

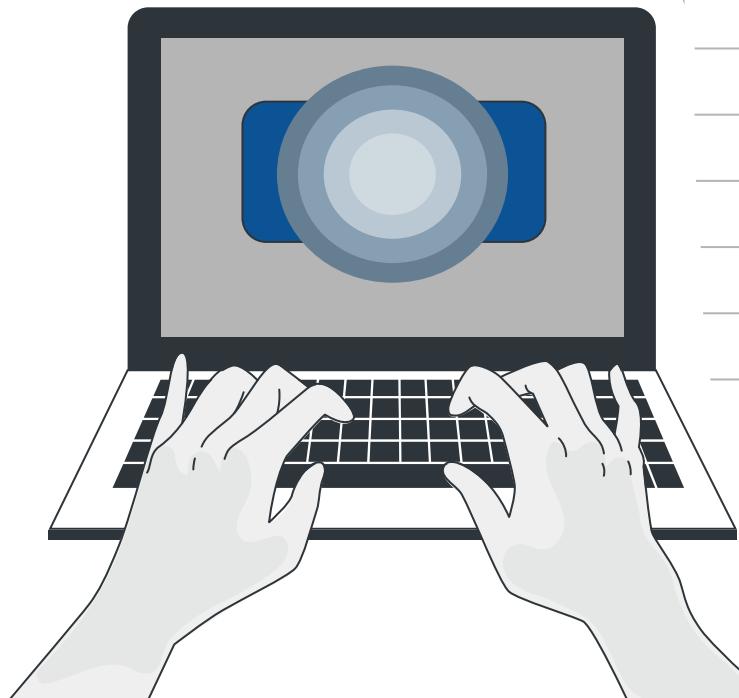
FINAL PRESENTATION

Fabrication Lab 2023 UniLock

Jacopo Caratti, Nicholas Kaegi

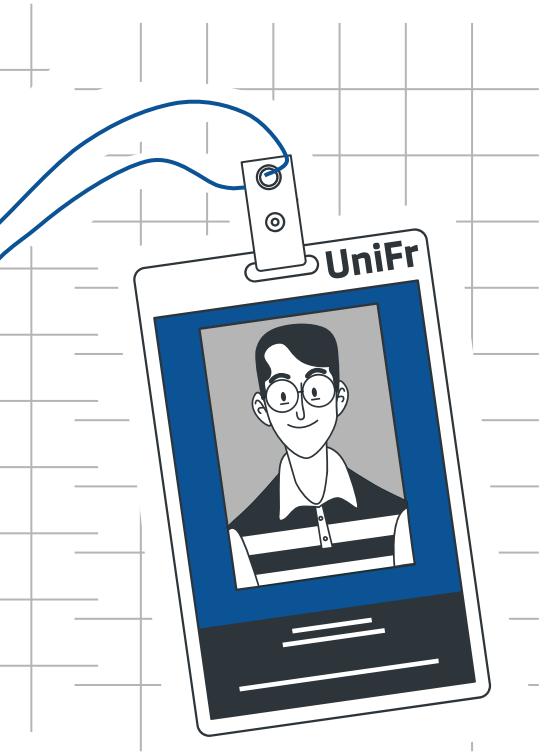
01

Intro



The background image shows a spacious, modern interior of a FabLab or workshop. Large windows on the left provide ample natural light. The floor is a polished concrete. Several white, round, height-adjustable tables are arranged in a circular pattern. In the center, there is a cluster of colorful, cylindrical stools in red, yellow, blue, and green. In the background, there are more workstations and a staircase. A small green exit sign is visible in the top right corner.

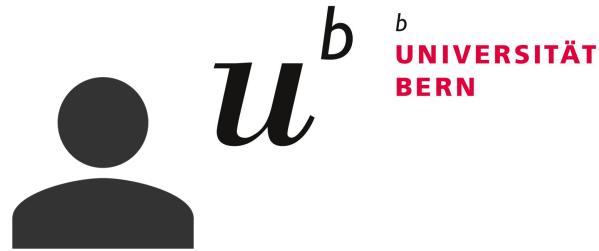
How to access the FabLab?



Current solution

Campus Card ↗

- physical accesses;
- student identity card;
- library card
- electronic credit card for specific services
- access to University sport;
- proof to obtain users discount



External collaborators

→ Obtaining one is a very slow process



Our idea



Computer Vision



Secure storage



Feedbacks



Usability



Secure access

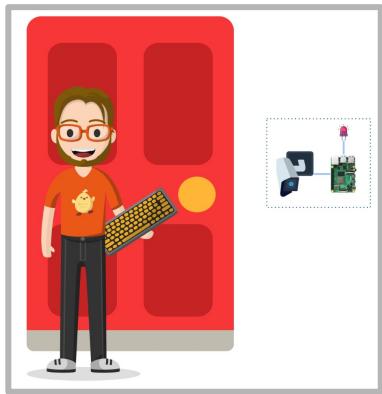
Easy-to-use, easy-to-manage, no privacy concerns, computer-vision

02

UniLock



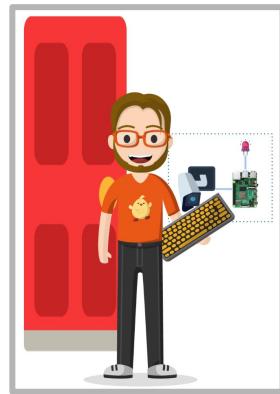
Workflow



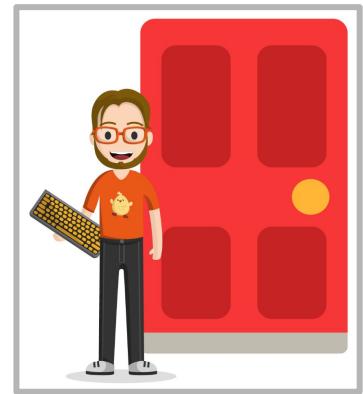
Approach UniLock
system



Generate, scan and
validate temporally QR
code



Access the
area



Leave and lock the
area

A picture is worth a thousand words...

– Tess Flanders, newspaper editor

...what about a video?

– Jacopo Caratti, currently unemployed

03

Demo



04

Technical challenges



Web App



Streamlit ↗

Open-source Python library for building and deploying custom web apps. Compatible with major Python libraries.

A screenshot of a web browser window showing the Streamlit Control flow documentation. The title 'Control flow' is prominently displayed. Below it, a paragraph explains Streamlit's architecture and its unique data flow. A bulleted list details situations where control flow occurs. At the bottom, a code snippet shows the `st.stop()` command.

Control flow

Streamlit's architecture allows you to write apps the same way you write plain Python scripts. To unlock this, Streamlit apps have a unique data flow: **any time something must be updated on the screen, Streamlit reruns your entire Python script from top to bottom.**

This can happen in two situations:

- Whenever you modify your app's source code.
- Whenever a user interacts with widgets in the app. For example, when dragging a slider, entering text in an input box, or clicking a button.

```
st.stop()
```



Streamlit

PROBLEMS

Particular control flow, no backend development, database management, URL routing

Web app

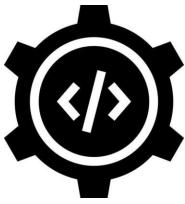
Better idea for the webapp



→ full-stack framework for robust, scalable web apps with extensive functionalities



Lock



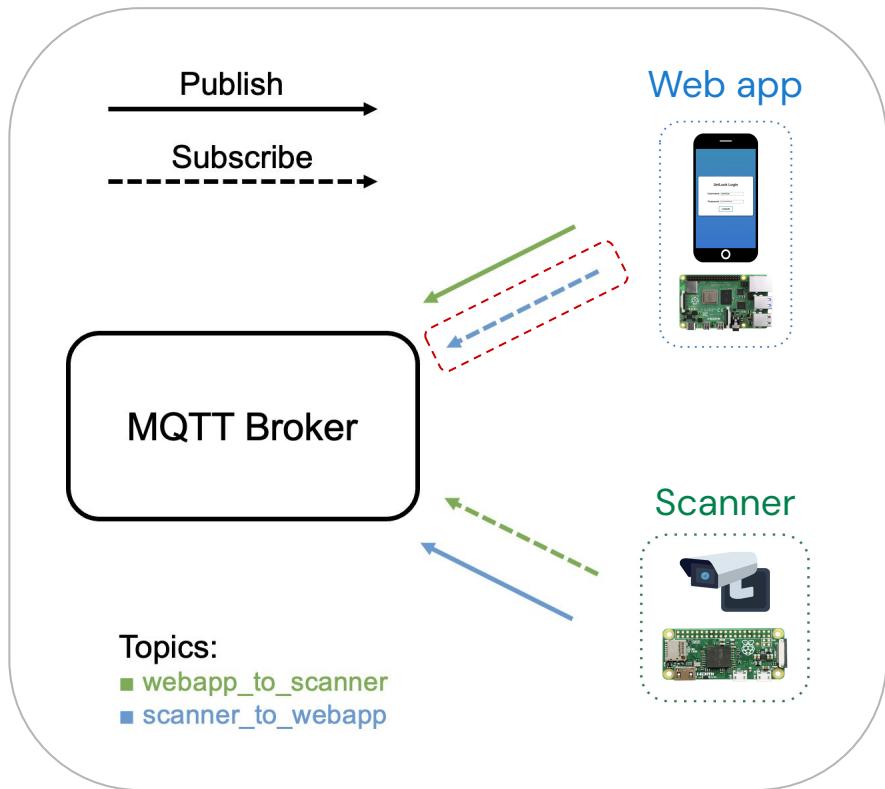
UniLock



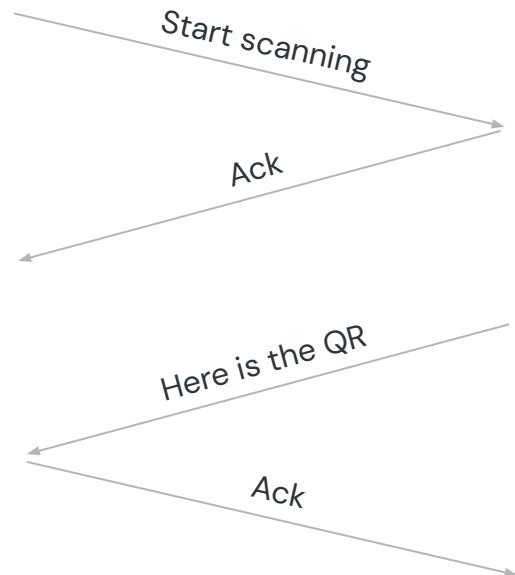
Statistics

Standardize communication among the 3 projects





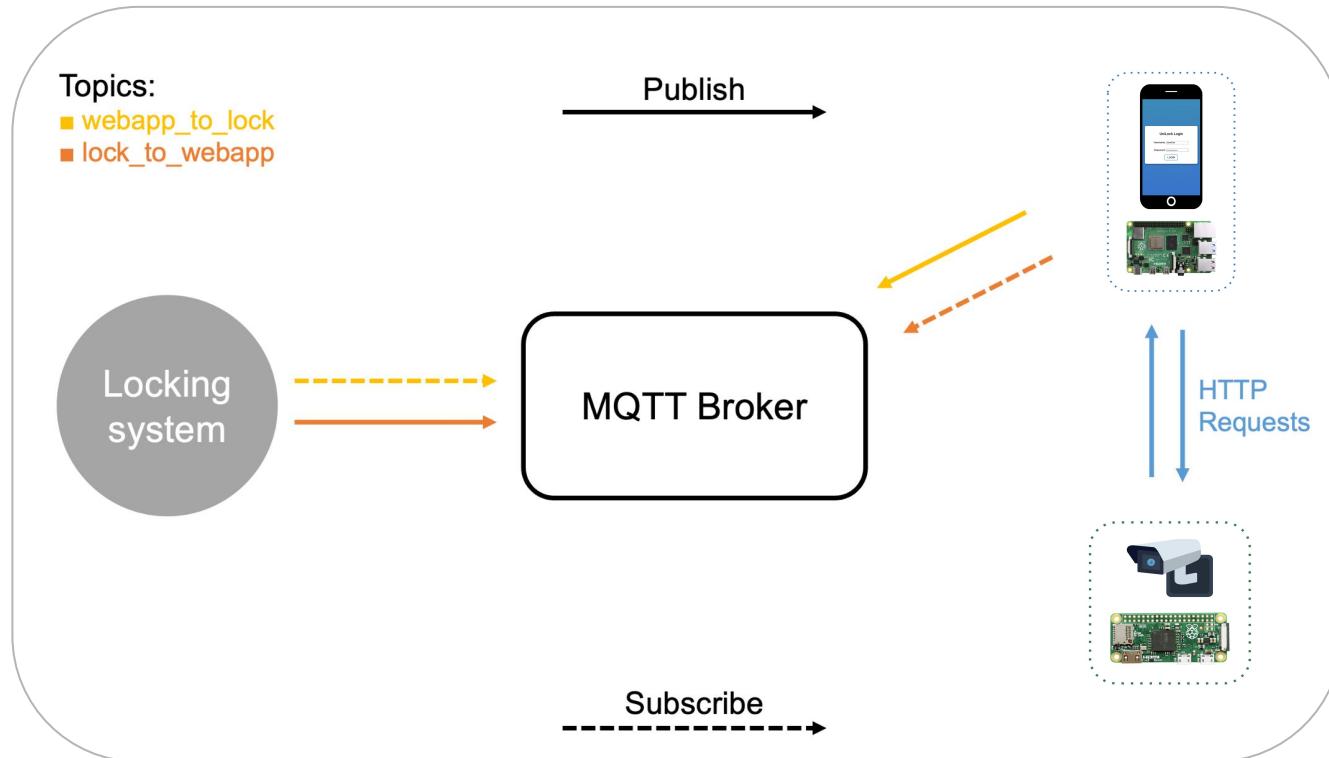
PROBLEM Broker fails to deliver scanned QR to web app for validation (Django vs MQTT)



HTTP Requests ↗

SOLUTION

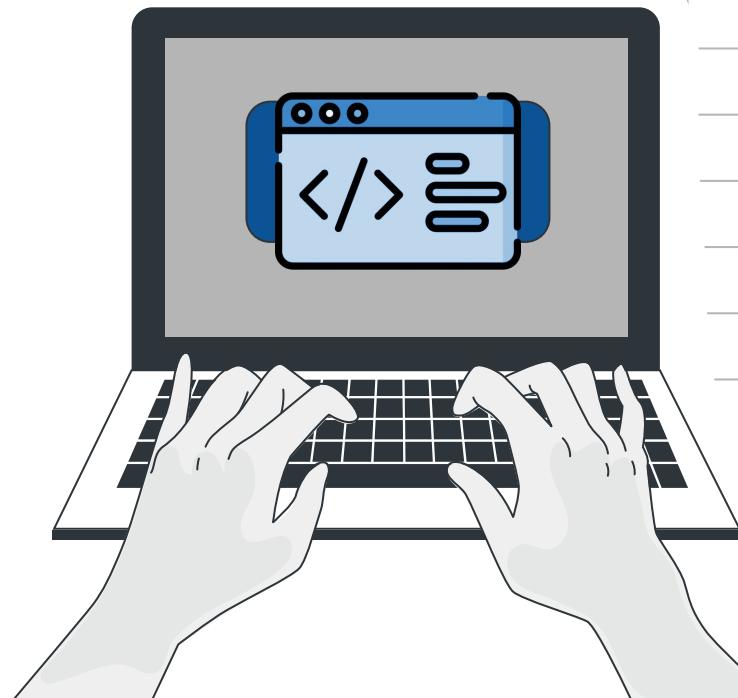
HTTP for internal communication

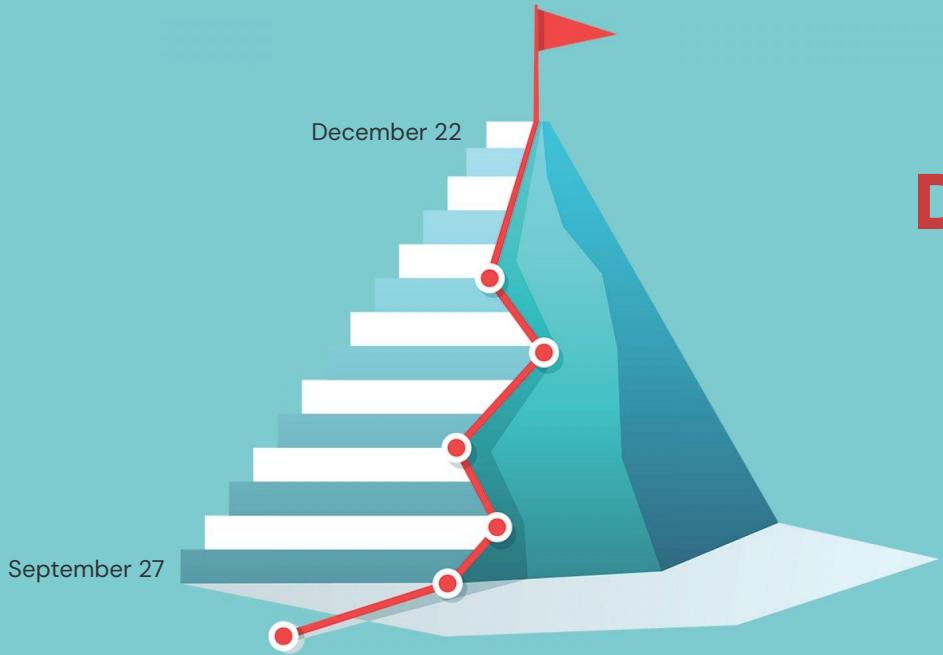


FINAL SETUP MQTT for external communication | HTTP for internal communication

05

Time Trade-offs





Main goal

Deliver a working system

Careful planning,
keeping the system easy,
specific design choices,
focusing on main components.

Very good for prototyping but...

Inside



Outside



Adjustable positioning and (limited) stability.

Case

over time

↗ Suction cup

- plastic flats out
- vacuum weaken
- cup's seal to the surface fail
- not stick to all surfaces

→ More permanent/fixed setup





Exposed SD card ↗

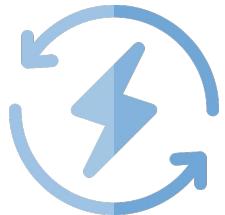
Easily removable while prototyping,
not meant for development.

→ SD card inside the case + lockable
with screws



Case

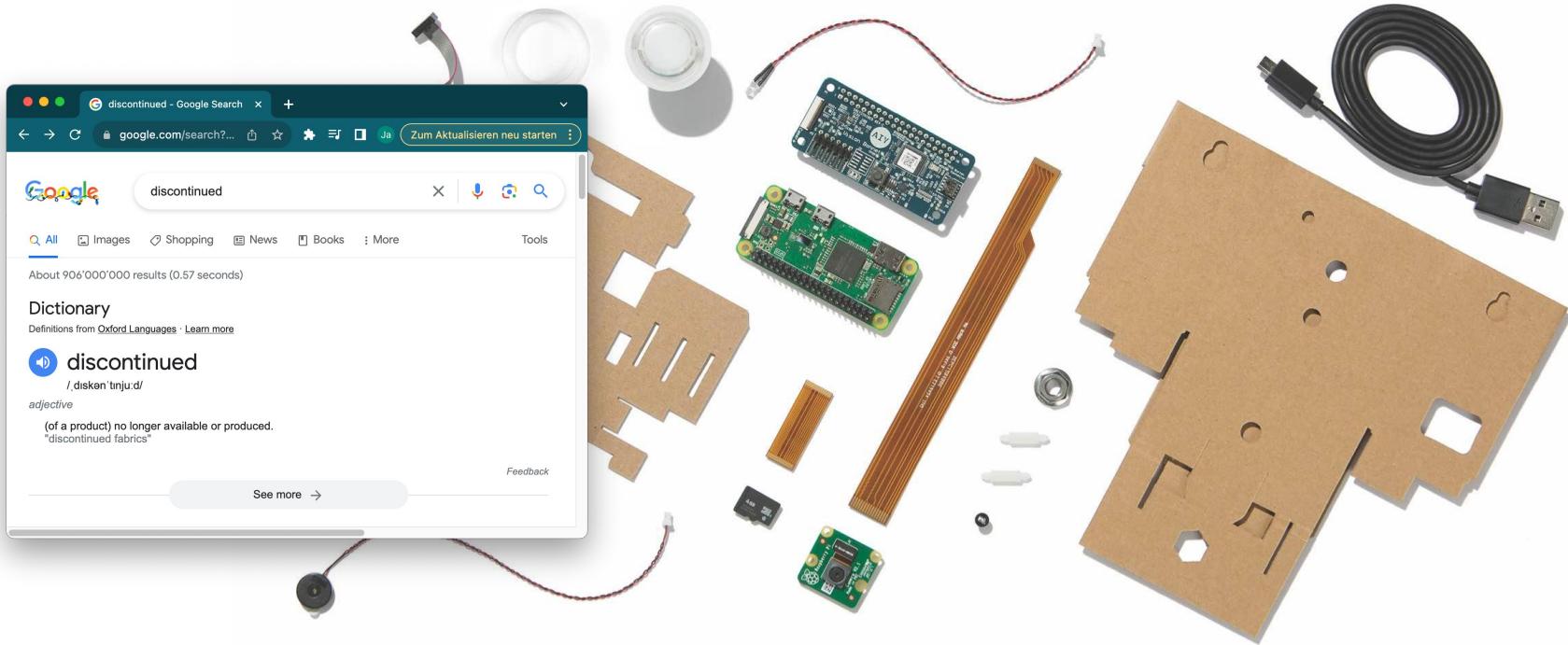
Power requirements



The battery is an additional cumbersome external component.

→ more compact case, attach to electricity

Case



Google AIY Vision Kit ↗

→ modest hardware needs: separate procurement and assembly of individual components.



The professor has permanent access.

The student has access only for the current semester.

The external collaborator has access only for the visit period.

Access valid until a specific date

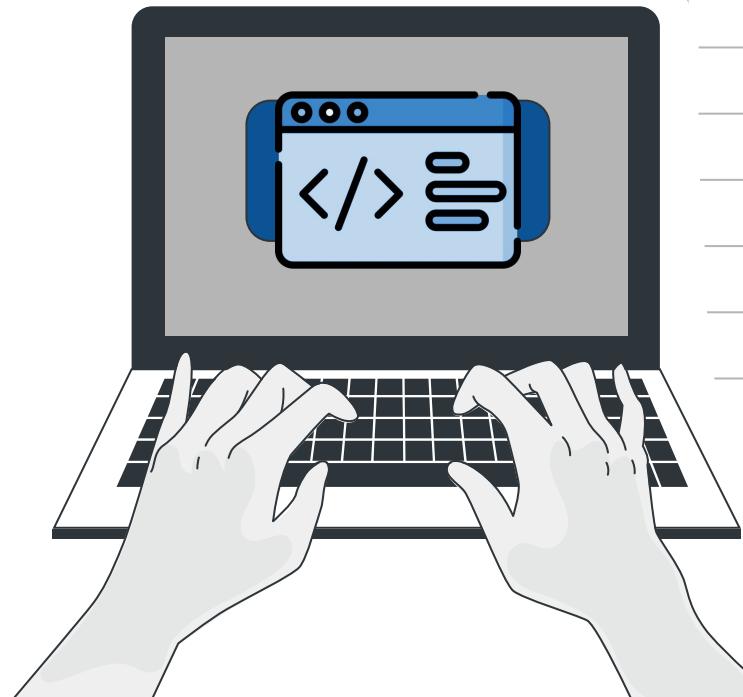


Analyze current situation directly from the admin panel.

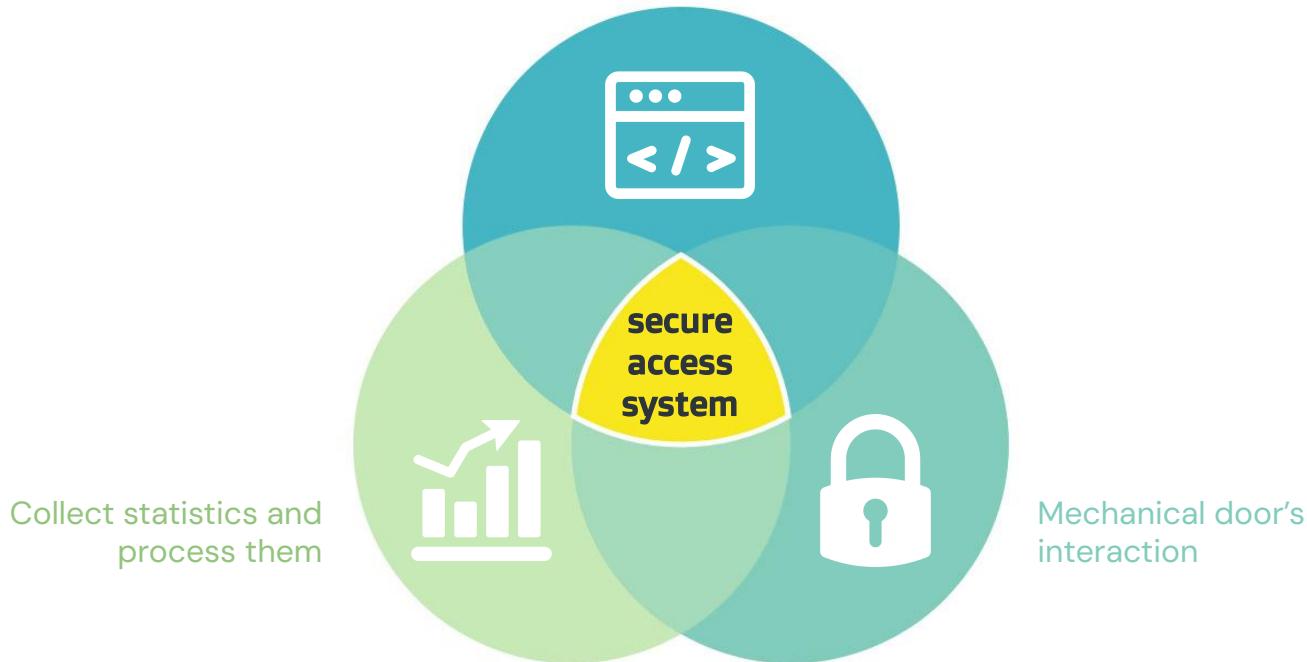
Include statistics in the web app

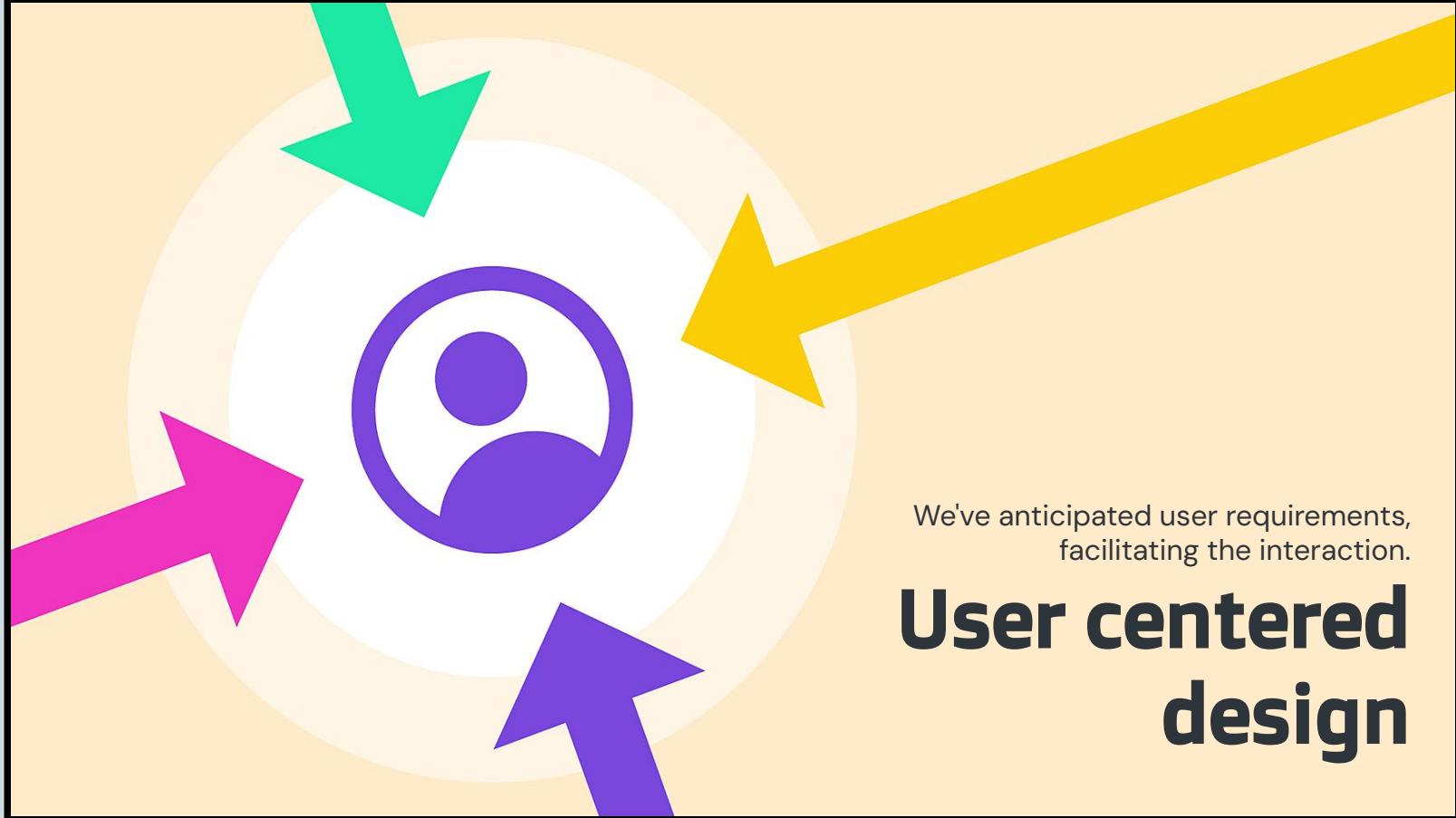
06

UniLock value



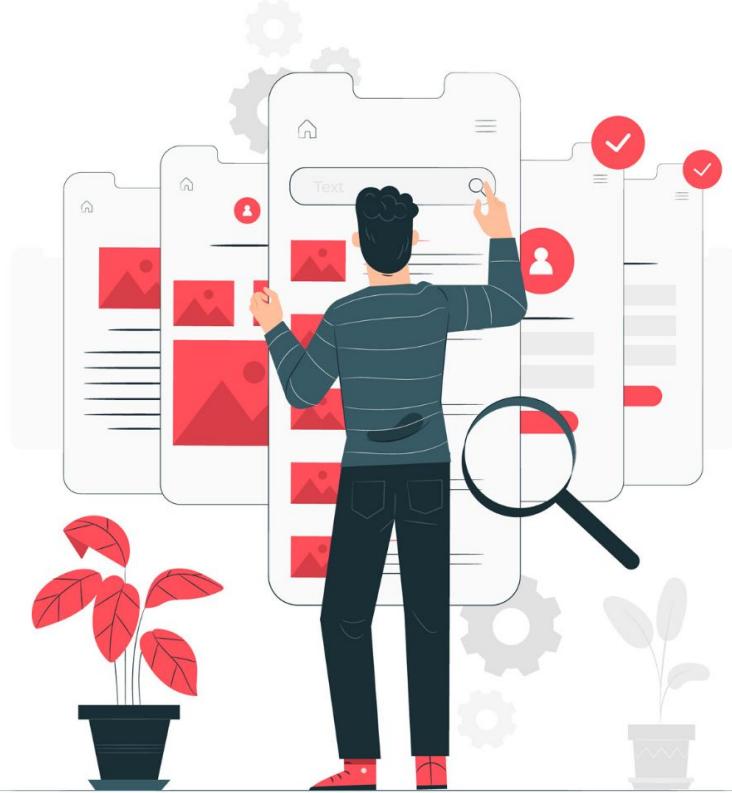
Facilitate user's workflow and interaction





We've anticipated user requirements,
facilitating the interaction.

User centered design



USABILITY

- easy-to-use for users
- easy-to-manage for administrators



Independent and potentially applicable in various environments.

Knowledge acquired

UniLock taught us the essence of **teamwork**, exploring
new tech, brainstorming **solutions**, embracing
experimentation and **learning from failures**.



Thanks

Do you have any questions?

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