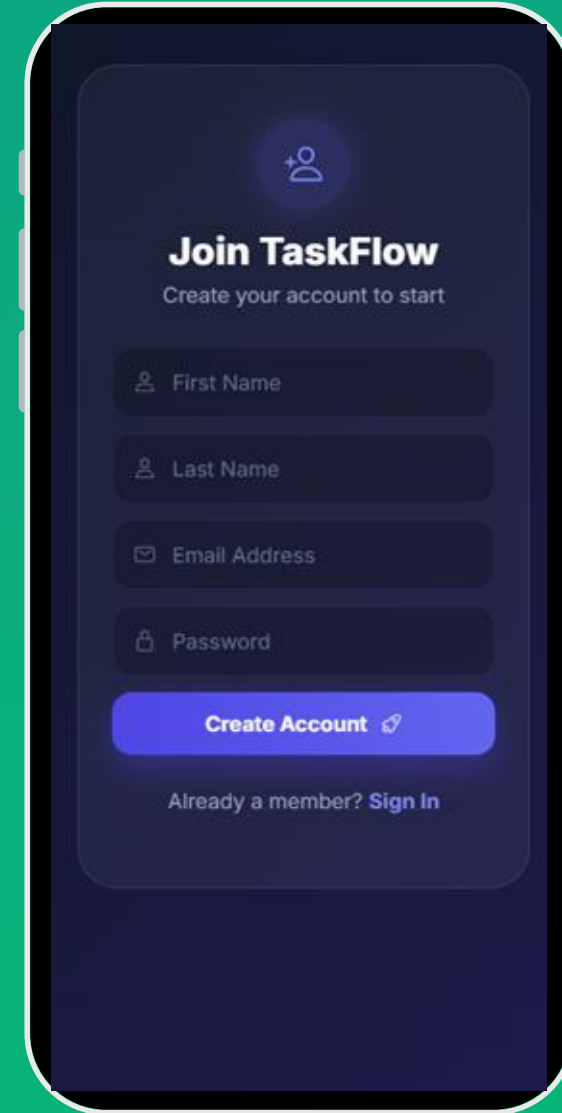
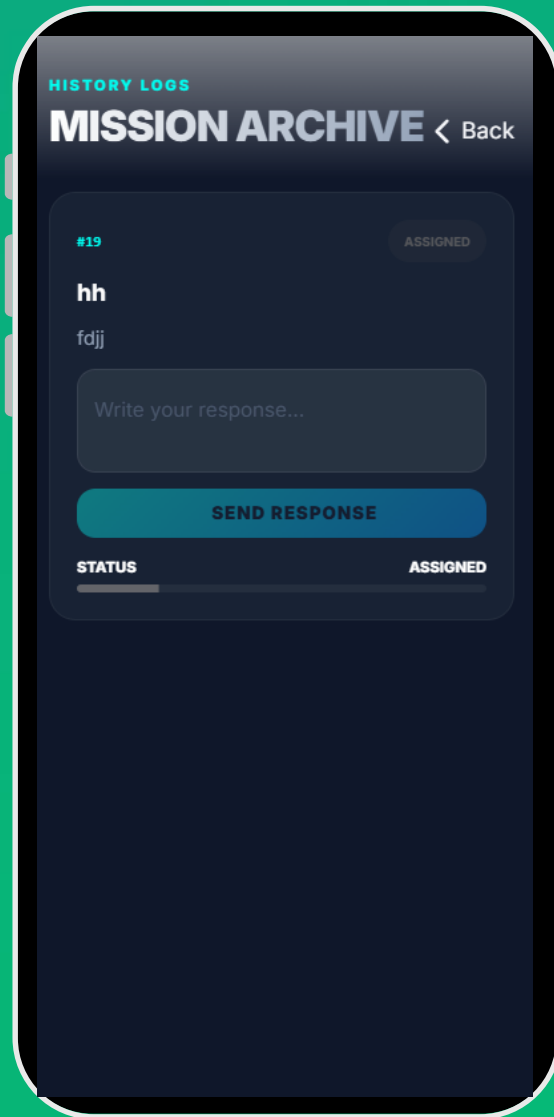
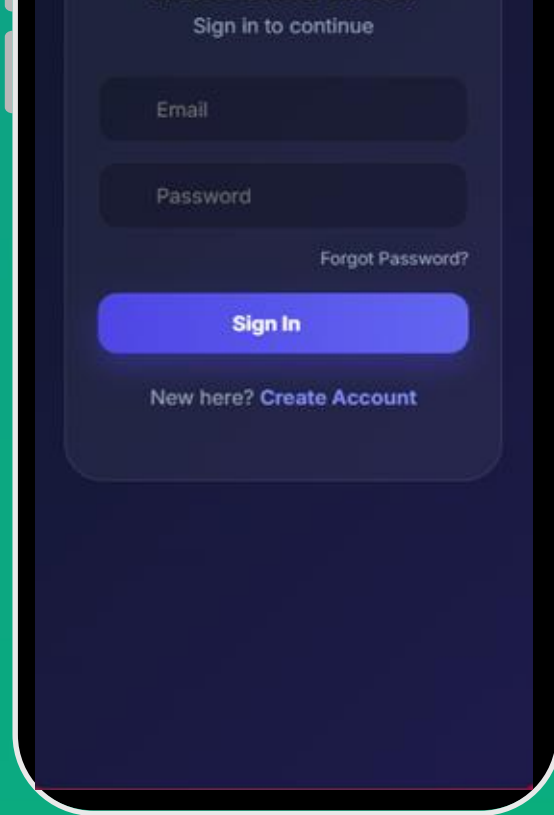
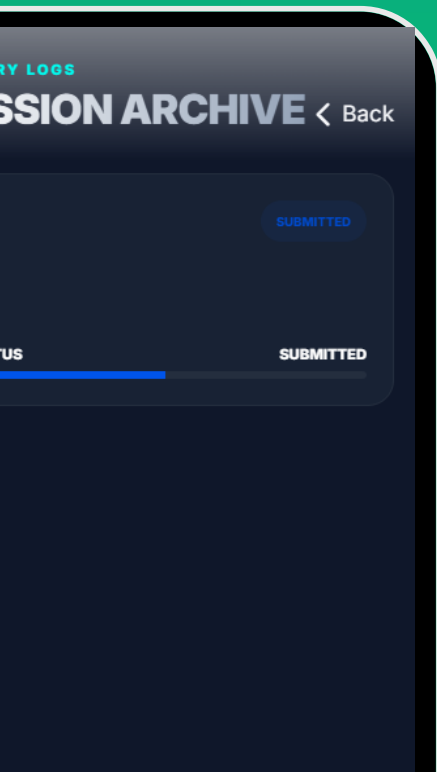
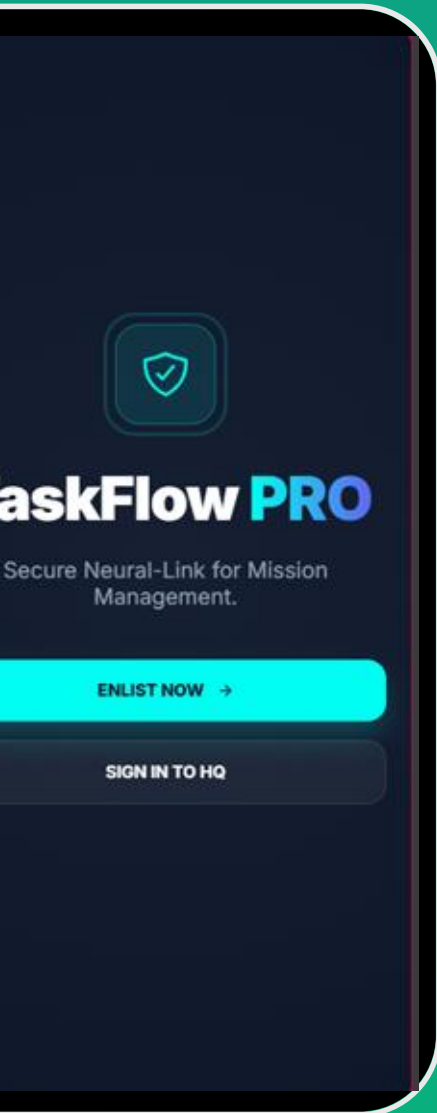




ALMA MATER STUDIORUM — UNIVERSITÀ DI BOLOGNA

Final Report for the Distributed Systems Course 2025/2026

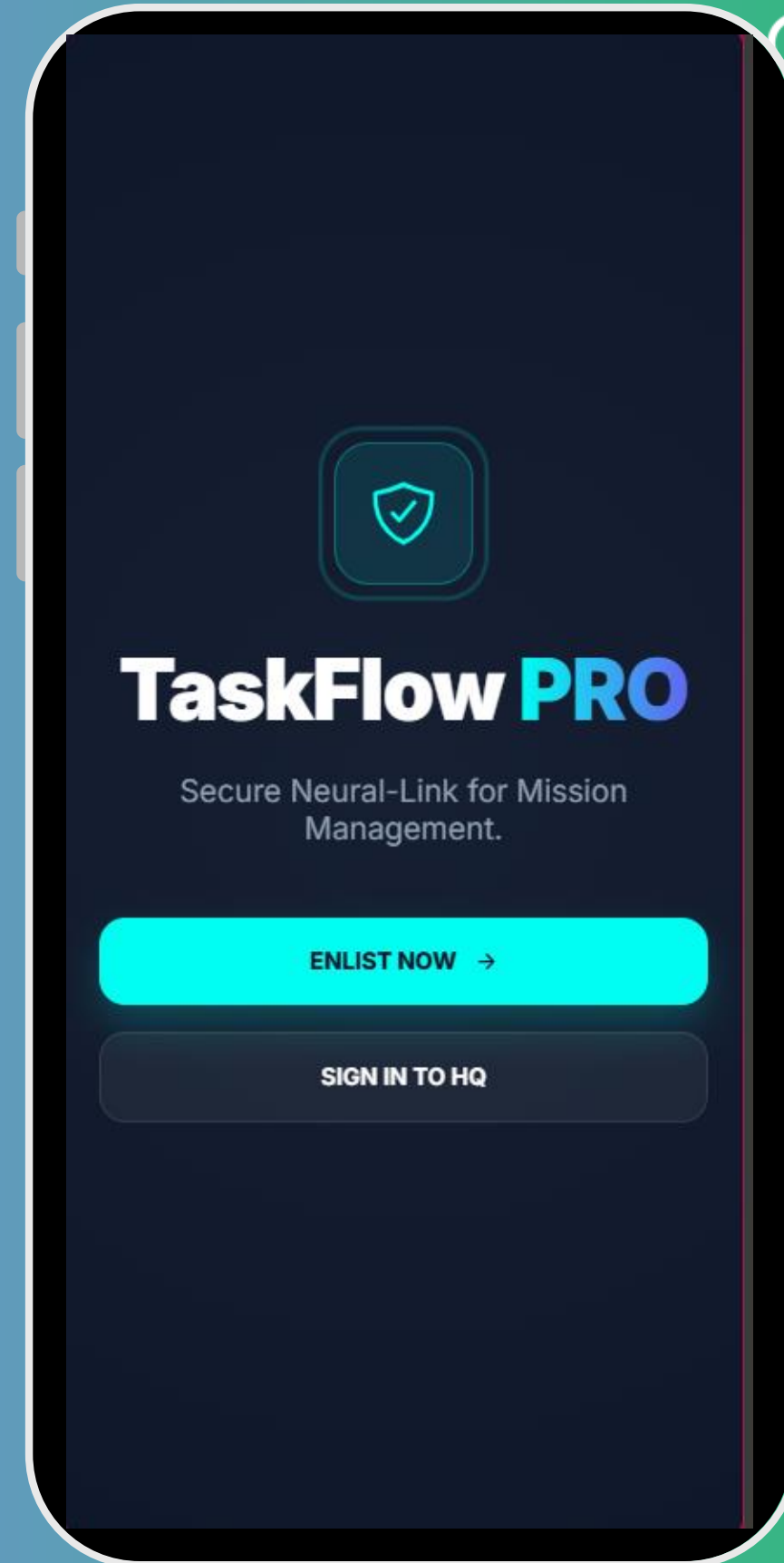
DEVELOPMENT OF MULTI-PLATFORM APPLICATION :
“TASKFLOW” FOR A Distributed Tactical Mission Control
System



PRESENTED THE 5 mai 2026 BY: AHMED
TRABELSI AND LOTFI TOUMI

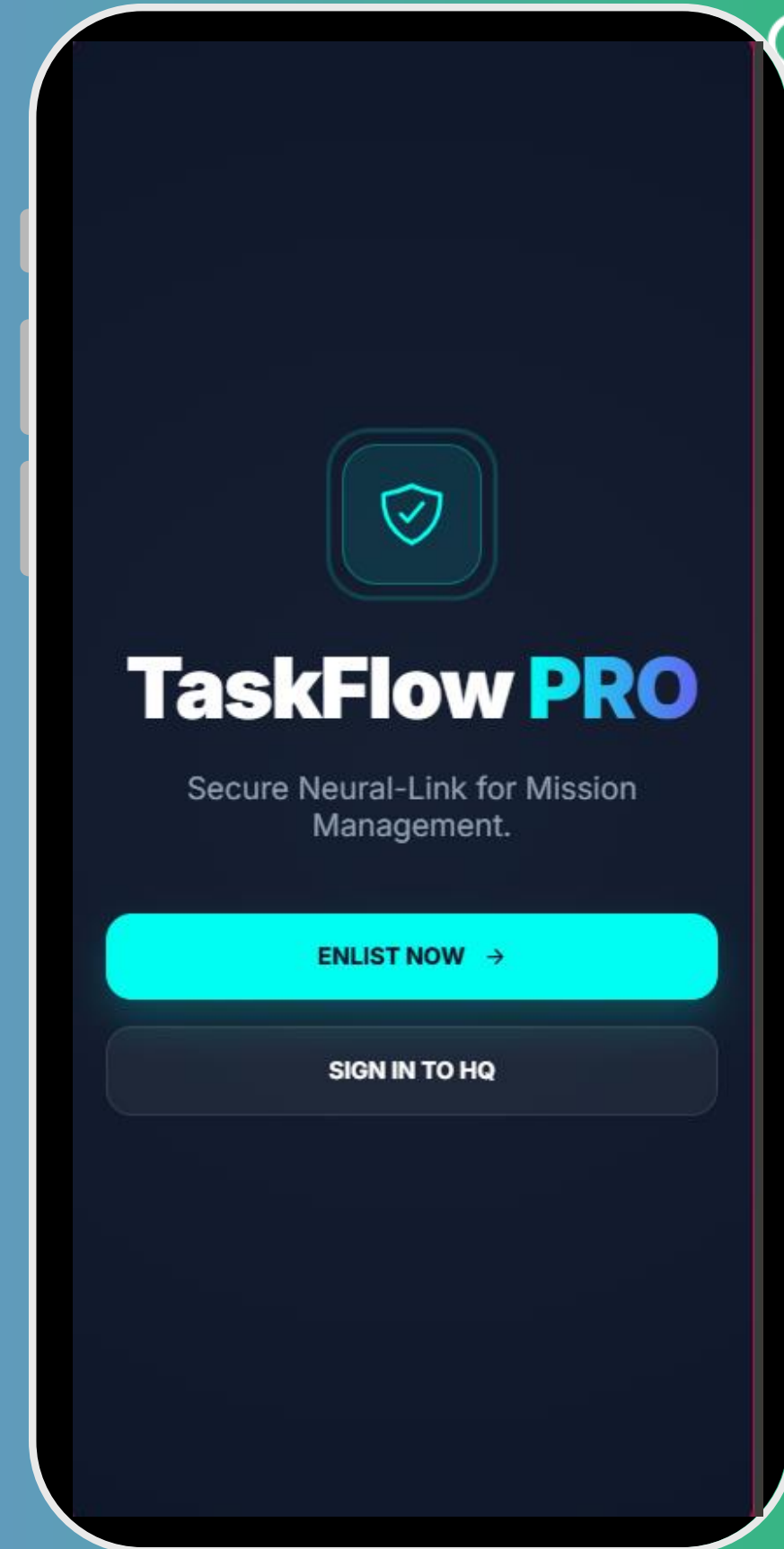
I. INTRODUCTI ...ON

LET'S GET STARTED



II. GENERAL PRESENTATIO N

What TaskFlow
does — and why
distribute.



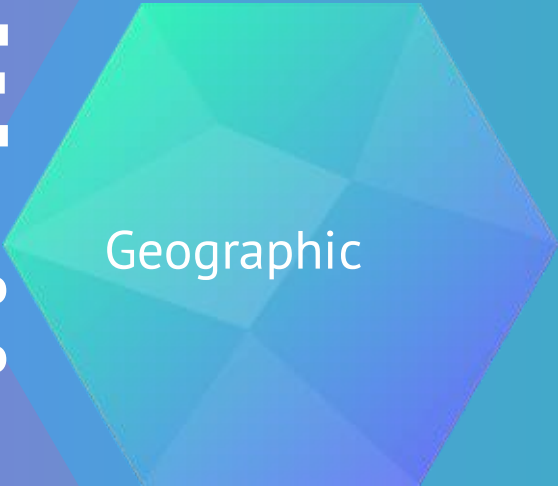
PROJECT CONTEXT



PERIOD

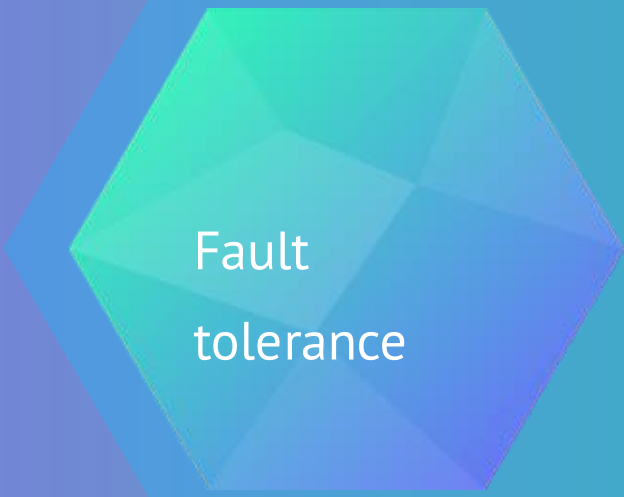
14/12/2025 until first MAI 2026

THEE REASONS WE MUST DISTRIBUTE:



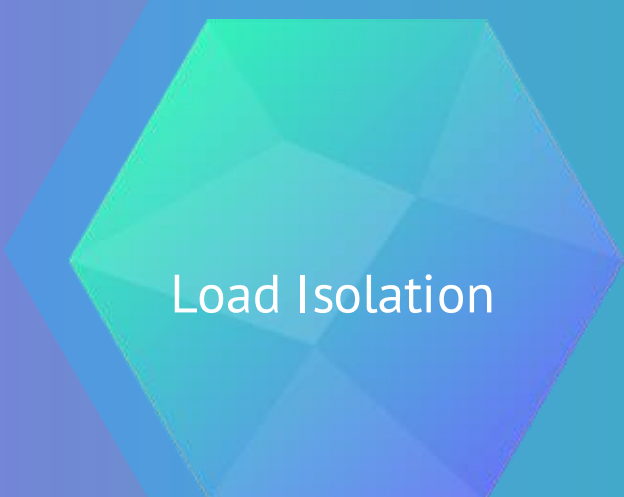
Geographic

Operatives use unstable 4G/5G networks



Fault
tolerance

Survive partitions without data loss



Load Isolation

WebSocket traffic must not block REST
APIs

Actors identification



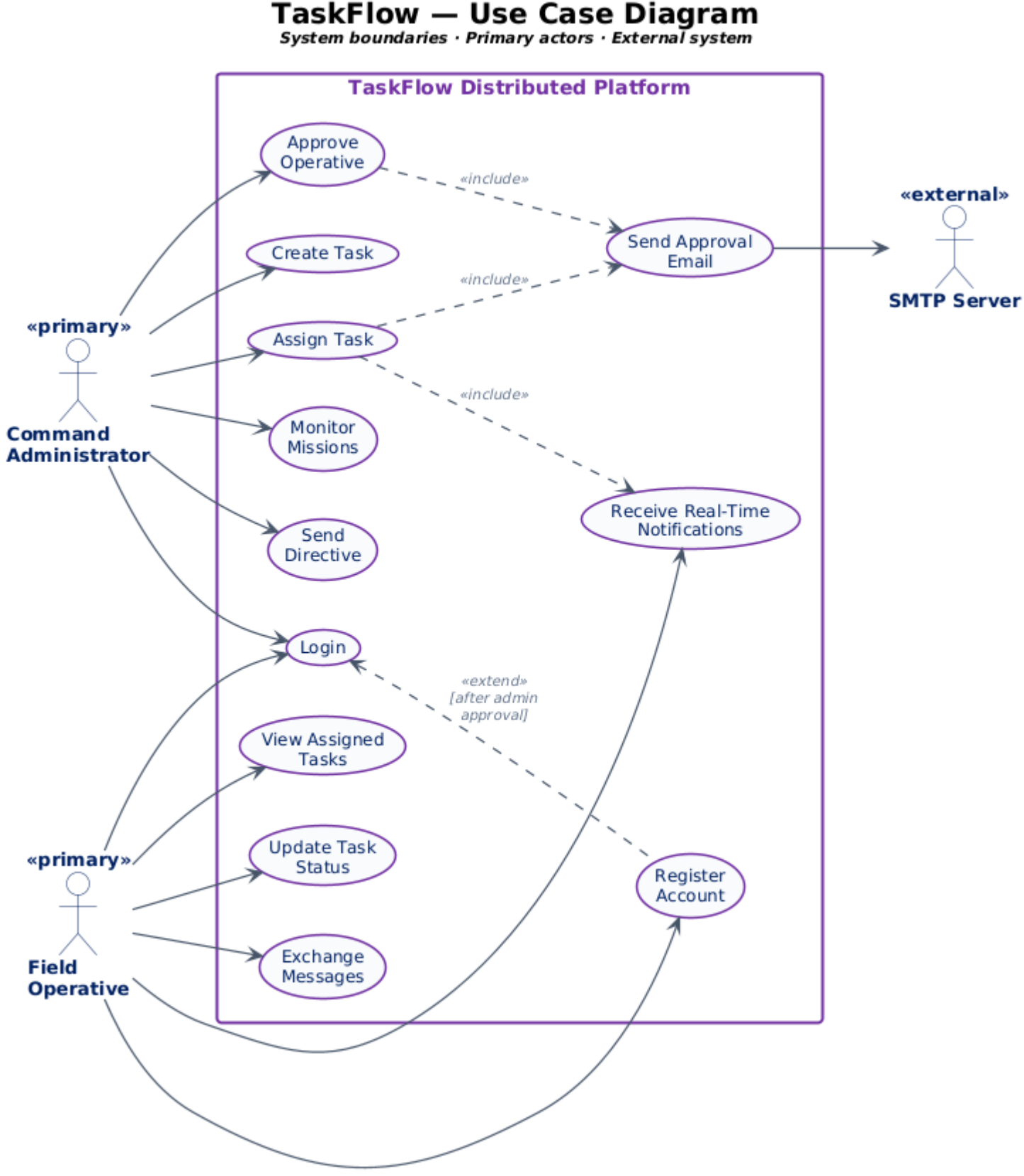
Admin



Normal user

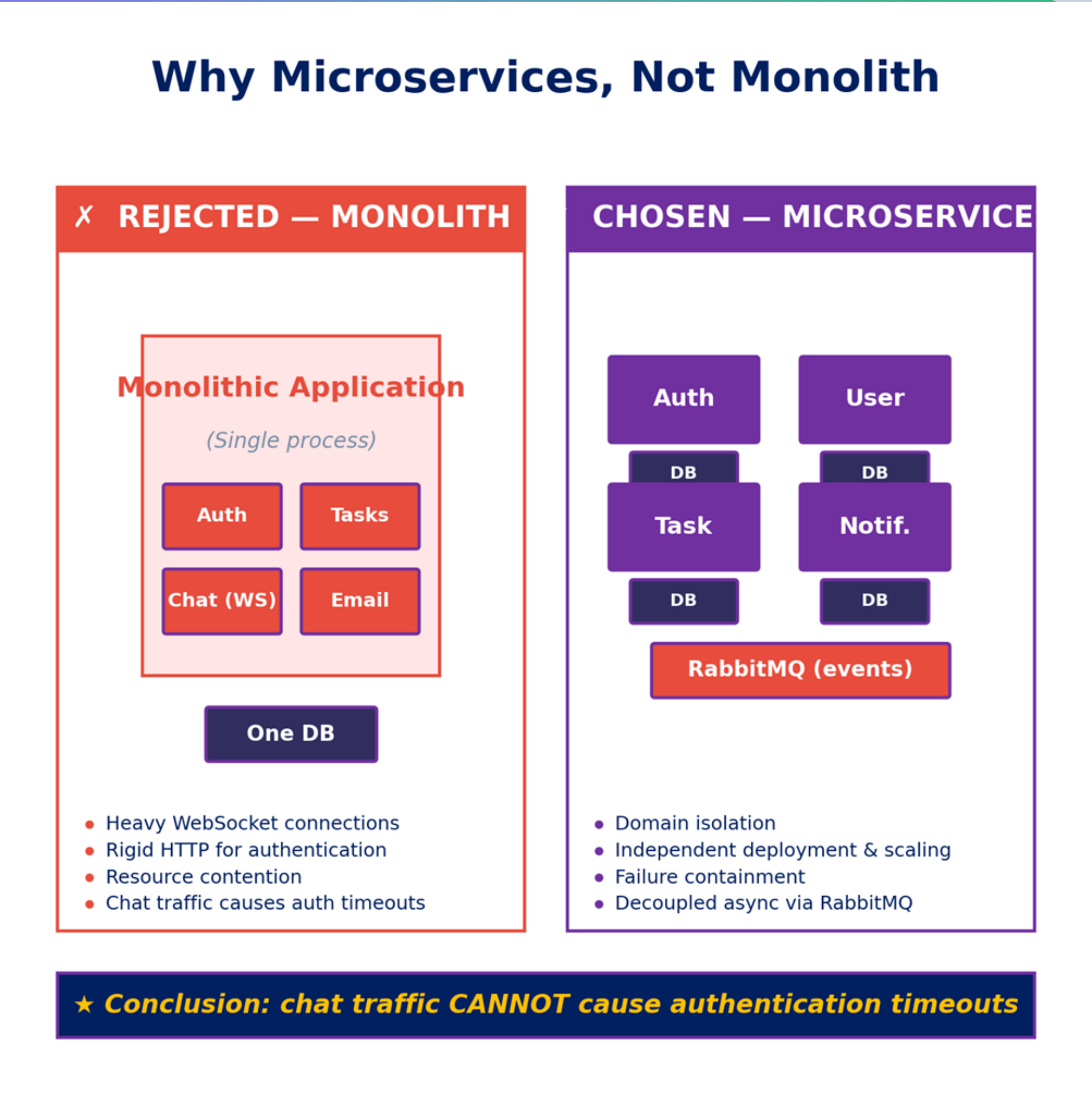
Global use case

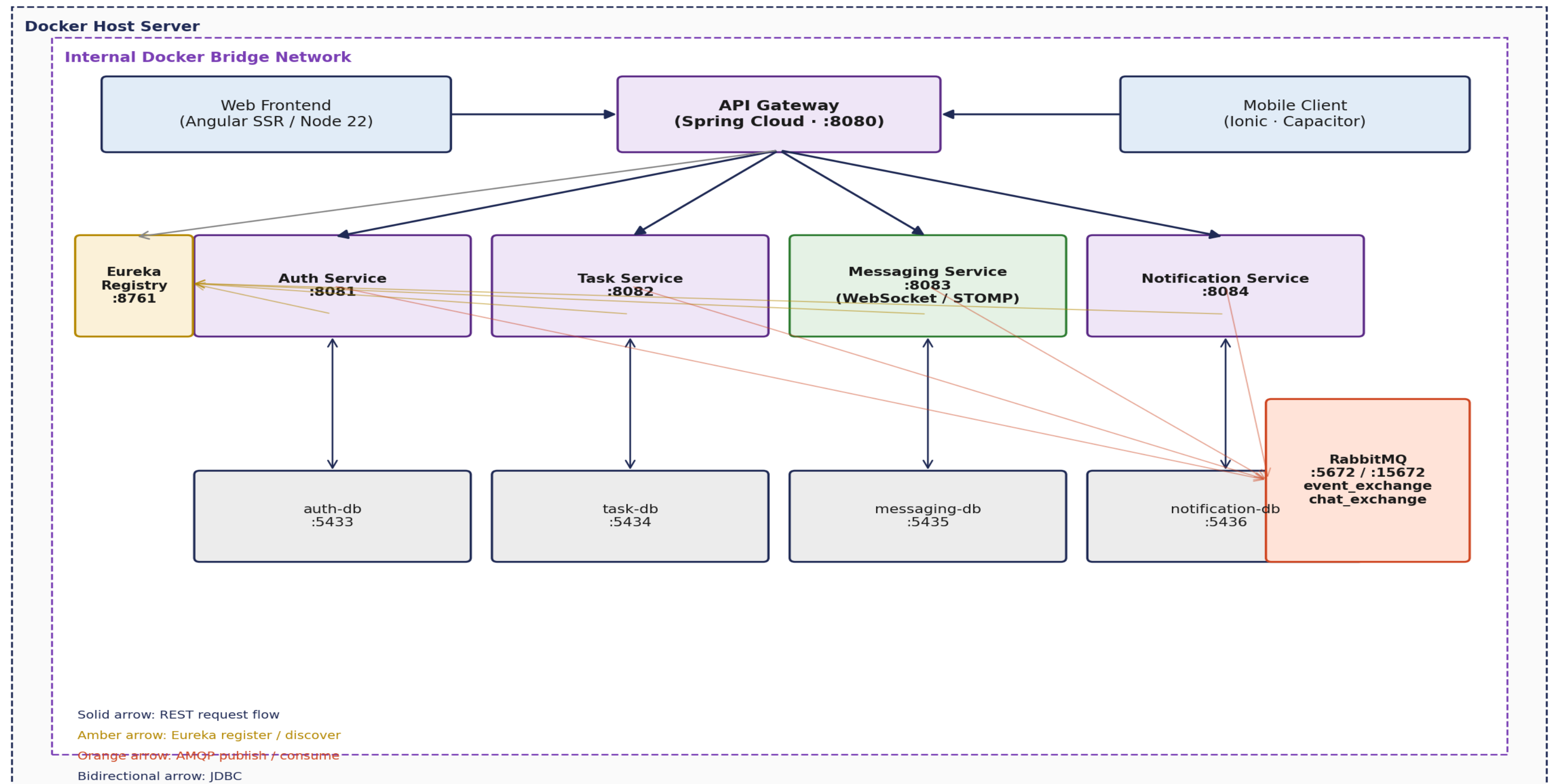
Two human actor two clients one backend one external SMTP



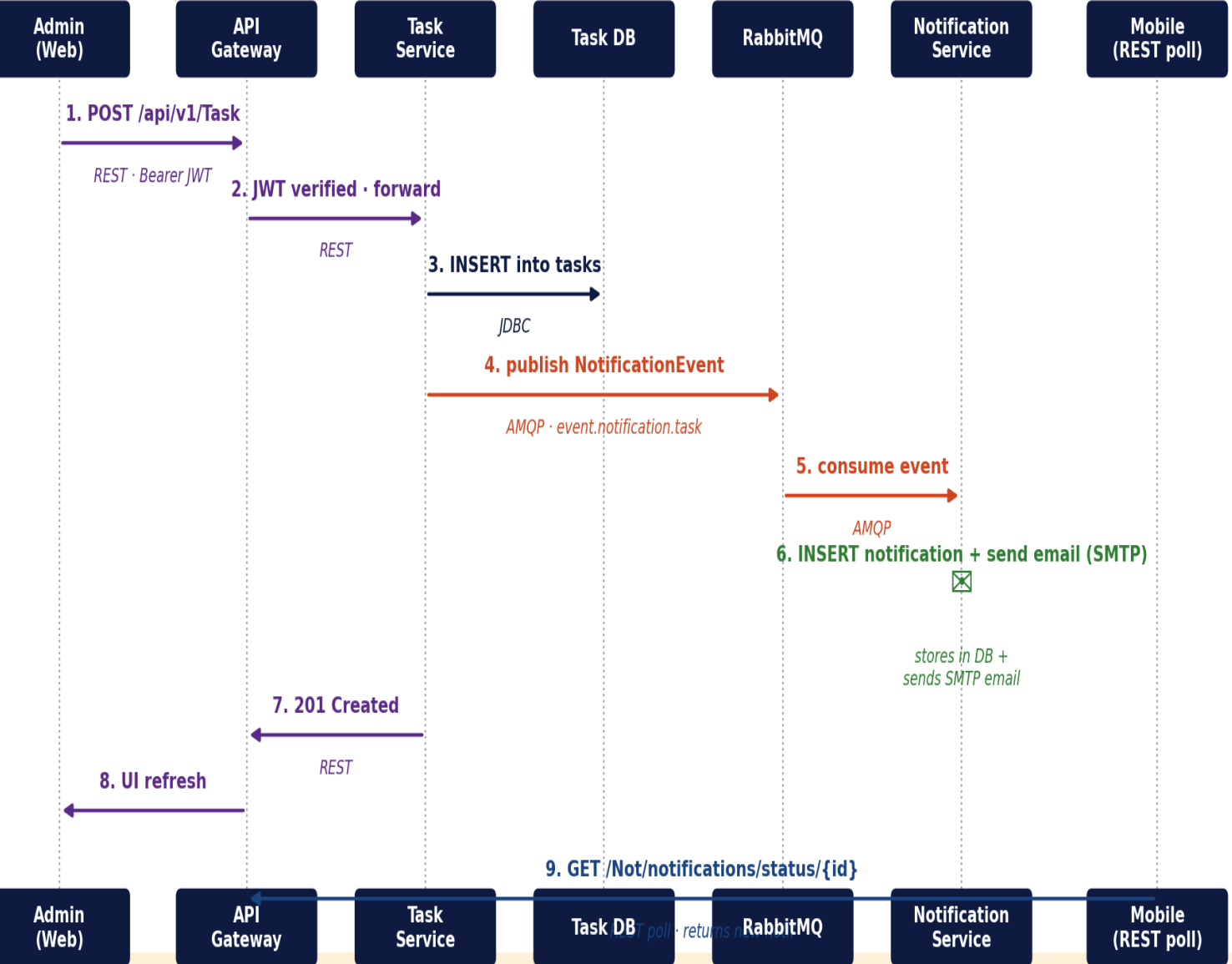
Why microservices, not a monolith.

Resource isolation prevents chat traffic from causing authentication timeouts.



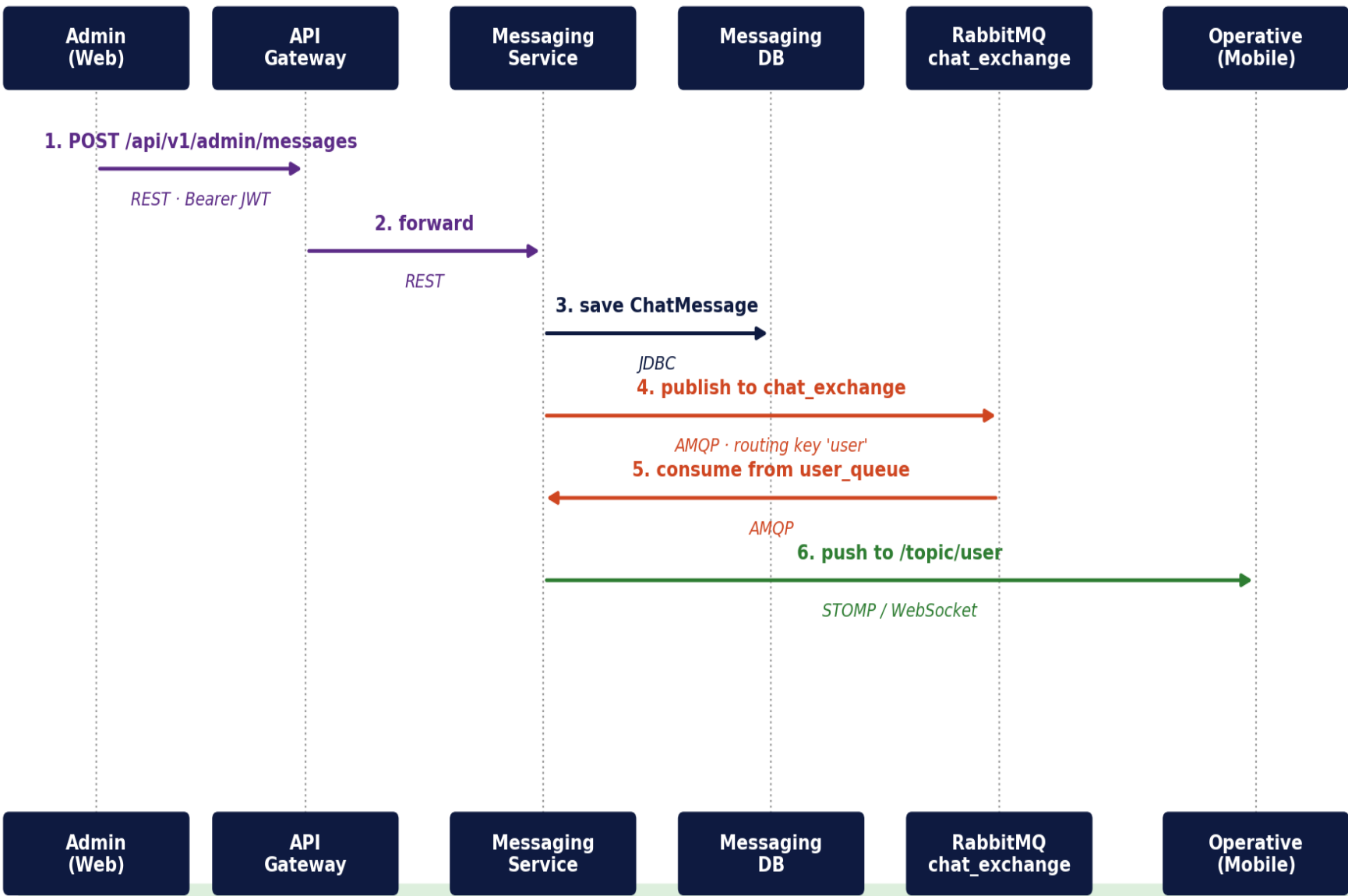


Task Assignment Flow · REST + AMQP



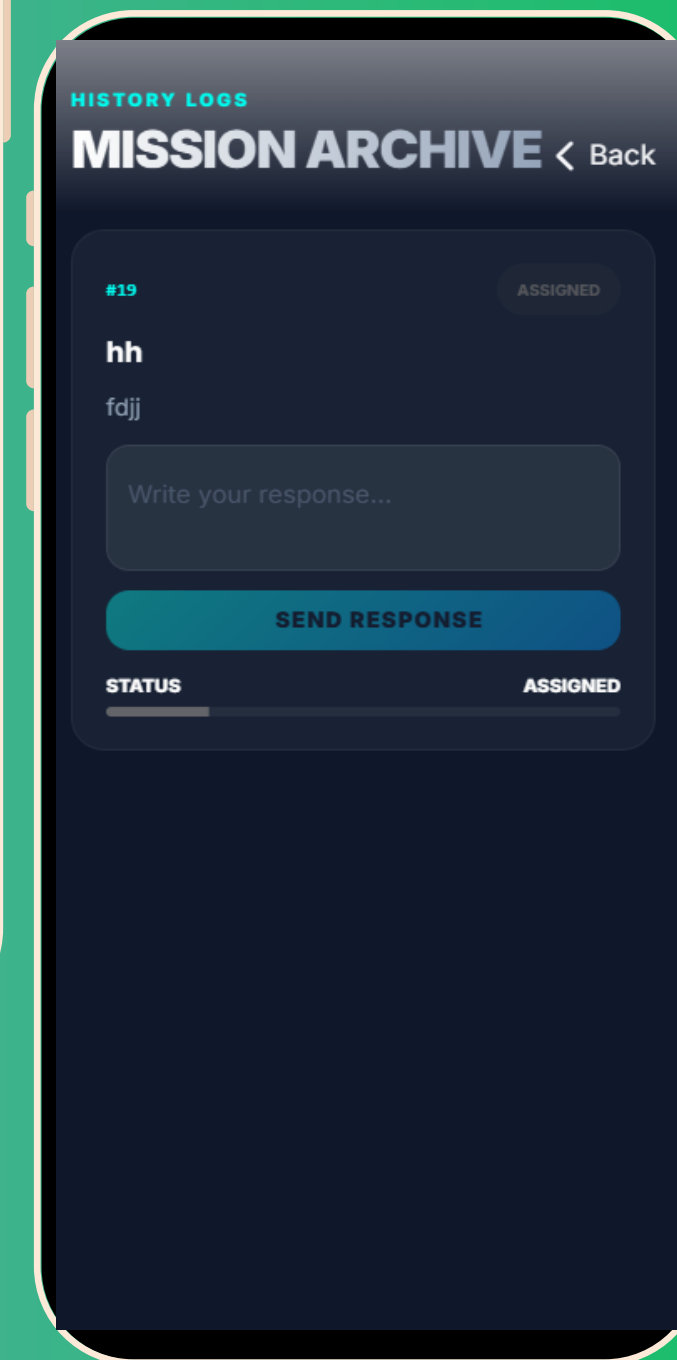
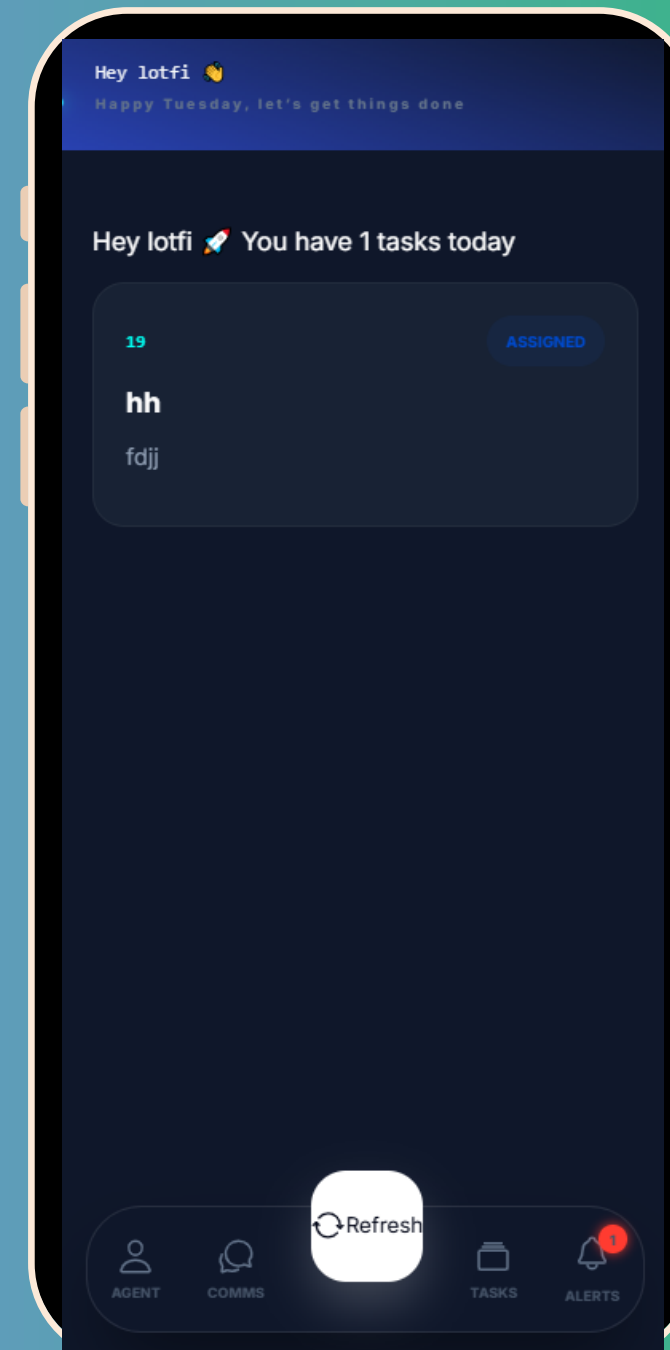
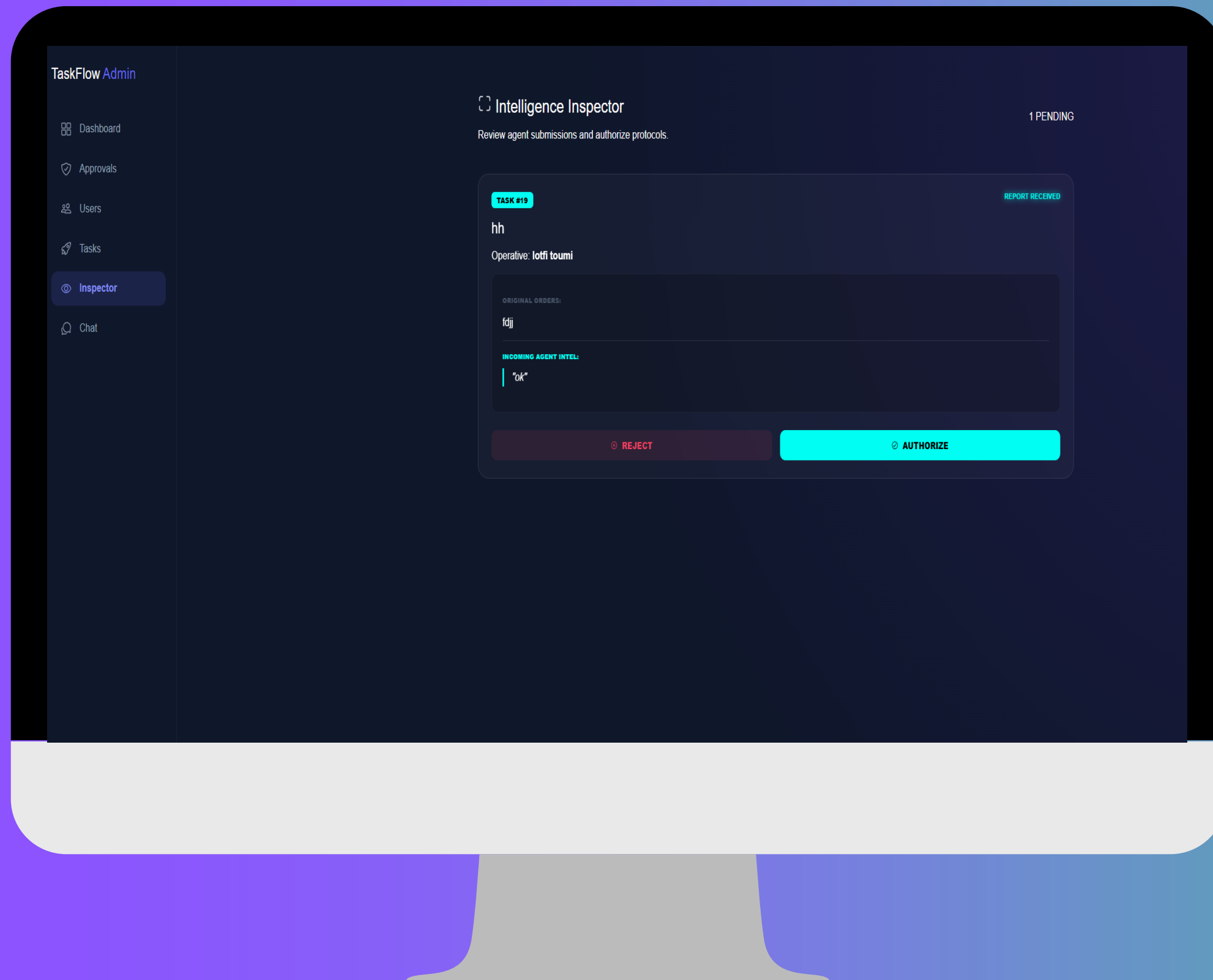
★ Task assignment uses REST + AMQP. STOMP/WebSocket is reserved for the Messaging Service (chat).

Chat Flow · REST + AMQP + STOMP (all 3 protocols)



★ ONE business action — "send a chat message" — uses ALL three protocols: REST · AMQP · STOMP.

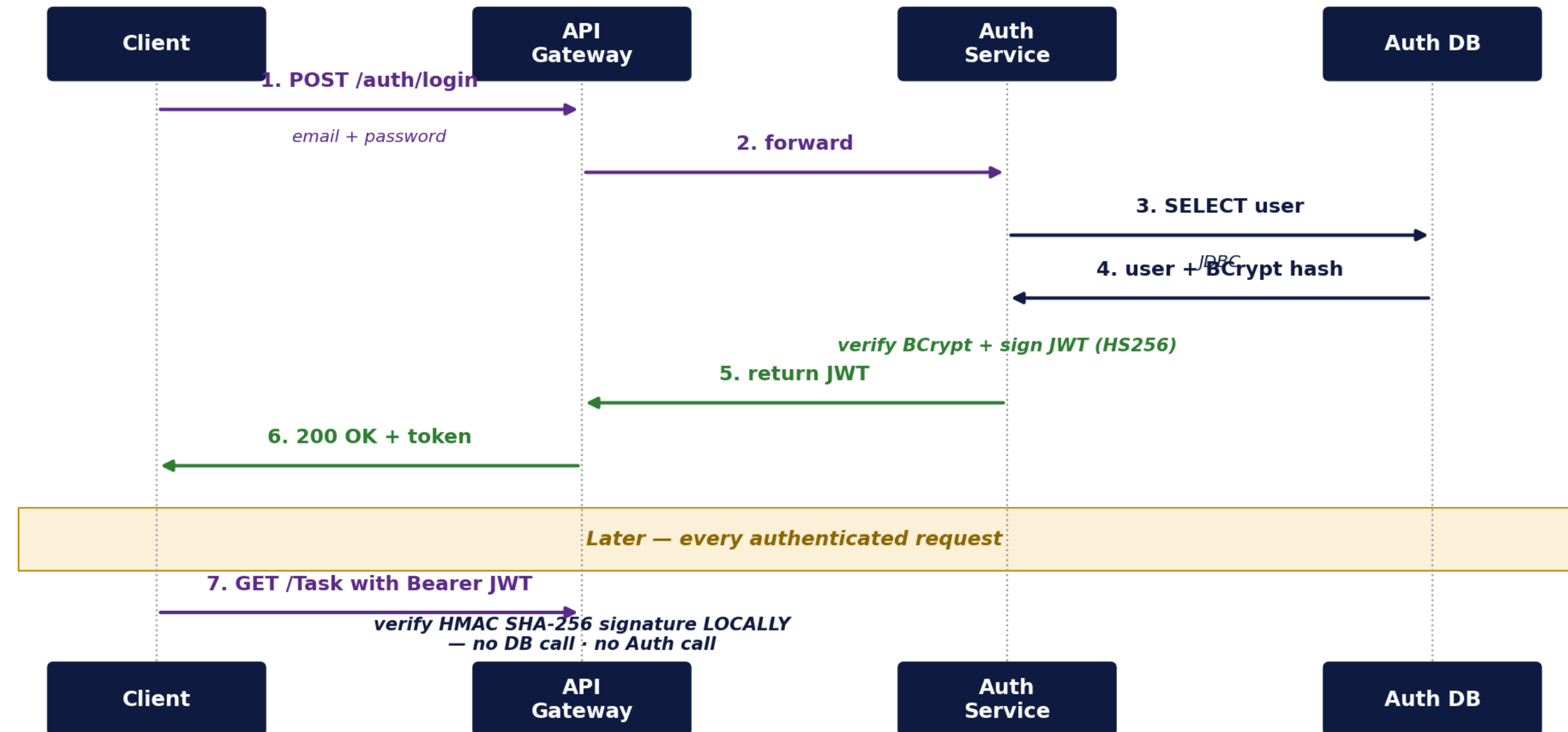
SHOWCASE



Sprints

Stateless JWT authentication (HMAC SHA-256)

Stateless JWT Authentication · HMAC SHA-256



Asymmetric Access Control — Registration Flow

WHAT

New operatives can register but CANNOT login until an admin approves them.

WHY

Tactical missions require asymmetric trust — admins must vet each operative.

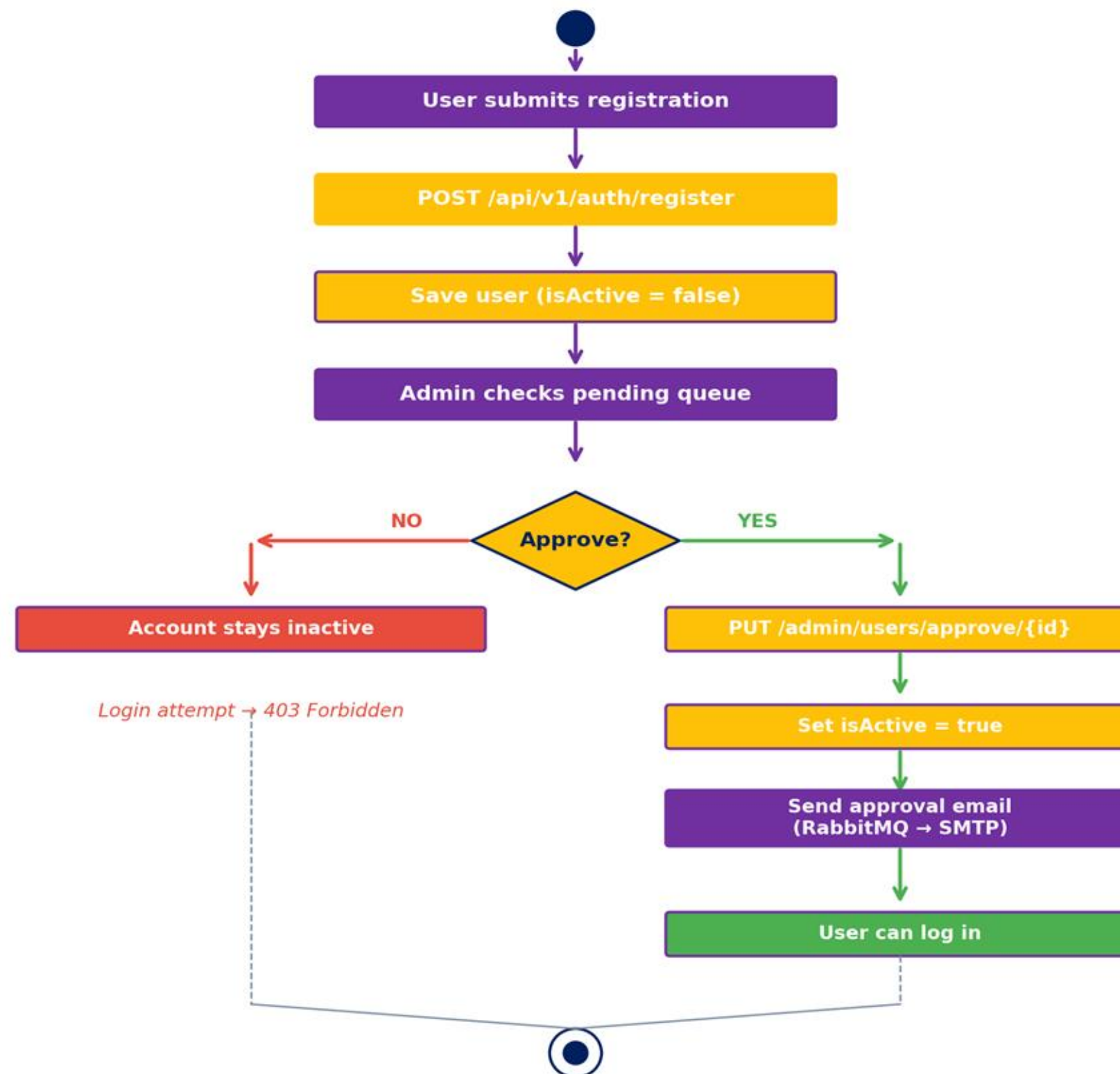
HOW

Boolean flag `isActive=false` until `PUT /admin/users/approve/{id}`

ONAPPROVAL

UserApprovedEvent fired → Notification Service sends approval email via SMTP

User Registration & Approval — Activity Diagram



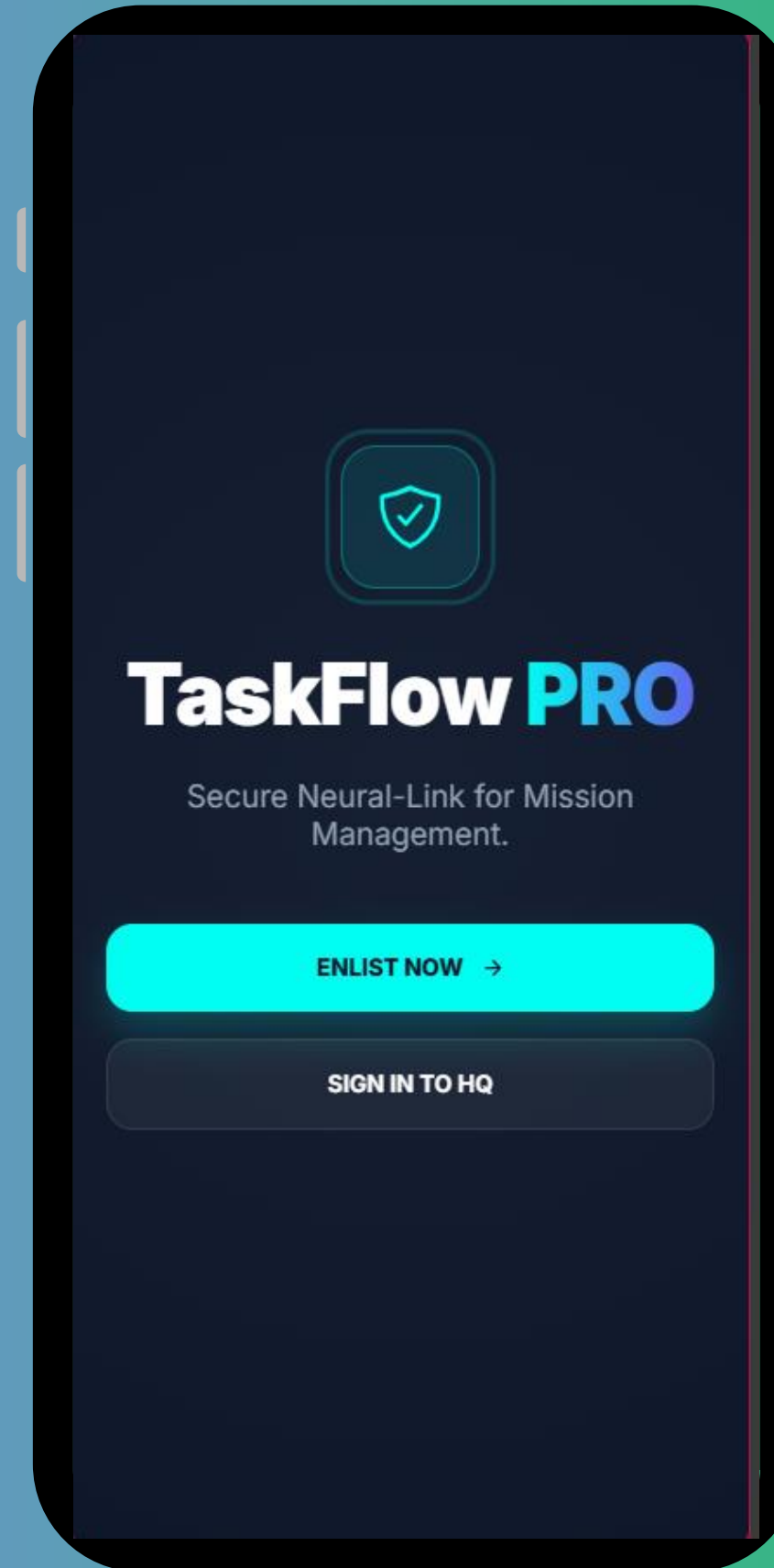
VII. TEST & VALIDATION



Testing Strategy

Test Environment

LET'S GET STARTED



Validation Strategy: JUnit 5 + Mockito + Manual E2E



Automated · JUnit 5 + Mockito

≈ 30 test classes across all services

- ▶ Run with `mvn test` from backend root
- ▶ Each service tested in isolation
- ▶ Mock `RabbitTemplate` and JPA repositories
- ▶ Cover JWT signing, `BCrypt`, REST controllers,
- ▶ AMQP publishers/listeners



Manual · End-to-End on Mobile

Native reconnection cannot be mocked in CI

- ▶ Toggle airplane mode on the phone
- ▶ Verify WebSocket auto-reconnect (5 s back-off)
- ▶ Verify REST resync of tasks after reconnect
- ▶ Validate approval email actually arrives
- ▶ Validate JWT expiry handling

DEPLOYMENT

One command. All containers.



```
$ cd backend
```

```
$ docker-compose up --build -d
```

```
✓ All 11 containers up
```

```
Eureka · Gateway · 4 svc · 4 DB · MQ
```

TEST ADMIN ACCOUNT

```
lotfitoumi56@gmail.com / admin123
```

Thank You

Contact us for more information

ahmed.trabelsi2@studio.unibo.it

Lotfi.toumi@studio.unibo.it