

SE2
R&DD I&T



POLITECNICO
MILANO 1863

CLUP



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Today's Presentation

MAIN POINTS

Goals of the system

Use Cases

Fundamental Requirements

Some Assumptions

Formal Verification

Components

Interfaces

Architectural styles and paradigms

Implementation (DEMO)

Integration

Testing

Algorithms

SOCIAL DISTANCING

Go shopping without danger.

TICKETS

Digital line up to visit a Shop.

MONITORING

Monitor the number of people entering a Shop.

BOOKING

Book your planned visit to a Shop.

What is CLup

CUSTOMERS

- Find shops
- Acquire tokens
- Show to staff

STAFF

- Manage queue
- Scan tokens
- Monitoring

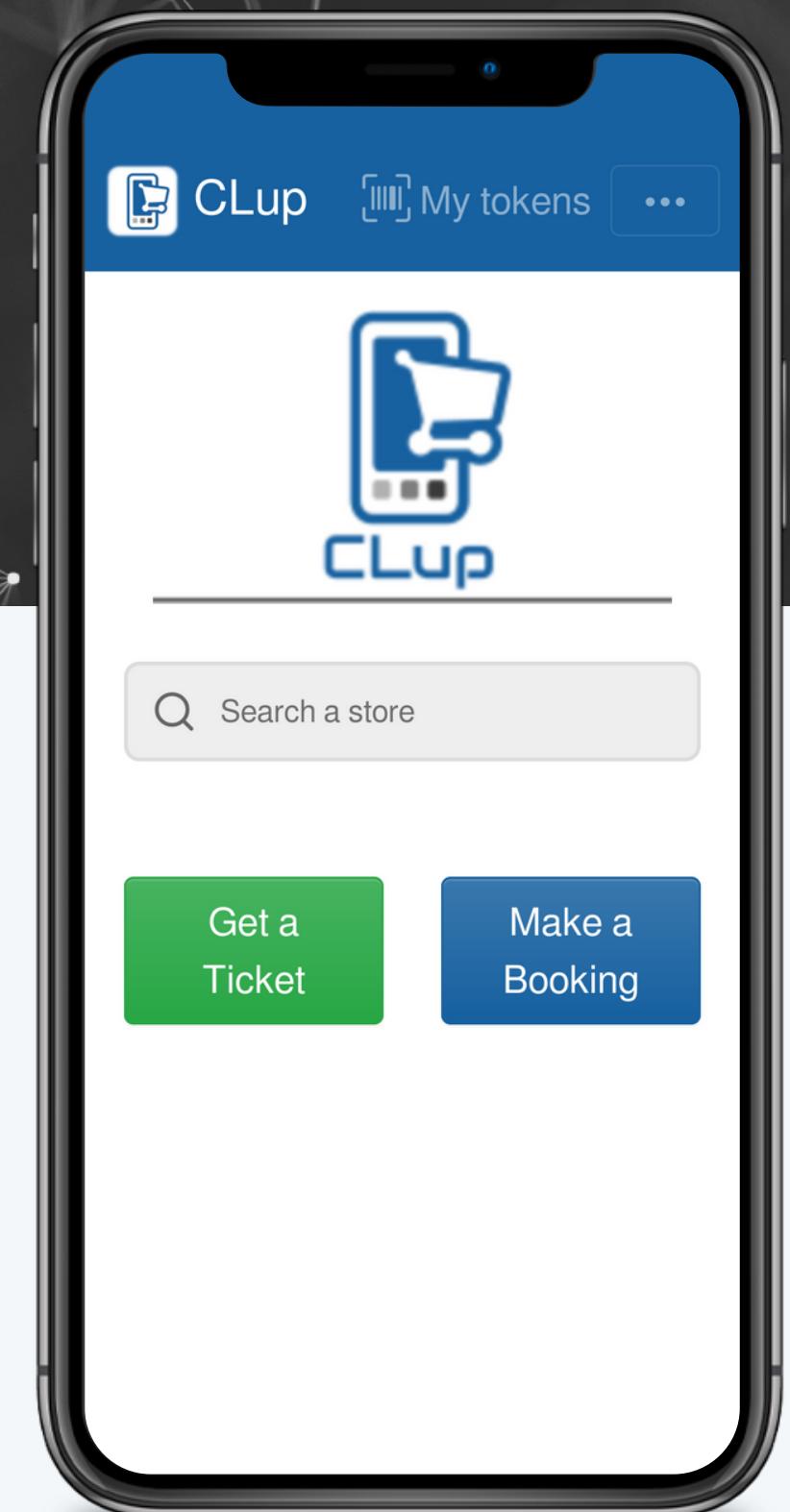
MANAGEMENT

- Manage shops

Apps

PROGRESSIVE WEB APPS

Browser or install



REGISTRATION/LOGIN

➤ GETTING A TICKET

BOOKING

SHOWING A TOKEN

ADDING A SHOP

SCANNING A TOKEN

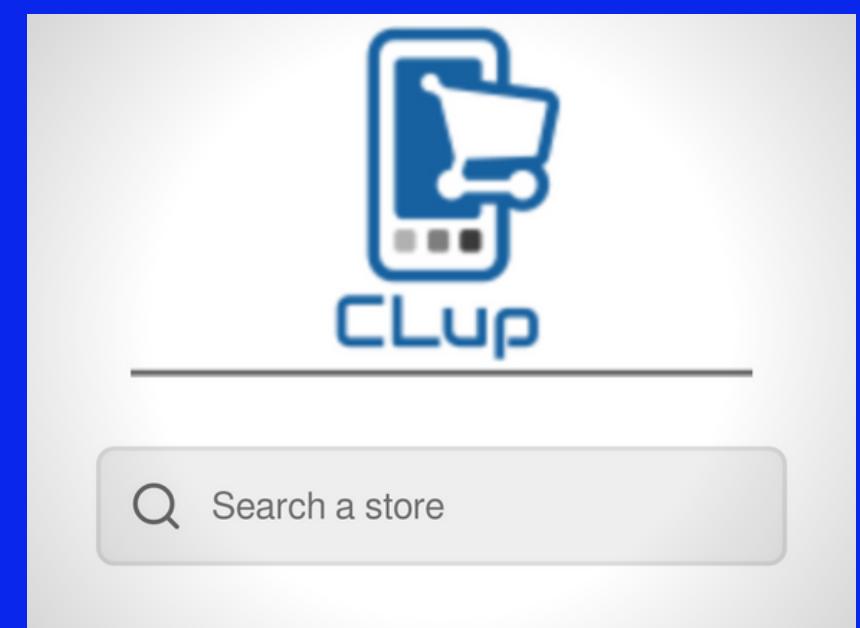
CREATE A SUBSTITUTE TICKET

CHECK SHOP OCCUPANCY



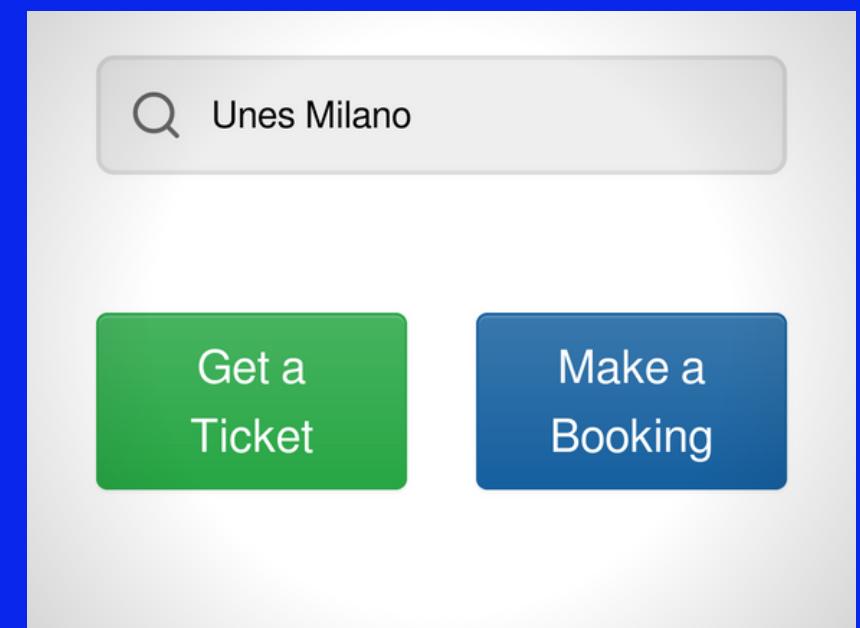
Use Cases

Getting a Ticket



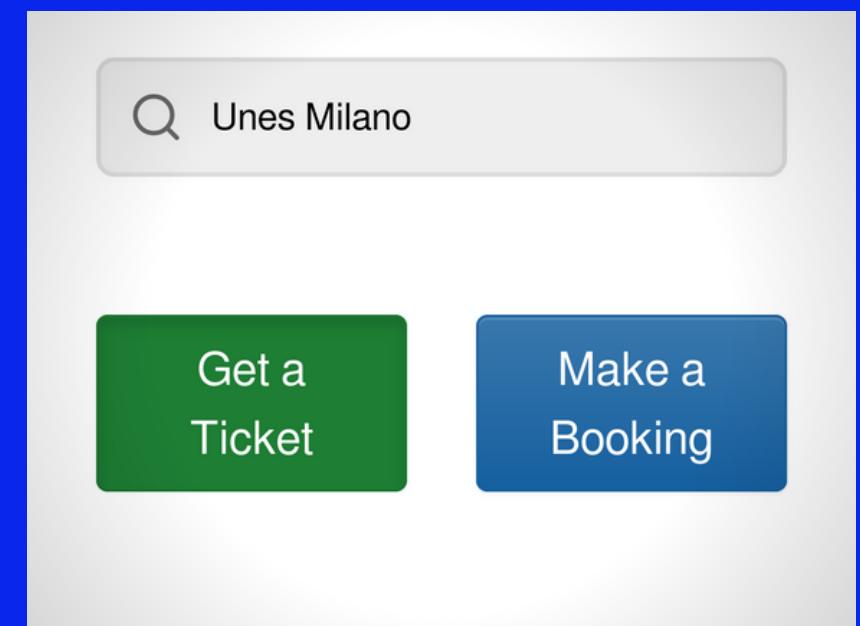
STEP 1

Type all or part of the shop name in the search bar.



STEP 2

Select one of the results.

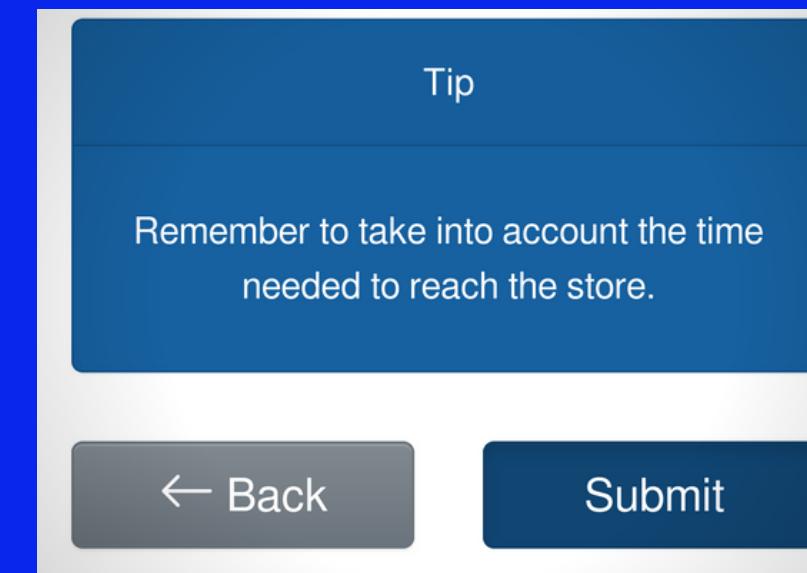


STEP 3

Click on "Get a Ticket".

Getting a Ticket

The screenshot shows a mobile application interface. At the top, it displays the store name "Unes Milano" and a button labeled "Open in Maps". Below this, there is a link "Unes via unes numero unes" and a button labeled "Show timetable". A section titled "Departments:" contains two items: "Frutta" with an empty checkbox and "Pane" with a checked checkbox. Below this, there is a section titled "Duration of your visit (minutes):" with a numeric input field showing the value "15".



STEP 4

Select the Categories of items.

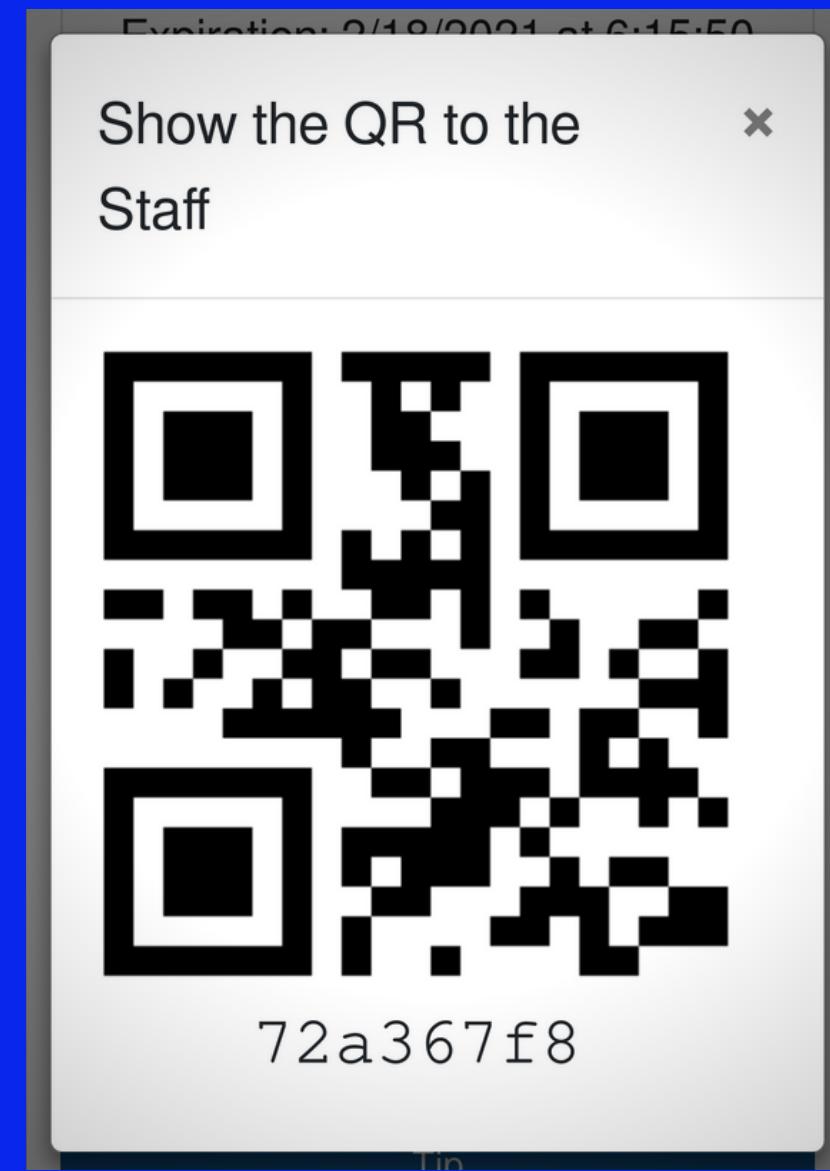
STEP 5

Select the Estimated duration of your visit.

STEP 6

Click on "Submit".

Getting a Ticket



STEP 7

The Customer receives confirmation from the server and is shown the new Ticket.

Fundamental Requirements

GENERATING TOKENS

VALIDATING TOKENS

TRACKING ENTRANCES

NO DUPLICATE ACCOUNTS

CUSTOMERS ACT PREDICTABLY

Most of the customers that take a ticket or book a visit will actually visit the shop

MANAGERS ARE TRUSTED

The information provided by the manager is correct.

VALIDATION HAPPENS

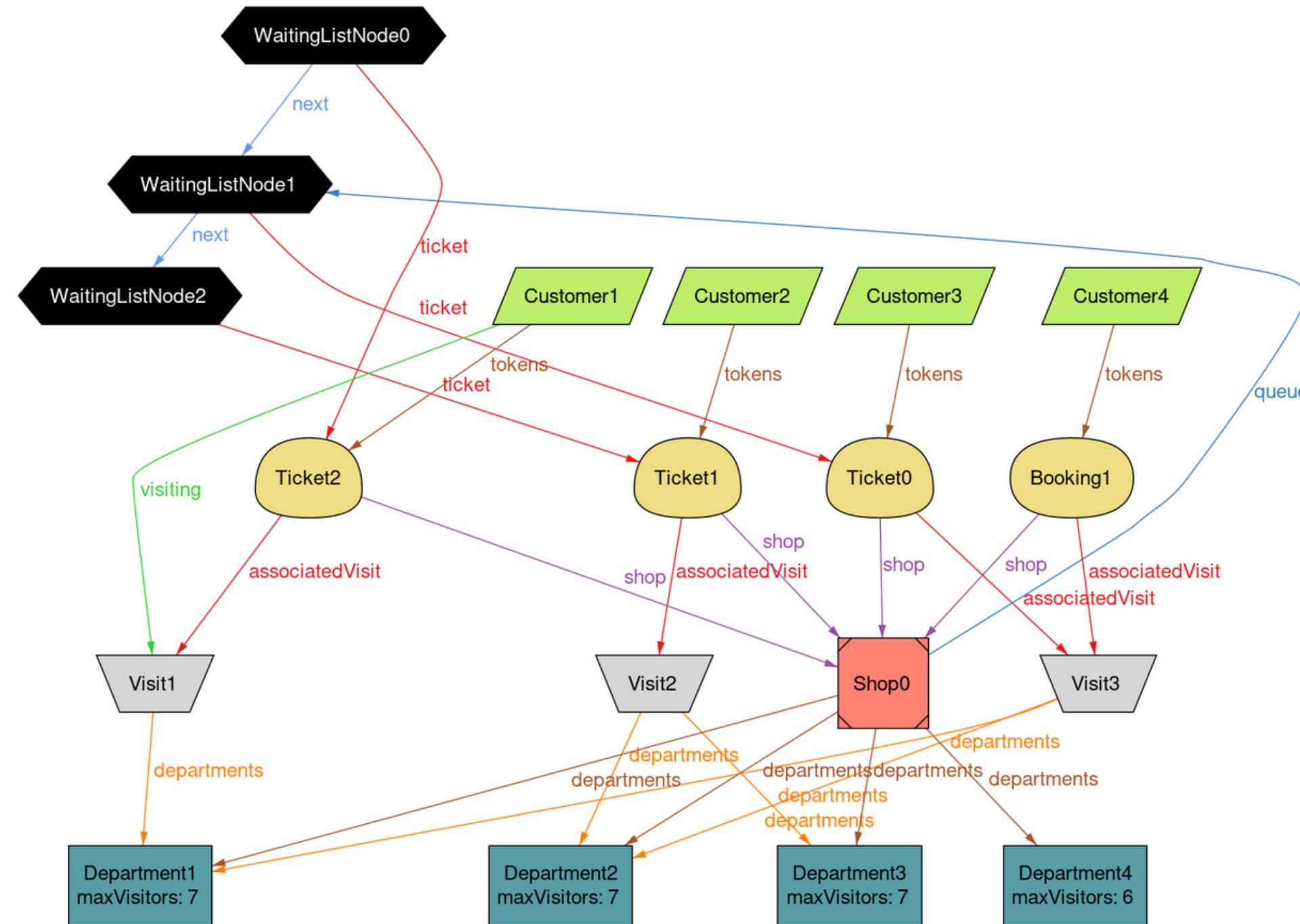
The staff will validate tickets and bookings on entry and exit



Some Assumptions

Formal Verification

ALLOY MODEL



WAITING LIST NODE

Points to a ticket, and to the next node

CUSTOMER

TICKET

BOOKING

VISIT
set of Departments

SHOP

DEPARTMENT

ALLOY ASSERTIONS

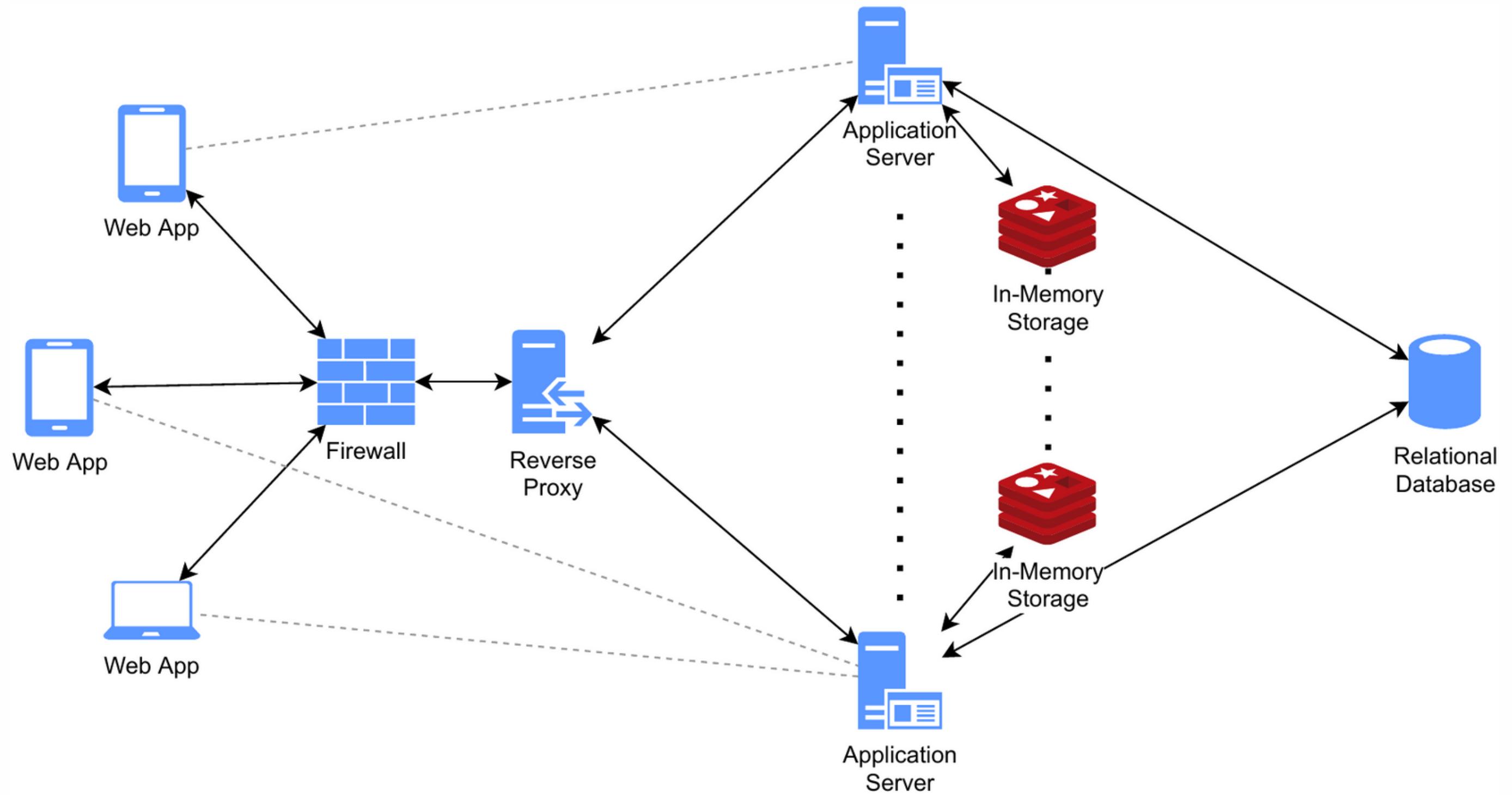
The following properties are checked:

- No department in a Shop exceeds its occupancy limits
- Customers cannot enter a Shop without a valid Token
- Customers can use a Booking to enter a Shop only at the time specified
- Customers cannot cut the waiting line for a Shop
- The same Token cannot be used for multiple visits

7 commands were executed. The results are:

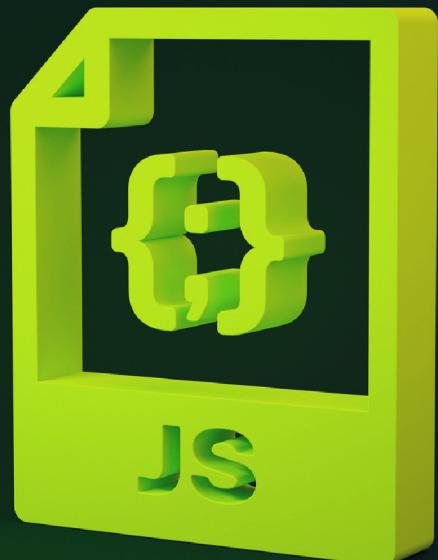
- #1: No counterexample found. checkOccupancy may be valid.
- #2: No counterexample found. cannotEnterWithoutToken may be valid.
- #3: No counterexample found. cannotEnterAtDifferentTimeWithBooking may be valid.
- #4: No counterexample found. cannotSkipQueue may be valid.
- #5: No counterexample found. cannotReuseTicket may be valid.
- #6: No counterexample found. ticketsGetUsed may be valid.
- #7: No counterexample found. cannotVisitMultipleAtSameTime may be valid.

Components



Components

WEB APPLICATION
JavaScript - Vue.js
Presentation Tier



APPLICATION SERVER
Rust - Actix - Redis
Application Tier



DATABASE SERVER
PostgreSQL
Data Access Tier



Interfaces



REST API

The web application interacts with the application server through a Rest API

Endpoints

- Account
- Booking
- Ticket
- Shop
- Staff
- Manage

Interfaces



SQLx

The application server interacts with the DBMS through SQLx

Features

- Checked queries
- Truly asynchronous
- Struct mapping
- TLS

Architectural styles

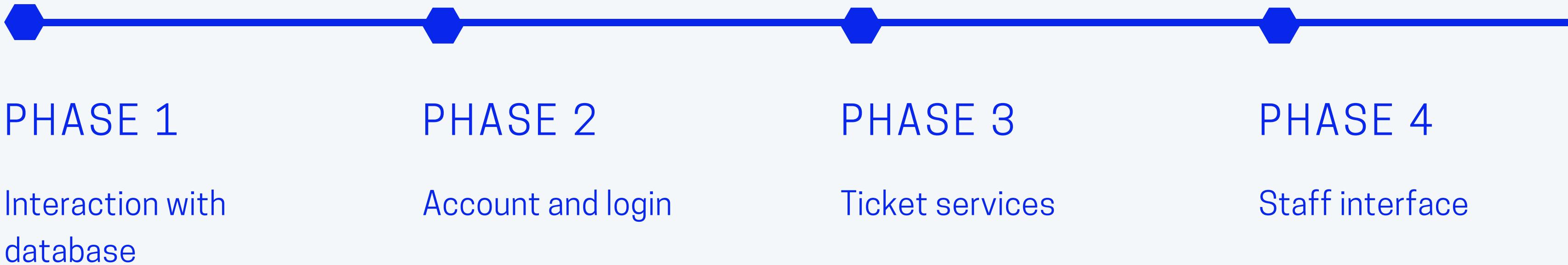
MODEL VIEW CONTROLLER
High level structure

MODEL VIEW VIEWMODEL
Web app controls

ACTOR MODEL
Application server endpoints

Implementation Plan

THREAD APPROACH





PHASE 5

Booking services

PHASE 6

Shop Management

PHASE 7

Additional features
and improvements

VUE.JS

The Progressive JavaScript
Framework

ACTIX

A powerful, pragmatic, and
extremely fast web
framework for Rust

DOCKER

The most popular container
solution

Frameworks

And tooling

Testing plan

BOTTOM UP



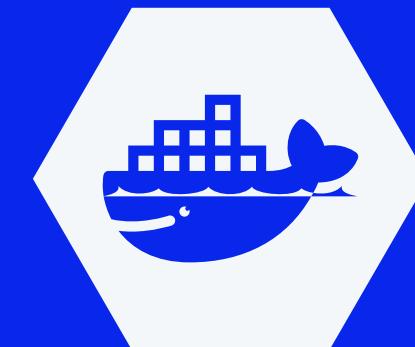
Unit tests



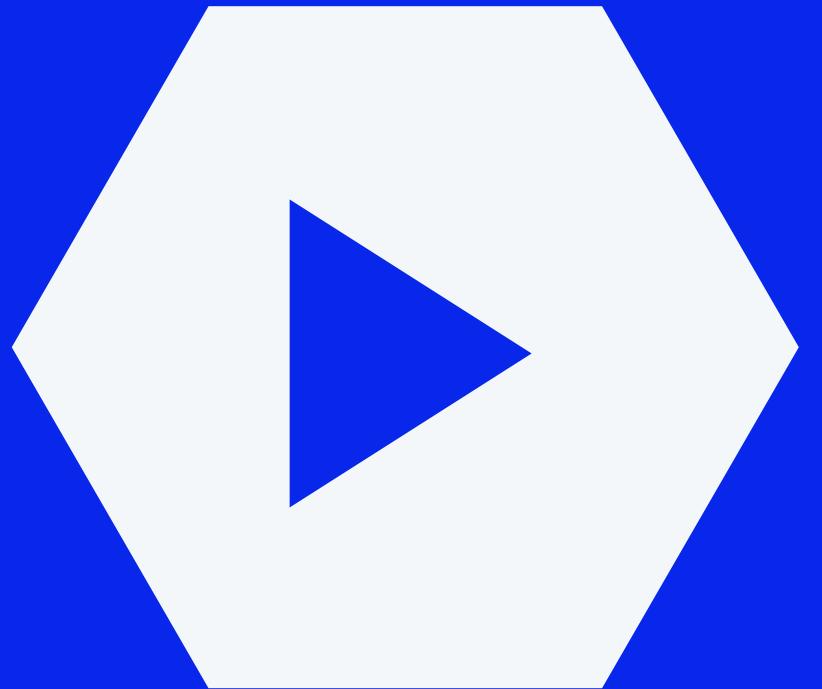
Integration Tests



Continuous Integration



Automation



[HTTPS:// CLUP.LIVE](https://CLUP.LIVE)

Demo

A demo of the project is online

Final Remarks

ALGORITHMS

Time estimate using EMA for throughput

- Get duration estimates
- Measure actual durations
- Keep an exponential moving average
- Combine them
- Transform into throughput

DEPLOYMENT

Modular deployment using containers

Consistent build and run environment

Quick distributed deployment

Thanks for listening!