# Team Number 6:
# E-Commerce System using Javalin

*…to serve and protect data.*

Alexandru, Dumitru
Andrejs, Kārkliņš
Xinrui, Xu
Zenan, Guan

TU Delft

# Technology

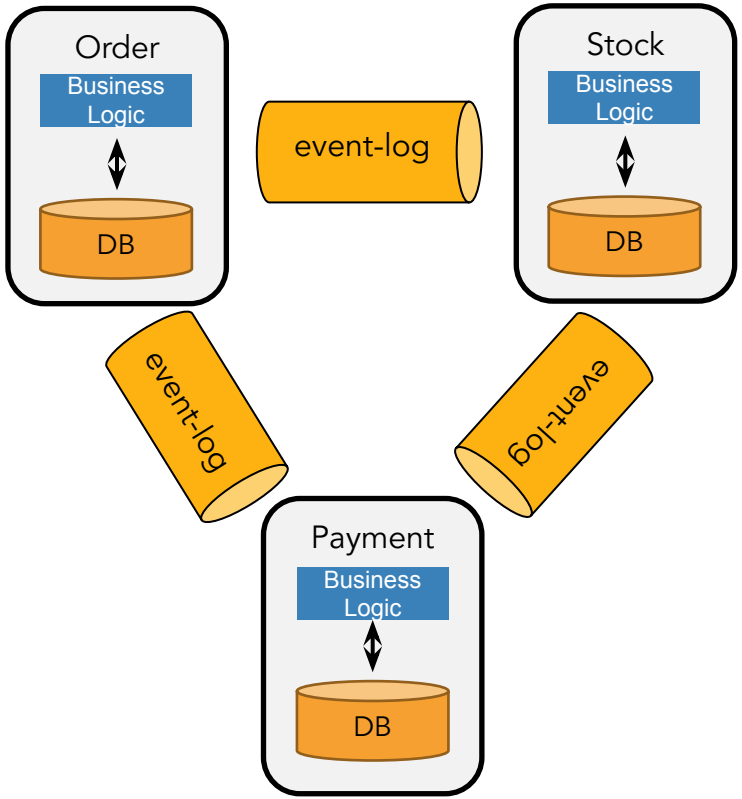
## Javalin (Java)

- Light frame
- Restful API

## Cassandra

- Nosql database
- Scalability
- Distributed database

# Services Architecture: Event Sourcing

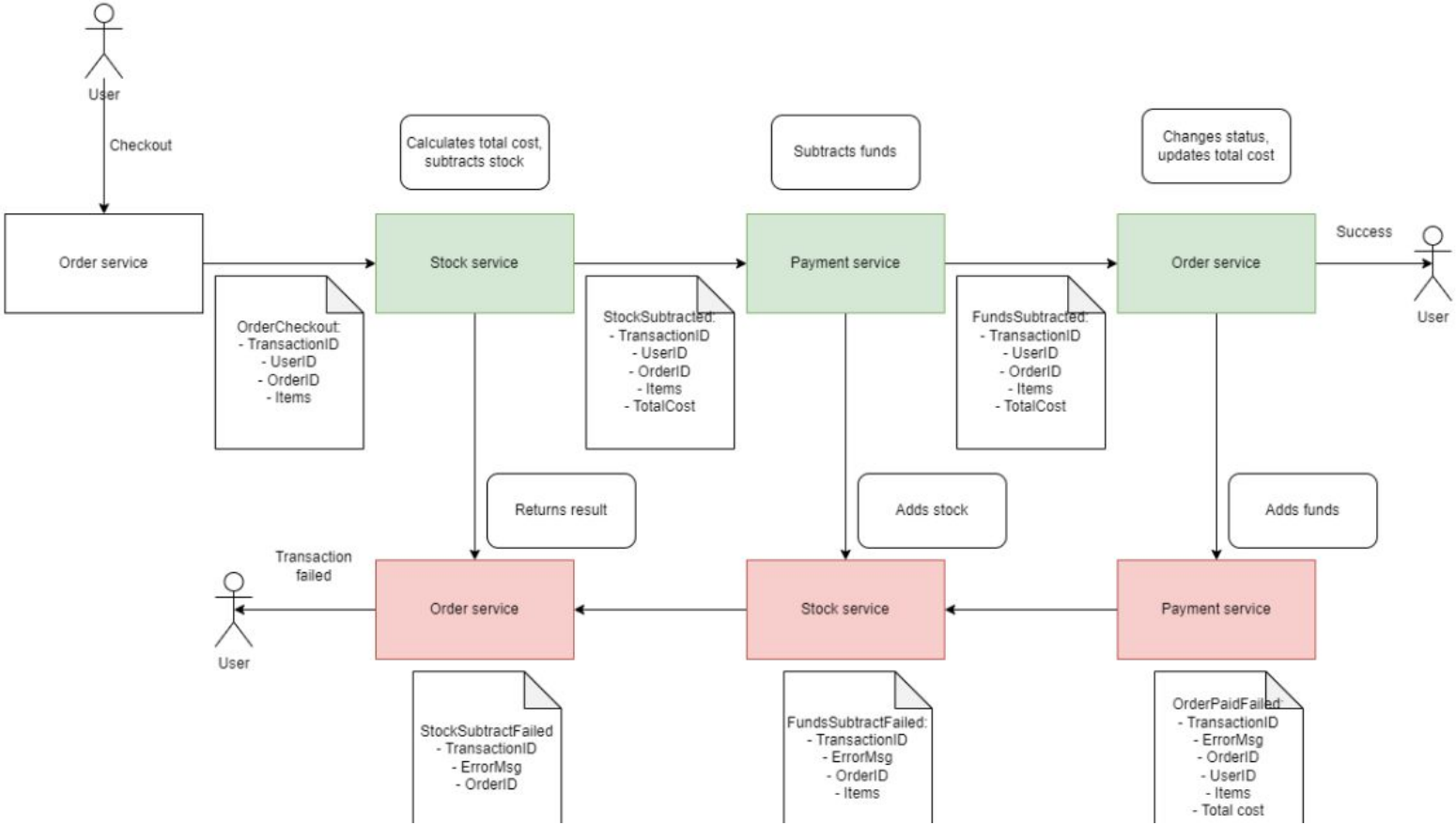


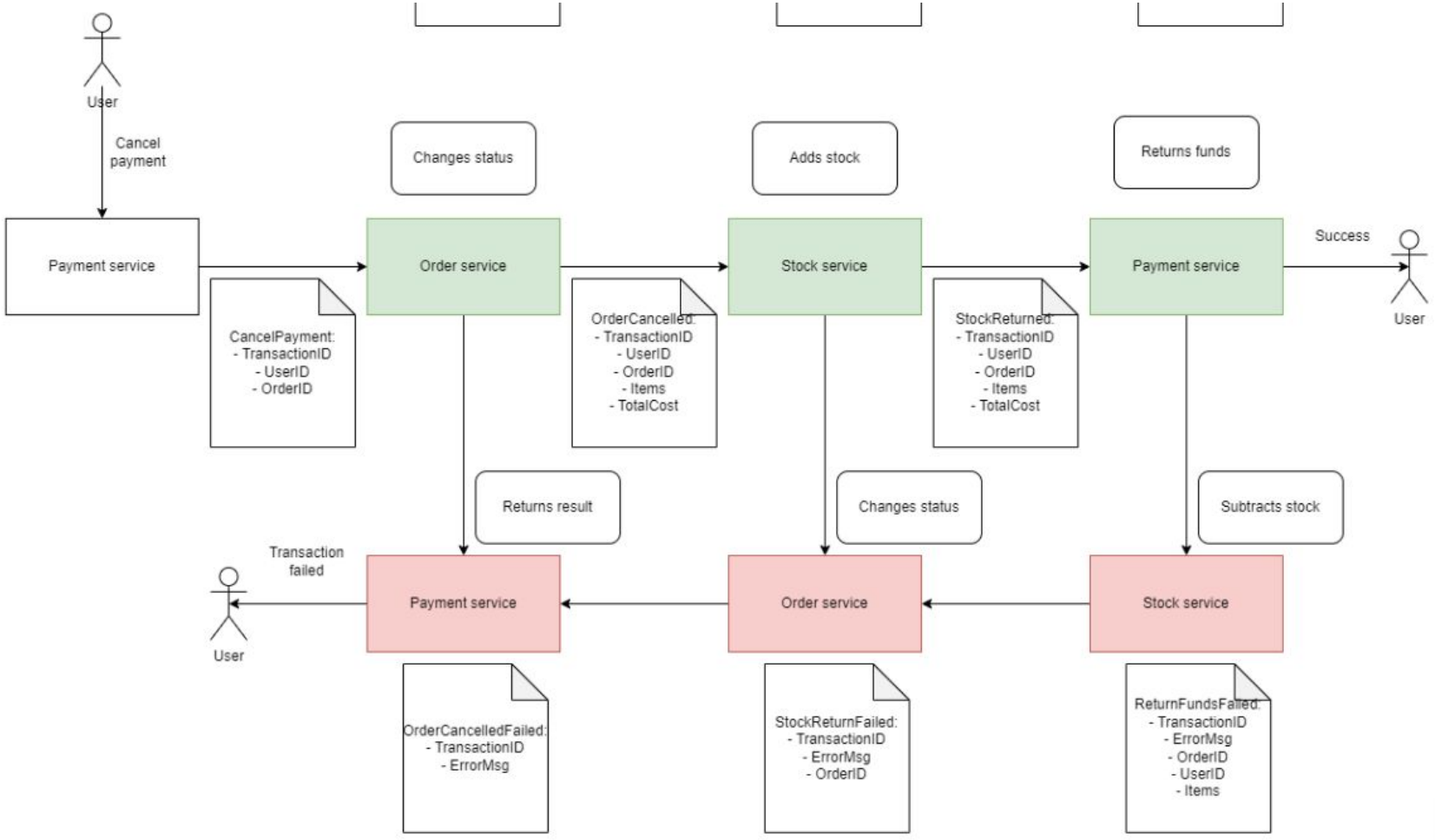

- SSE (Server-side events) communication between microservice.
  - Guaranteed at-least once delivery!
- 2 Threads reserved for keep-alive communication
- Stock-service queue based writes. Consistency > speed.
- Keep total-cost lazy. Consistency < speed.

# SAGA
# (Choreography)

# Global transactions

- **Checkout Transaction:**
  - Subtract stock
  - Subtract balance
  - Change status
- **Cancel Transaction:**
  - Return balance
  - Return stock
  - Change status


User
Checkout
Order service
Calculates total cost, subtracts stock
Stock service
OrderCheckout:
- TransactionID
- UserID
- OrderID
- Items
Subtracts funds
Payment service
StockSubtracted:
- TransactionID
- UserID
- OrderID
- Items
- TotalCost
Changes status, updates total cost
Order service
FundsSubtracted:
- TransactionID
- UserID
- OrderID
- Items
- TotalCost
Success
User
Returns result
Adds stock
Adds funds
Transaction failed
User
Order service
Stock service
Payment service
StockSubtractFailed
- TransactionID
- ErrorMsg
- OrderID
FundsSubtractFailed:
- TransactionID
- ErrorMsg
- OrderID
- Items
OrderPaidFailed:
- TransactionID
- ErrorMsg
- OrderID
- UserID
- Items
- Total cost


User
Cancel payment
Payment service
CancelPayment:
- TransactionID
- UserID
- OrderID
Changes status
Order service
OrderCancelled:
- TransactionID
- UserID
- OrderID
- Items
- TotalCost
Adds stock
Stock service
StockReturned:
- TransactionID
- UserID
- OrderID
- Items
- TotalCost
Returns funds
Payment service
Success
User
Subtracts stock
Stock service
ReturnFundsFailed:
- TransactionID
- ErrorMsg
- OrderID
- UserID
- Items
Changes status
Order service
StockReturnFailed:
- TransactionID
- ErrorMsg
- OrderID
Returns result
Payment service
OrderCancelledFailed:
- TransactionID
- ErrorMsg
Transaction failed
User

# Results

# Stress Test

LOCUST

HOST localhost | STATUS RUNNING 100 users Edit | RPS 51.8 | FAILURES 0% | STOP | Reset Stats

Statistics | Charts | Failures | Exceptions | Current ratio | Download Data

| Type | Name | # Requests | # Fails | Median (ms) | 90%ile (ms) | 99%ile (ms) | Average (ms) | Min (ms) | Max (ms) | Average size (bytes) | Current RPS | Current Failures/s |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| POST | /orders/addItem/[order_id]/[item_id] | 499 | 0 | 3 | 4 | 5 | 3 | 2 | 19 | 7 | 10.8 | 0 |
| POST | /orders/checkout/[order_id] | 327 | 0 | 9 | 11 | 14 | 9 | 4 | 15 | 17 | 6.9 | 0 |
| POST | /orders/create/[user_id] | 352 | 0 | 3 | 4 | 4 | 3 | 2 | 5 | 51 | 6.8 | 0 |
| DELETE | /orders/removeItem/[order_id]/[item_id] | 69 | 0 | 3 | 4 | 5 | 3 | 2 | 5 | 7 | 1.6 | 0 |
| POST | /payment/add_funds/[user_id]/[amount] | 312 | 0 | 4 | 4 | 6 | 4 | 2 | 6 | 13 | 5.6 | 0 |
| POST | /payment/create_user | 377 | 0 | 3 | 4 | 5 | 3 | 2 | 6 | 50 | 6.2 | 0 |
| POST | /stock/add/[item_id]/[number] | 521 | 0 | 4 | 5 | 6 | 4 | 2 | 44 | 7 | 6.8 | 0 |
| GET | /stock/find/[item_id] | 23 | 0 | 3 | 3 | 4 | 3 | 2 | 4 | 72 | 0 | 0 |
| POST | /stock/item/create/[price] | 541 | 0 | 3 | 60 | 150 | 18 | 2 | 156 | 72 | 7.1 | 0 |
| POST | /stock/subtract/[item_id]/[number] | 23 | 0 | 3 | 3 | 3 | 3 | 2 | 3 | 7 | 0 | 0 |
| | **Aggregated** | **3044** | **0** | **3** | **9** | **75** | **6** | **2** | **156** | **31** | **51.8** | **0** |

# Consistency Test

```
INFO - 08:05:18 - Consistency test - Creating tmp folder...
INFO - 08:05:18 - Consistency test - tmp folder created
INFO - 08:05:18 - Consistency test - Populating the databases...
INFO - 08:05:18 - populate - Creating items ...
INFO - 08:05:18 - populate - Items created
INFO - 08:05:18 - populate - Creating users ...
INFO - 08:05:20 - populate - Users created
INFO - 08:05:20 - Consistency test - Databases populated
INFO - 08:05:20 - Consistency test - Starting the load test...
INFO - 08:05:20 - stress - Creating orders...
INFO - 08:05:22 - stress - Orders created ...
INFO - 08:05:22 - stress - Running concurrent checkouts...
INFO - 08:05:26 - stress - Concurrent checkouts finished...
INFO - 08:05:26 - Consistency test - Load test completed
INFO - 08:05:26 - Consistency test - Starting the consistency evaluation...
INFO - 08:05:26 - verify - Stock service inconsistencies in the logs: 0
INFO - 08:05:27 - verify - Stock service inconsistencies in the database: 0
INFO - 08:05:27 - verify - Payment service inconsistencies in the logs: 0
INFO - 08:05:27 - verify - Payment service inconsistencies in the database: 0
INFO - 08:05:27 - Consistency test - Consistency evaluation completed

Process finished with exit code 0
```

# What would we do better?

# Main improvements

- Work on fault-tolerance
  - Logging
  - Redundancy
  - Recoverability
  - Account for unfinished transactions
- Use full potential of Cassandra:
  - Caching
  - Data replication
- Asynchronous non-blocking I/O for all HTTP request handling.

# Thank You!