open200

Seven years with Axon Framework

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Java User Group Vienna

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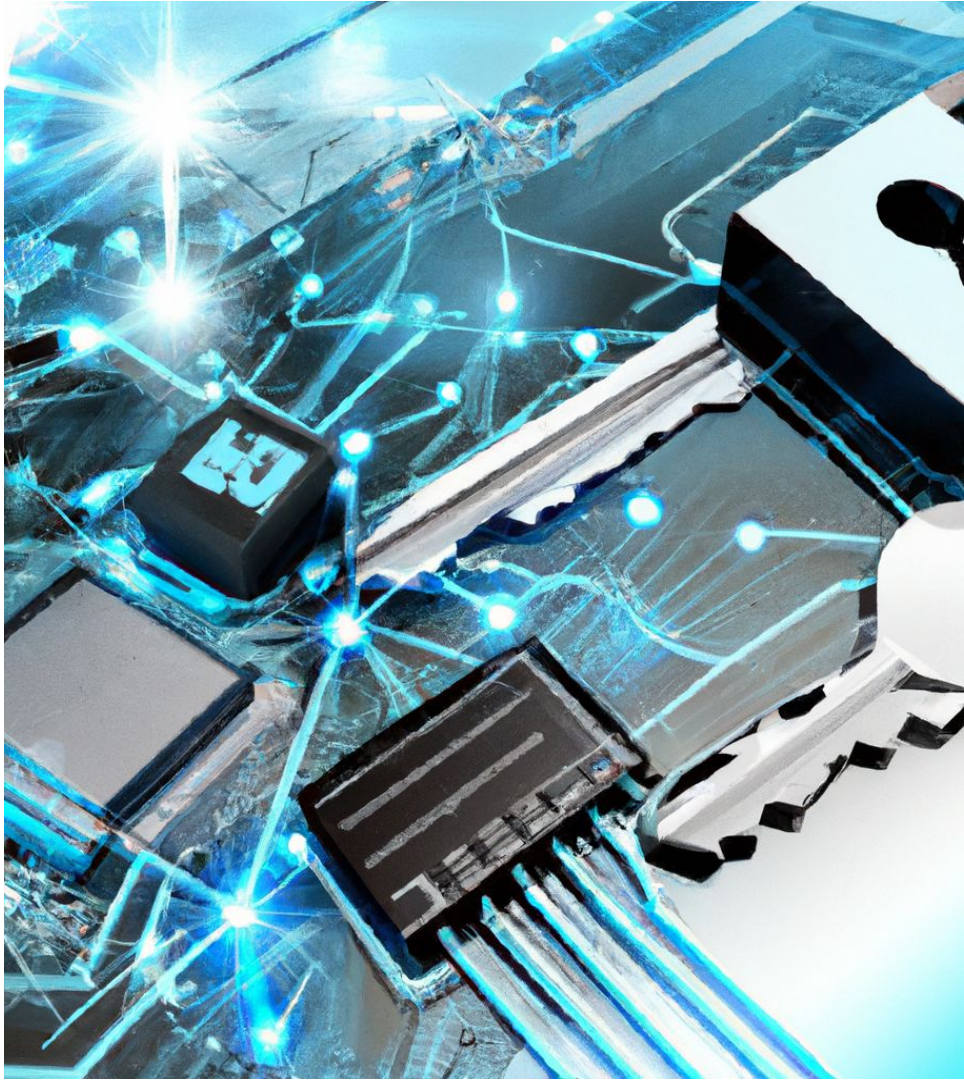
Our MISSION

CREATE A NEXT GENERATION ELECTRONIC LOCKING SYSTEM!



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We cannot design the solution until we understand the SYSTEM

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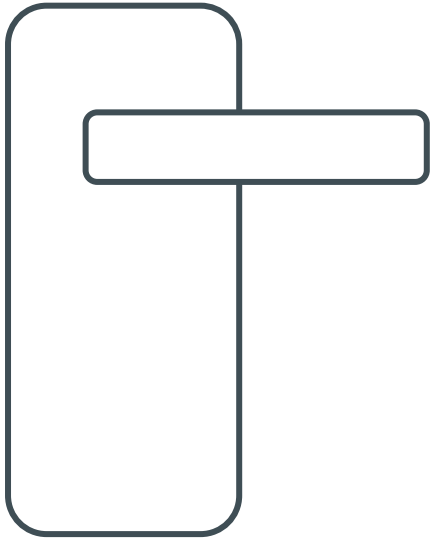
Let's start very SIMPLE



Lock

Keycard

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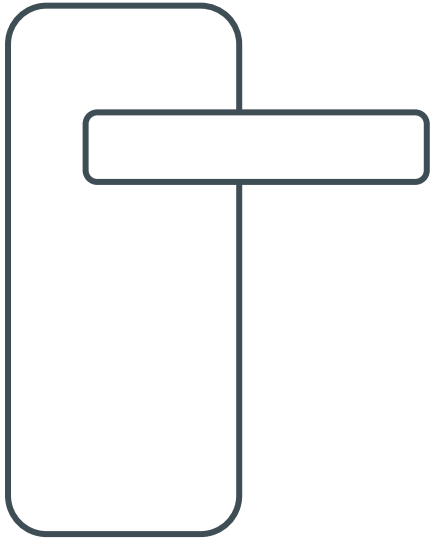
Let's start very SIMPLE



Firmware for NFC, config, storage, motor control, sensors, state management, and more

Contains NFC Interface
Some kB data store

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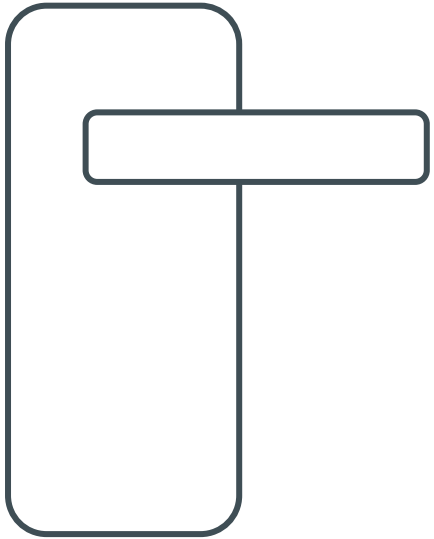
Let's start very SIMPLE



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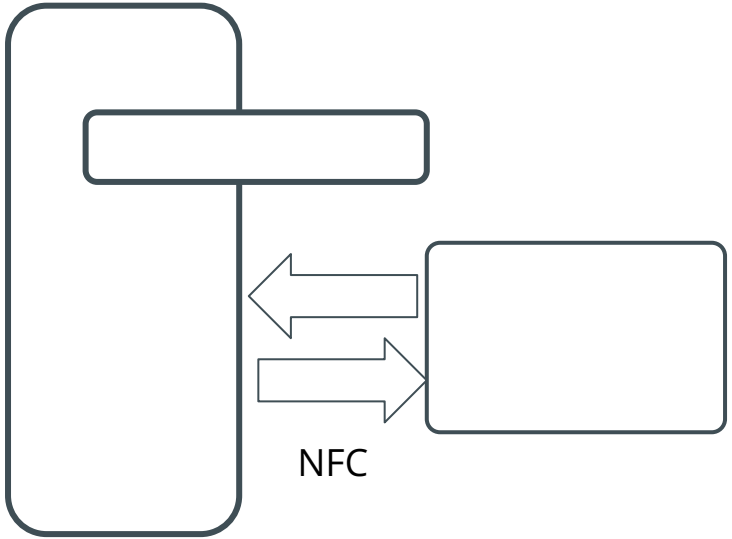

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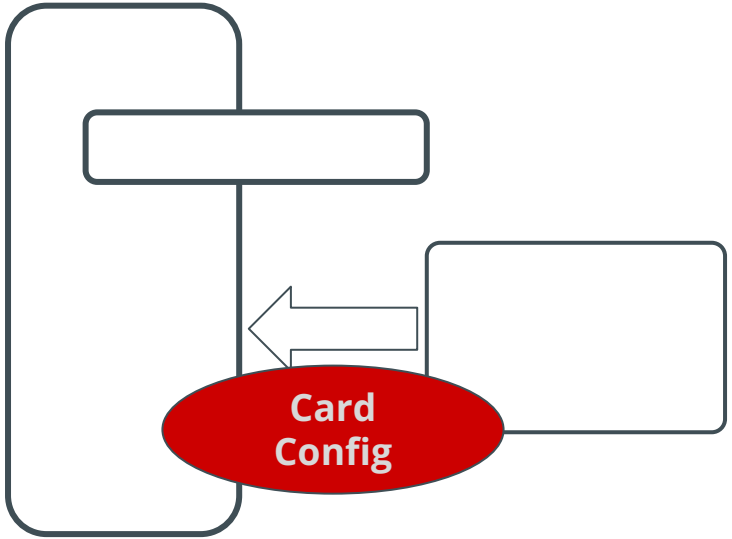

Read data from card

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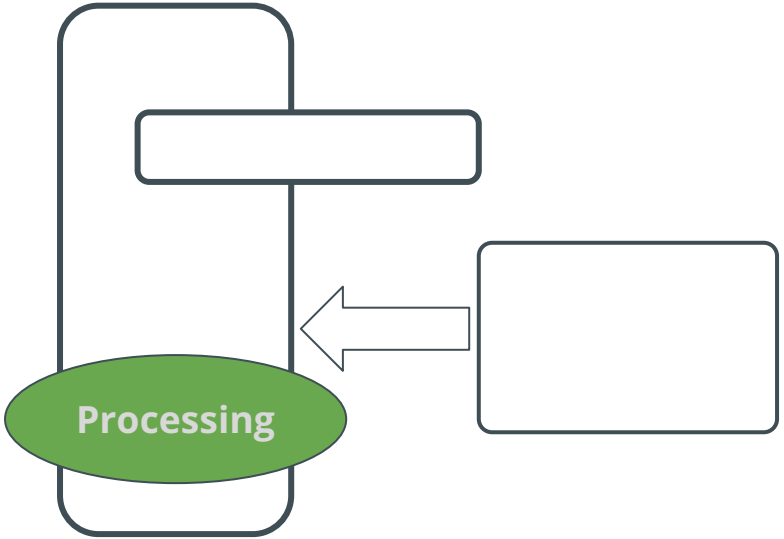
Let's start very SIMPLE



Check permissions
Update config
Open lock or not and signal result

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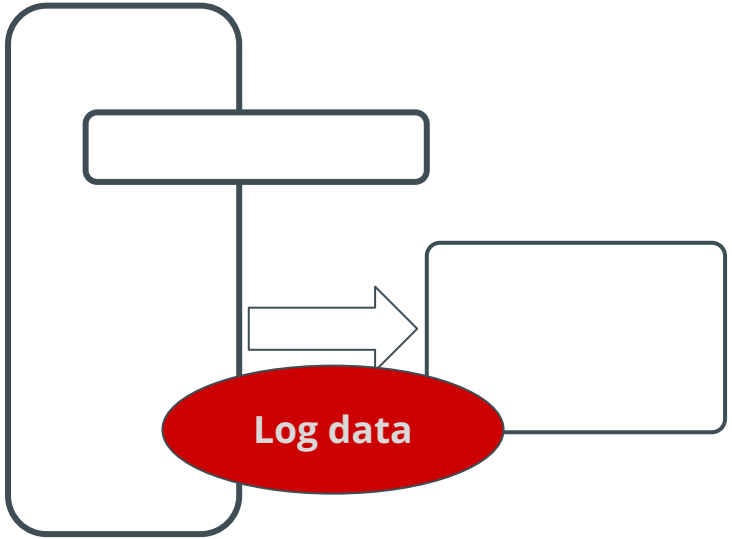
Let's start very SIMPLE



Write data to the card

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Basic CHALLENGES

We have very limited computing power on the edge devices

We have very limited space on the keycards (only a few kB)

We have very limited space on the device (only a few more kB)

Devices are battery powered - every CPU cycle counts!

We need to be fast: <250 ms worst case for the whole process

And we don't know where the config comes from (and the log files go to)

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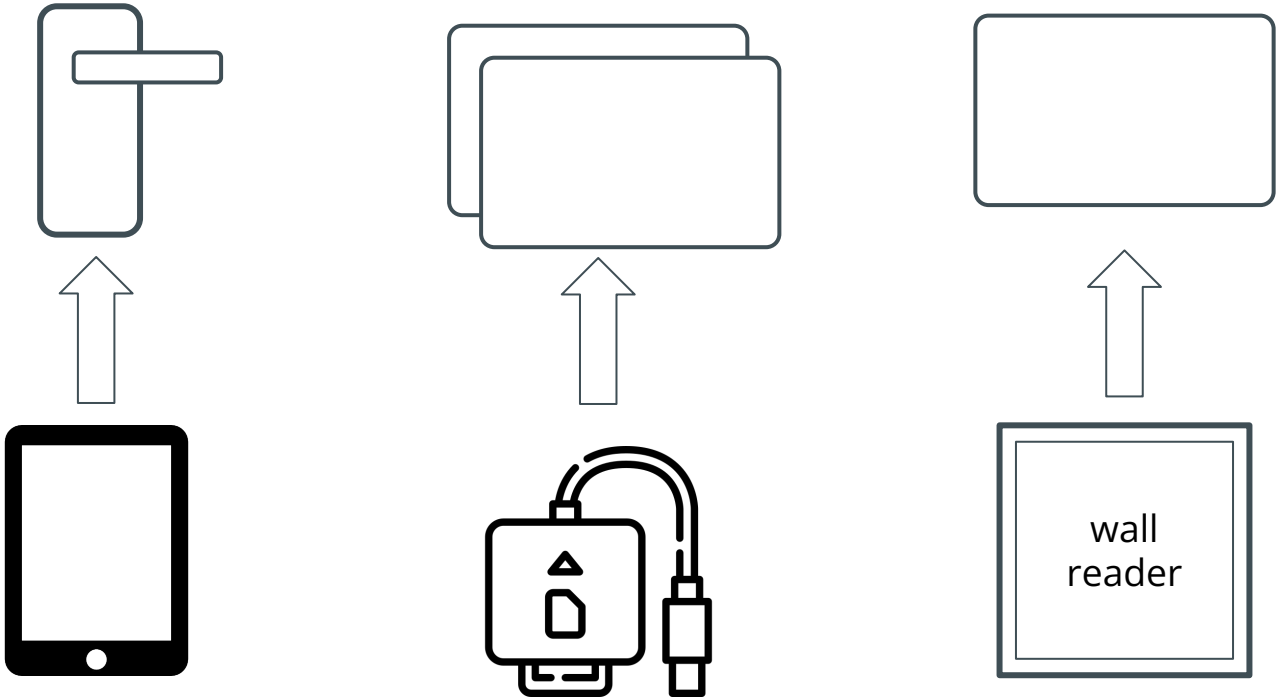
Where to get the CONFIG?



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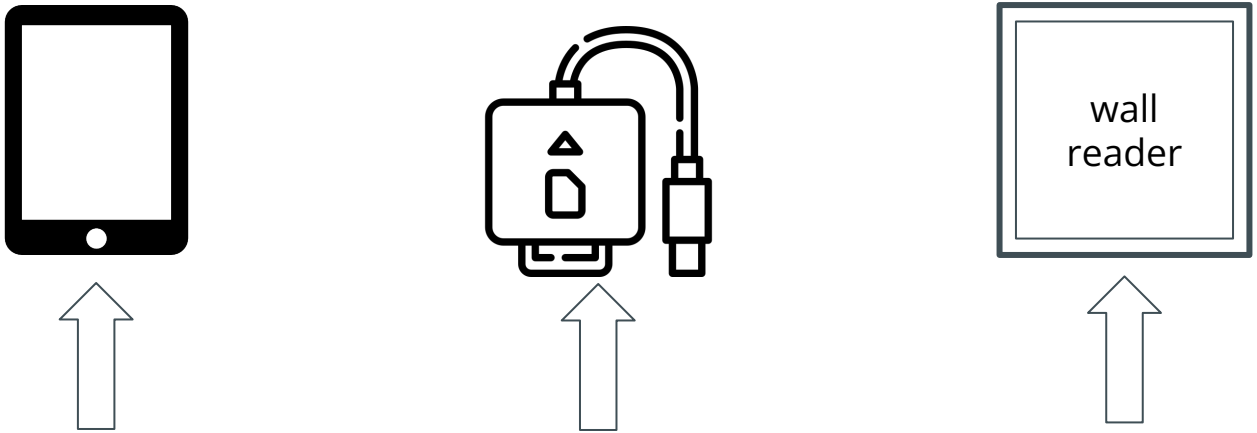

Our provisioning and controlling software

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One software to rule them ALL

Manage people

Manage all devices and keycards

Manage all the permissions

Visualize the system state

Prepare all config for all devices

Integrate 3rd parties via API's

Handle all the events in the system

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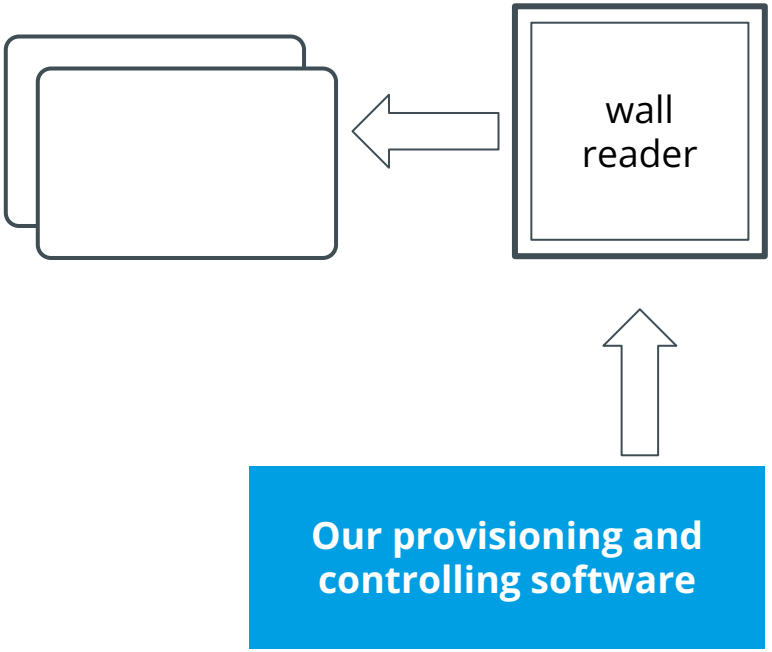
So let's SCALE UP



About 50 key cards

Wall reader is online connected with control software

Still need to write card data < 250 ms !!

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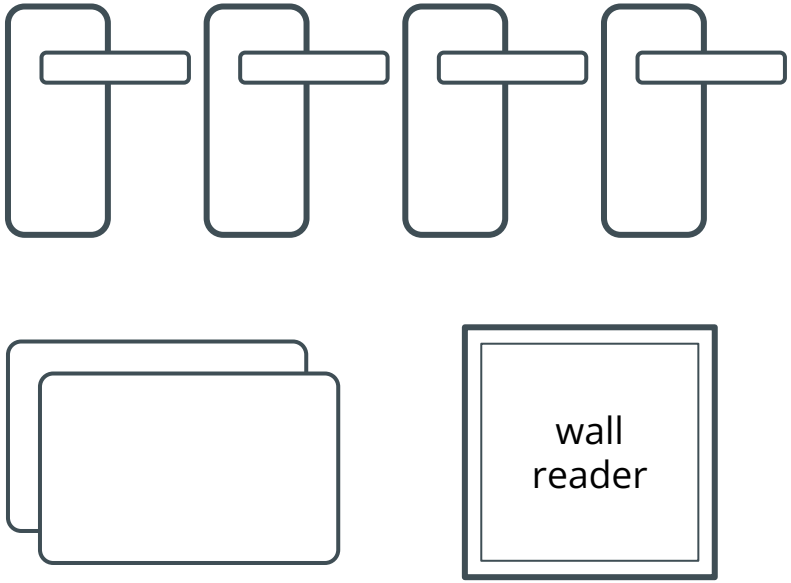
So let's SCALE UP



Now we add 2 wall reader

Not really hard yet...

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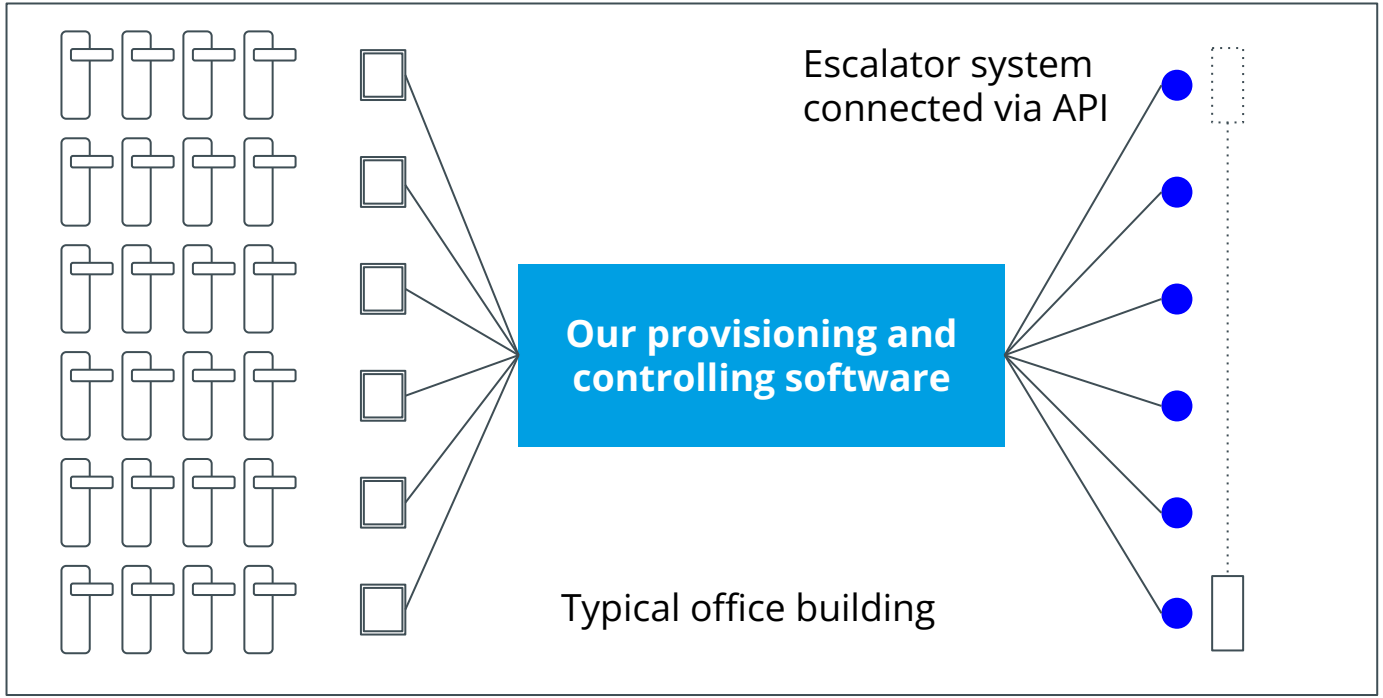
So let's SCALE UP



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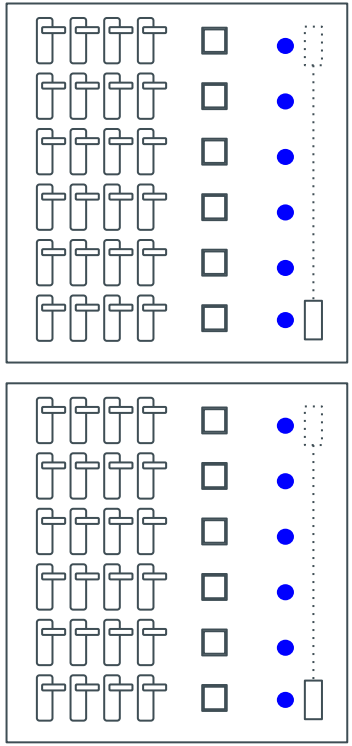
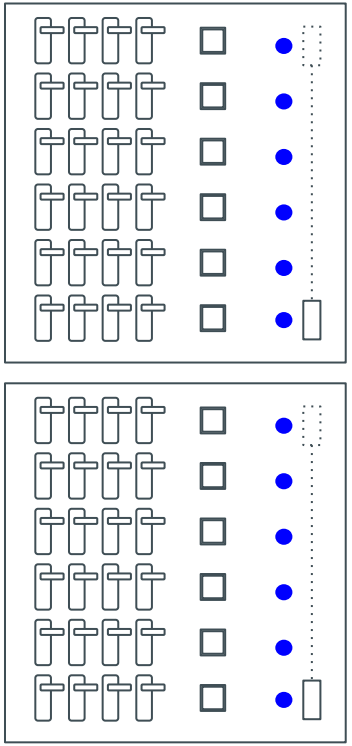


Our provisioning and controlling software



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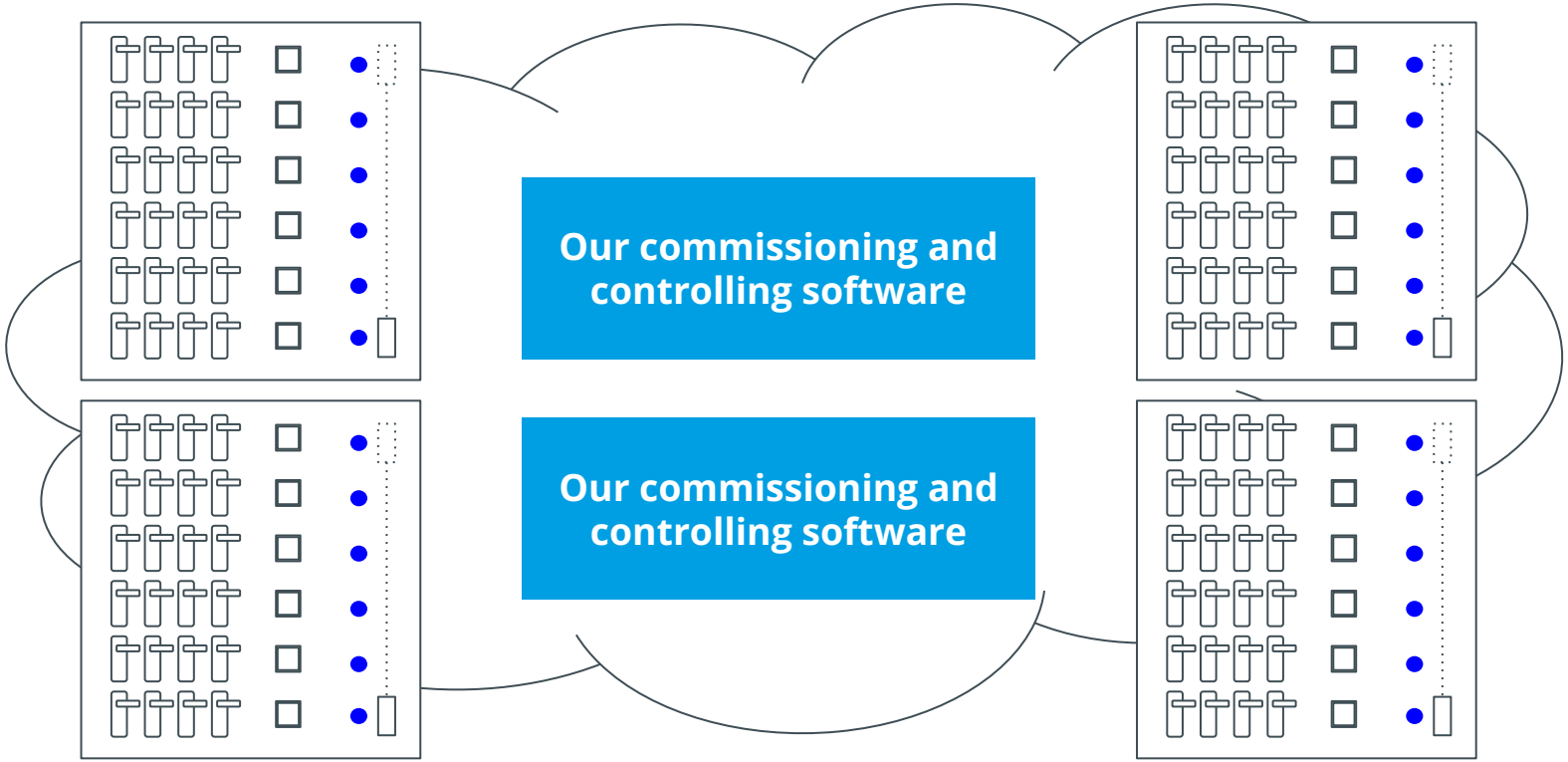

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The real CHALLENGE

React within milliseconds on keycard presentation

Smartcards ARE the network for offline components

Blacklists must be distributed as fast as possible

We need to derive security state with incomplete informations

With each fact we get to know we need to update the state of the system

Time traveling - why person x was or was not able to open the door y at time z

Support 50.000 keycards, 1.000s of devices

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Our SOLUTION - let the events flow

During system design we started to talk about events and think in events

We decided to use an event driven design!

We need to write events (fast)

We need to prepare small config data foreach smart card and lock (async)

We have many different views for monitoring and configuration for facilitators

So we drafted our software architecture…

Our natural fit - EVENT SOURCING

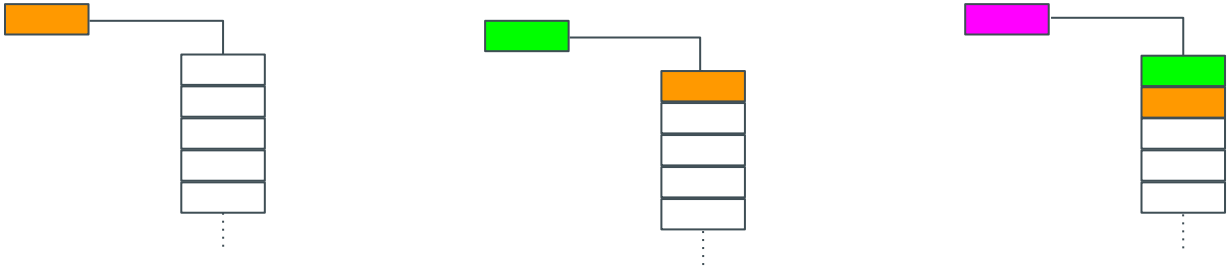
A design pattern to store data (events) in an append only log

Storage can be highly optimized for writing

System state is evaluated by applying logic depending on occurred events

But of course we need to access our data to be useful

Event sourcing alone is missing something...



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But we need to read data too - CQRS

We need to read the configuration for 1.000s of devices (fast)

We need to visualize huge amounts of data

We need to read the data for 10.000s of key cards (fast)

So we need a technique to prepare data for reading

CQRS to the rescue

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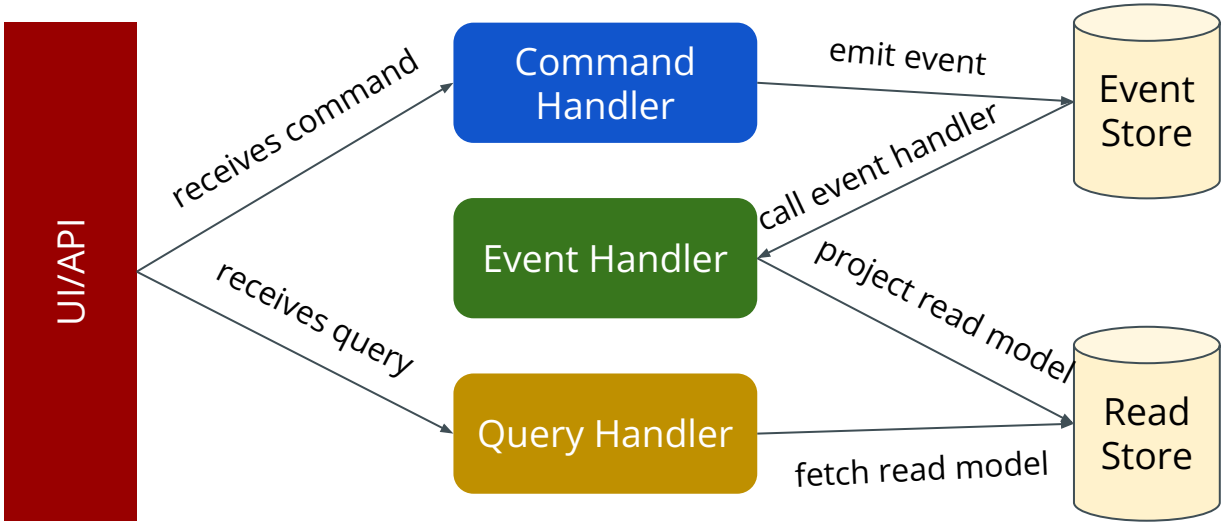
(Just if you are new to CQRS PATTERN)



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The search for a framework to fit

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Hello AXON Framework!

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AXON Framework

Based on DDD principles

CQRS/ES

Event-Driven

Java/Kotlin

Spring Boot

Flexible event stores: Axon Server, relational DB, Mongo, ...

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What we've LEARNED

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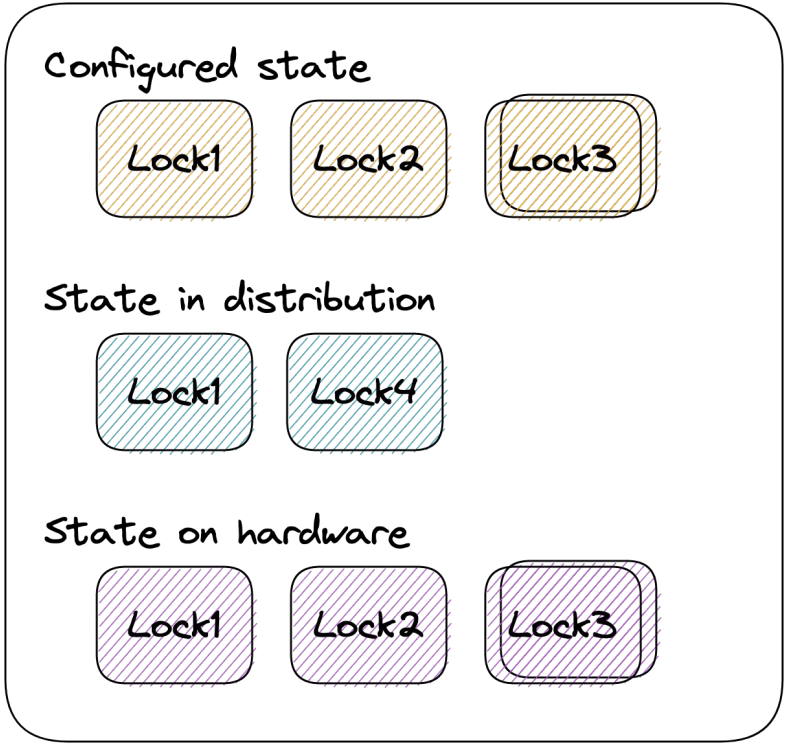
Event Sourcing



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Gaps in theory and practice

Steep learning curve

Source of truth is a series of events

Eventual Consistency is challenging

Many things to trip over

Frameworks help, e.g. Axon Framework, ...

Online documentation, Axon Academy, examples, ...

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Domain Driven Design is a good fit

Event Modeling & Event Storming

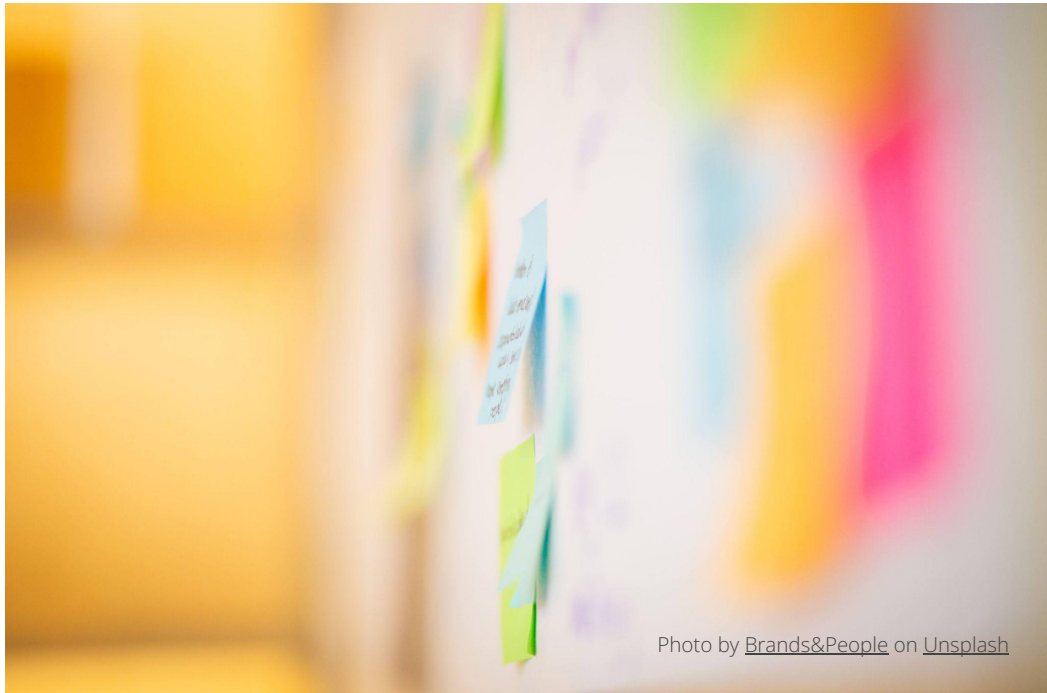

Photo by Brands&People on Unsplash

Is it fast by default?

Optimized fetching

Snapshots on Write-side

Optimize your model

More ways to scale up:

- ***location transparency***
- ***multiple read models, ...***

Things we TRIPPED over

Eventual consistency

Technical events

Unnecessary sagas / business processes

Aggregates with dependencies

Set-based consistency validation (e.g. enforcing unique names)

https://developer.axoniq.io/w/set-based-consistency-validation

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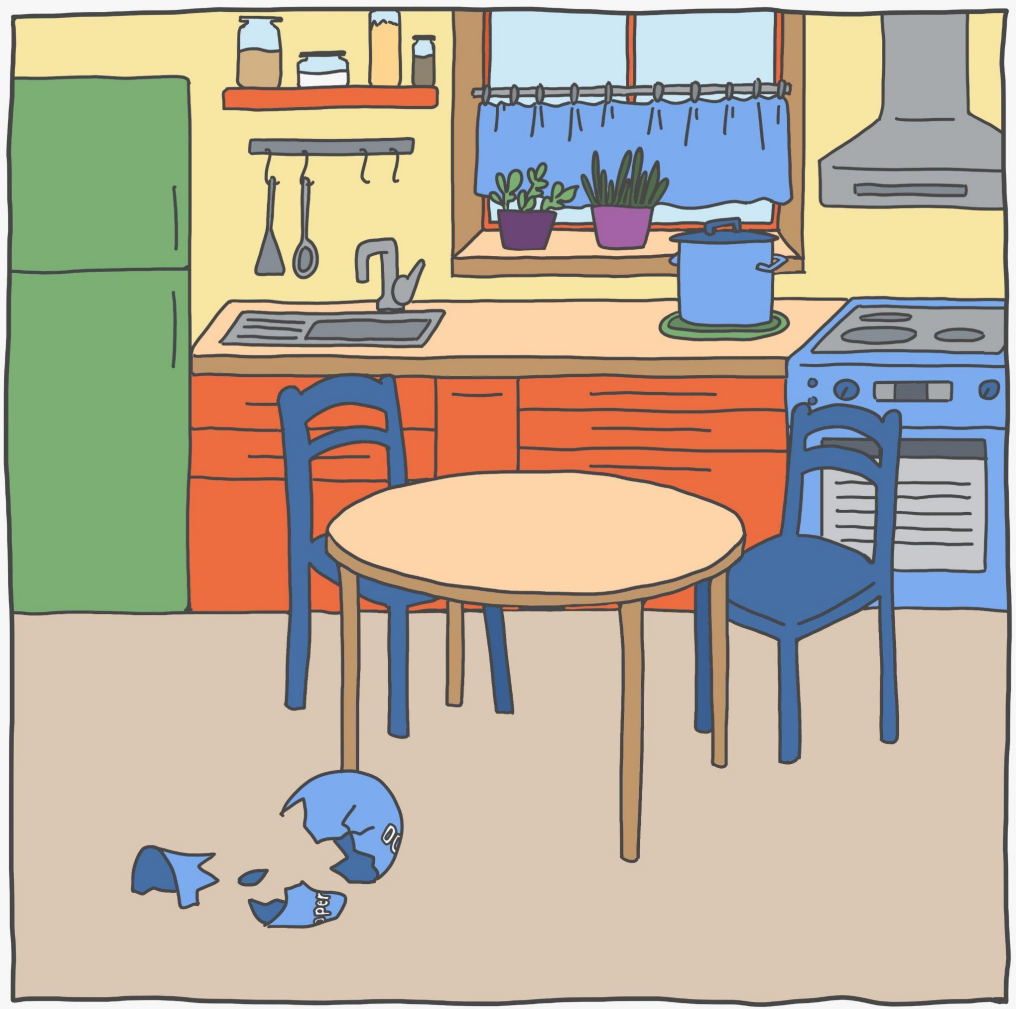
Where it SHINED

Photo by Shai Pal on Unsplash



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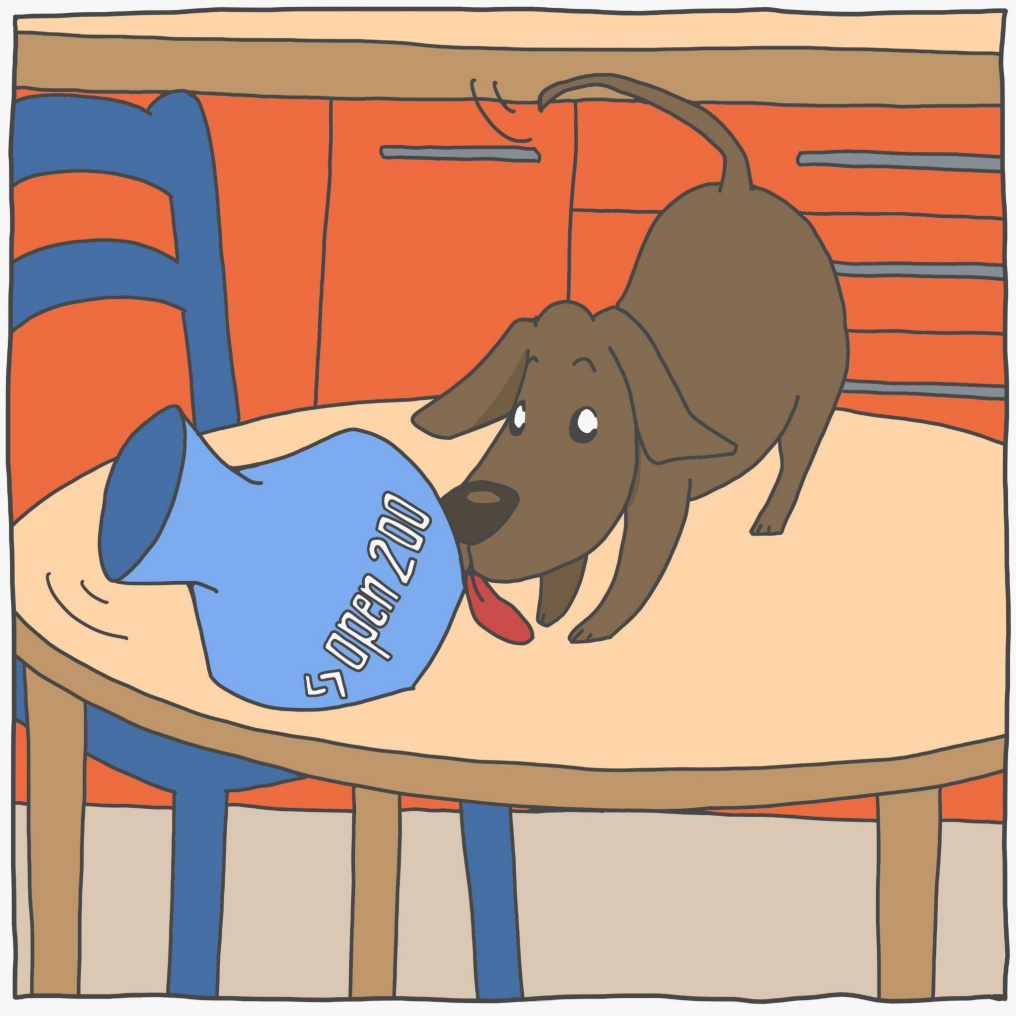

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something happened at a customer instance...

they want to know why the application behaved in a certain way

SUMMARY

Don’t reinvent the wheel - use a well know and maintained framework

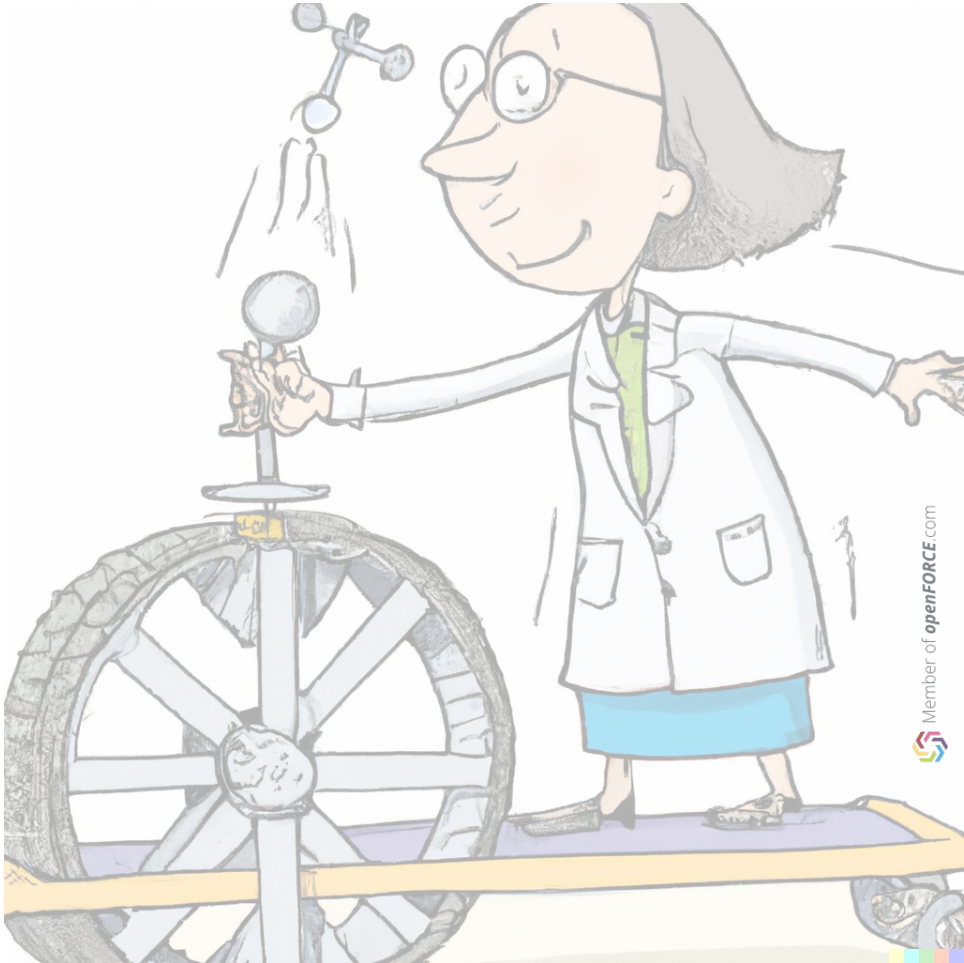
Talk to domain experts and read the blue book

Mind your domain model, focus on aggregate and simple models

Decouple your external API from internal structure

Be aware of eventual consistency

Remove CRUD from your mindset



Questions
Answers

Where to find us

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Andreas Grill

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