MyConsumption

Design of a mobile application for real-time energy consumption monitoring

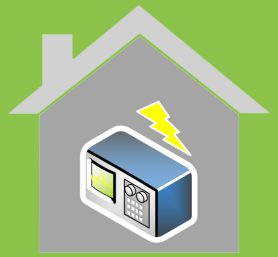
Master thesis | Thibaud Ledent | June 2015
Computer Science and Engineering

1.

PROBLEM DESCRIPTION

Mobile application for real-time energy consumption monitoring

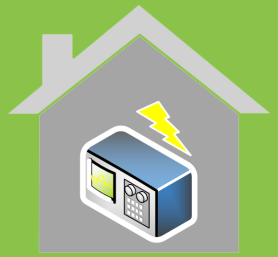
3 MAIN ACTORS



- Existing device
- Records consumption of energy
- Accessible from a central system

SMART METER

3 MAIN ACTORS



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- Synchronization
- Distribution
- Backup

of energy consumption data

BACK END

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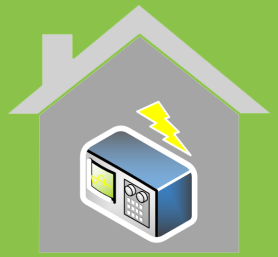

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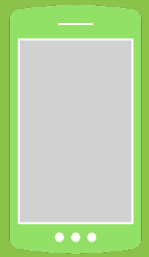
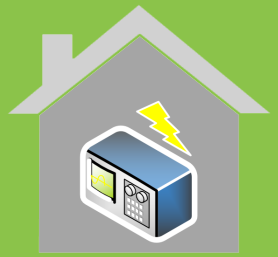


- Retrieve consumption data and information
- Display
- Solutions to use cases

FRONT END

3 MAIN ACTORS

COMPLETELY OPEN SOURCE



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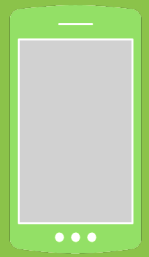

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FRONT END

3 MAIN ACTORS

2.

CONTEXT

MEASURING ENERGY CONSUMPTION IS THE FIRST STEP TO DECREASE IT

Mobile computing

Mobile devices bring new game-changing challenges

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Internet of things

Transfer data over a network without human interaction

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Mobile computing

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Transfer data over a network without human interaction

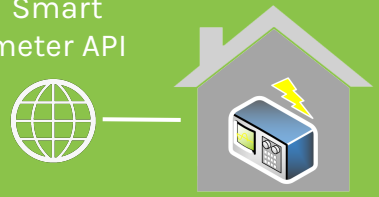
Efficiency measures

Measures where intelligent monitoring is an essential asset

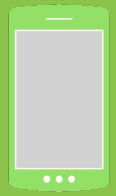
3.

DESIGN & IMPLEMENTATION

Smart
meter API



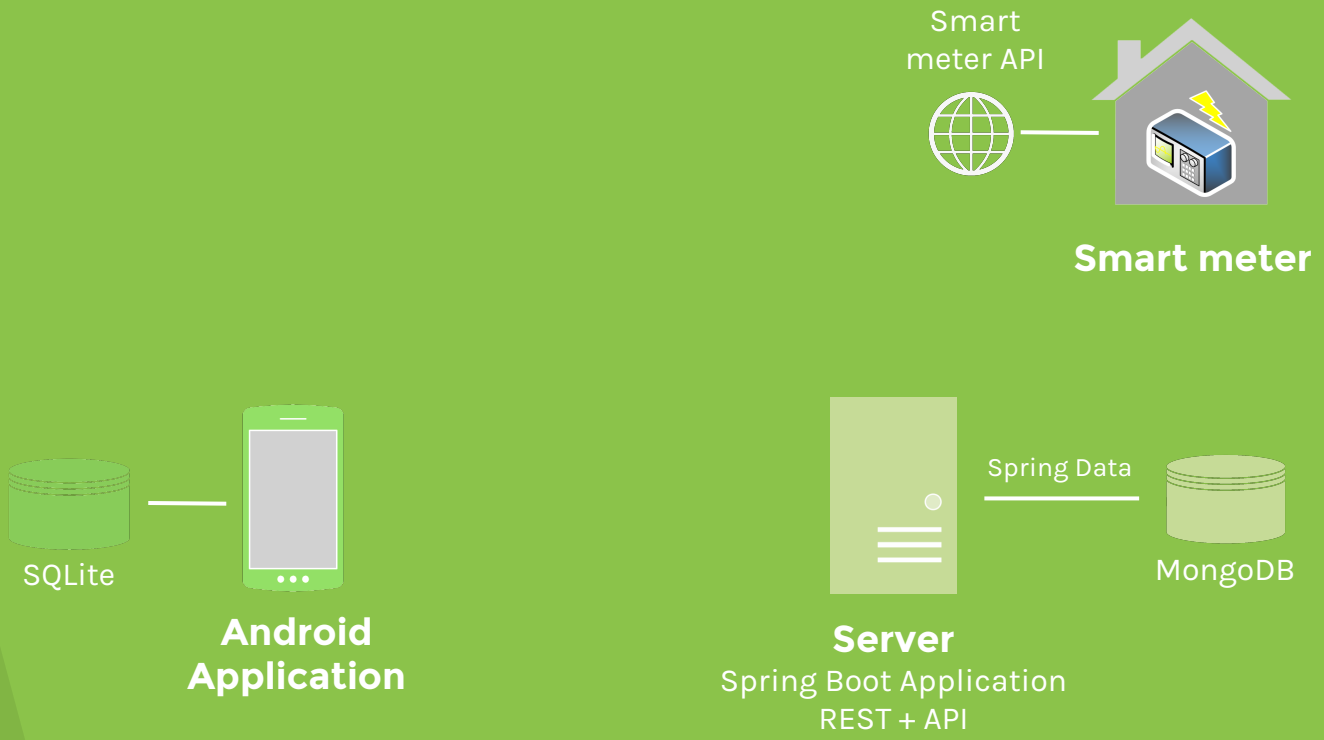
Smart meter



Android Application

Server
Spring Boot Application
REST + API

DESIGN: OVERVIEW



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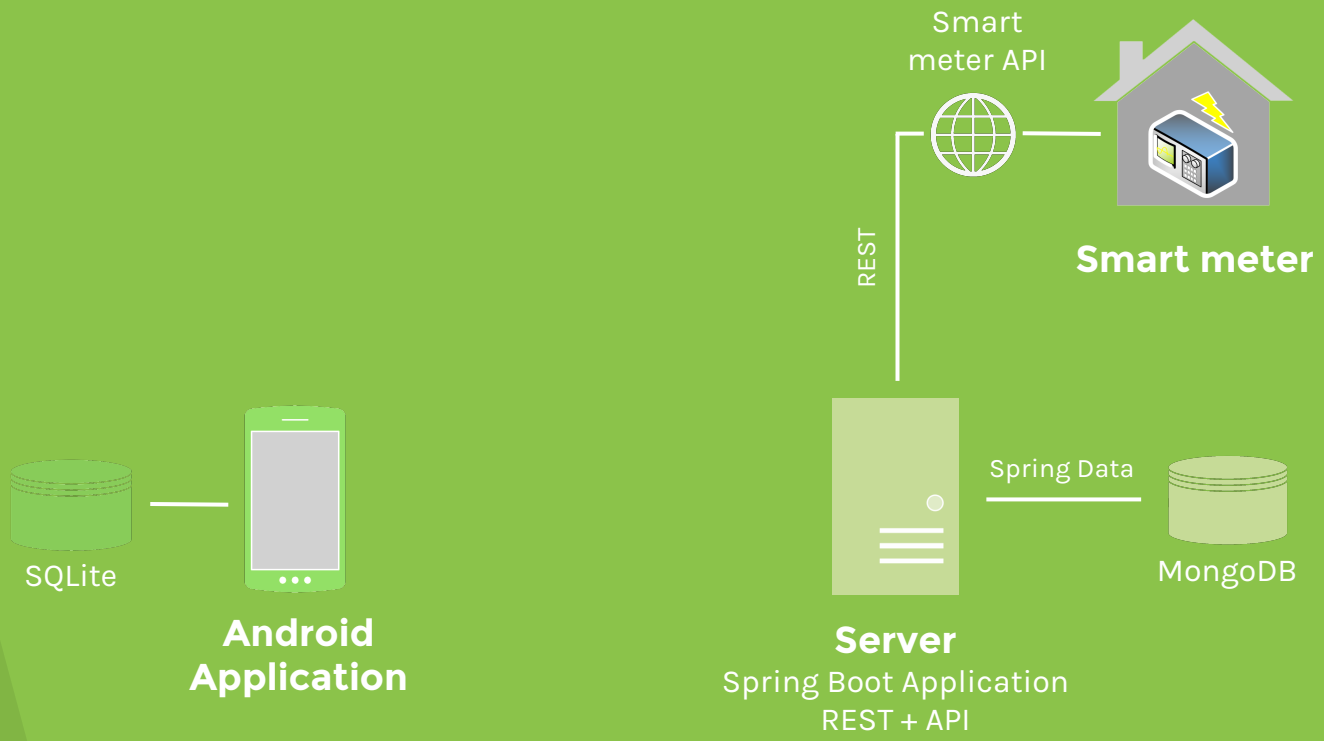

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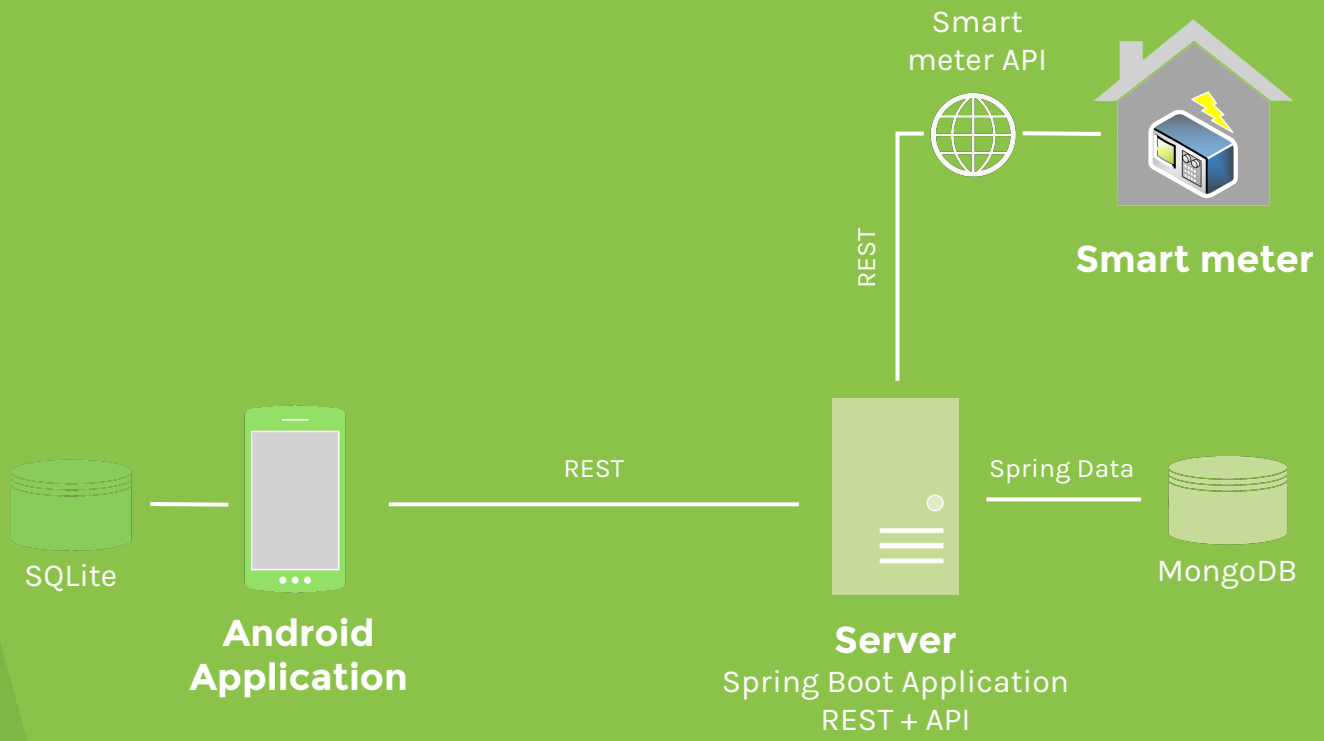

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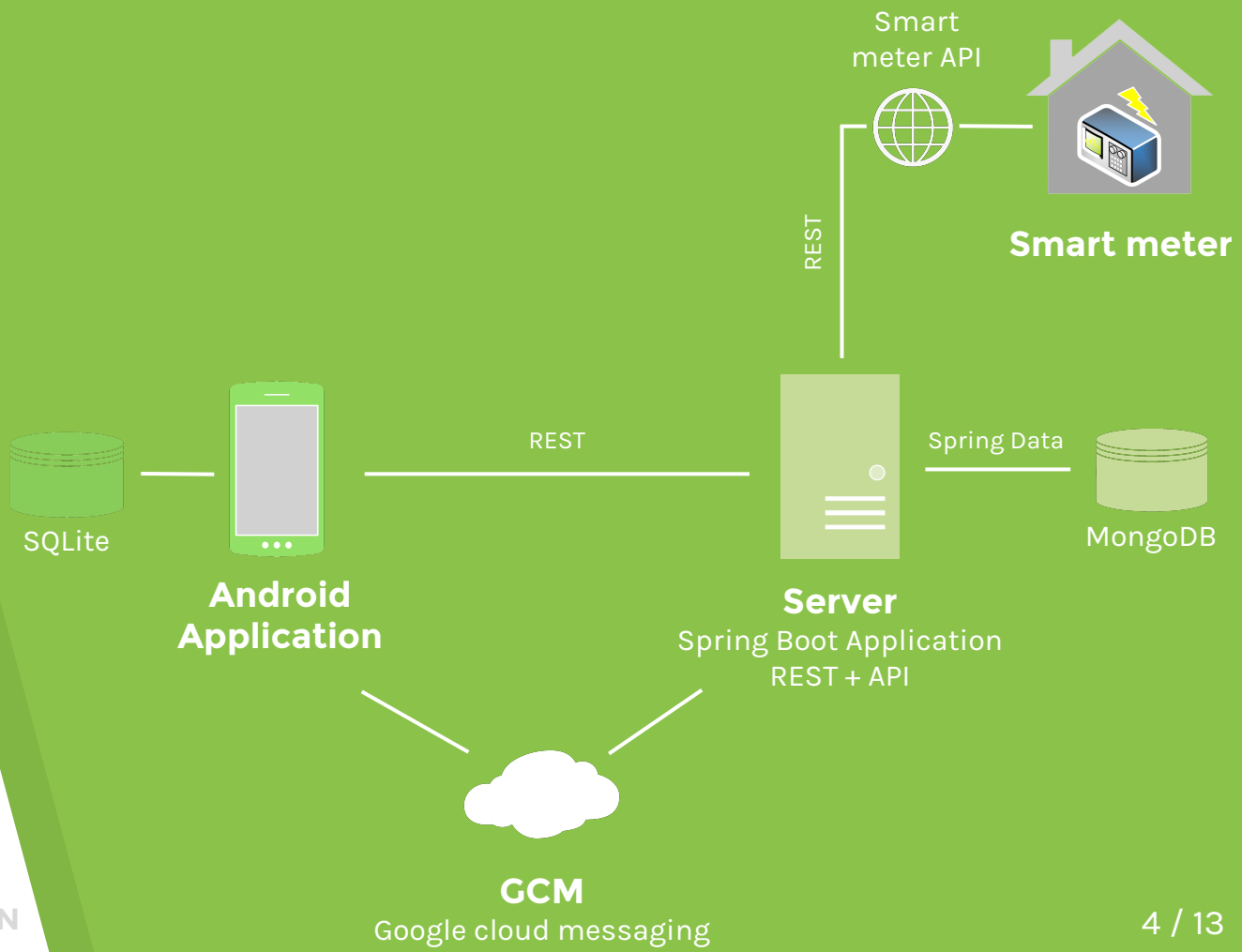

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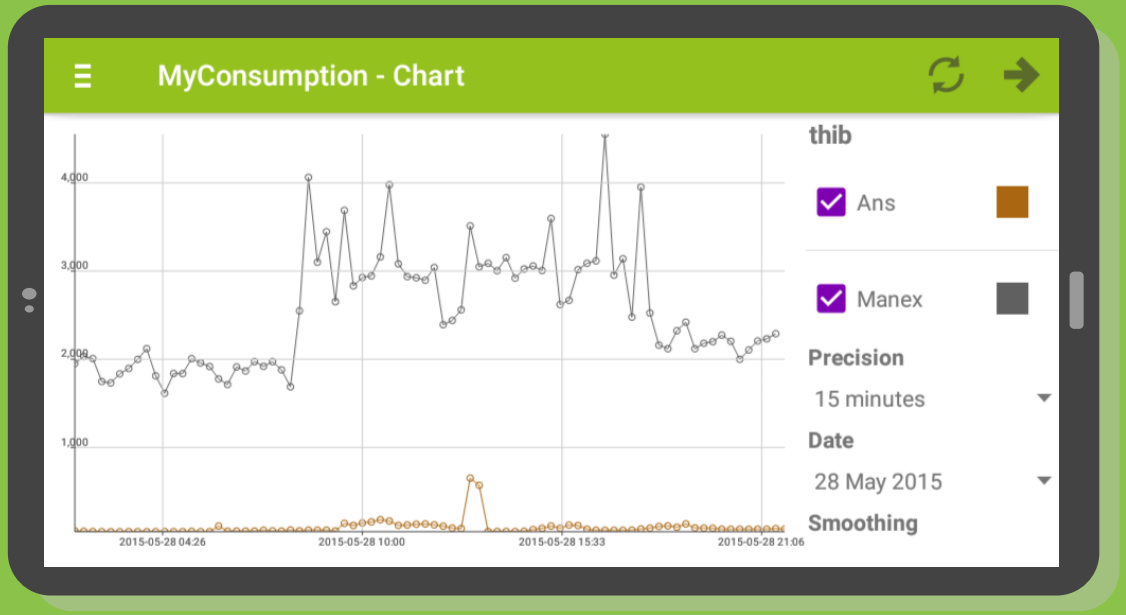
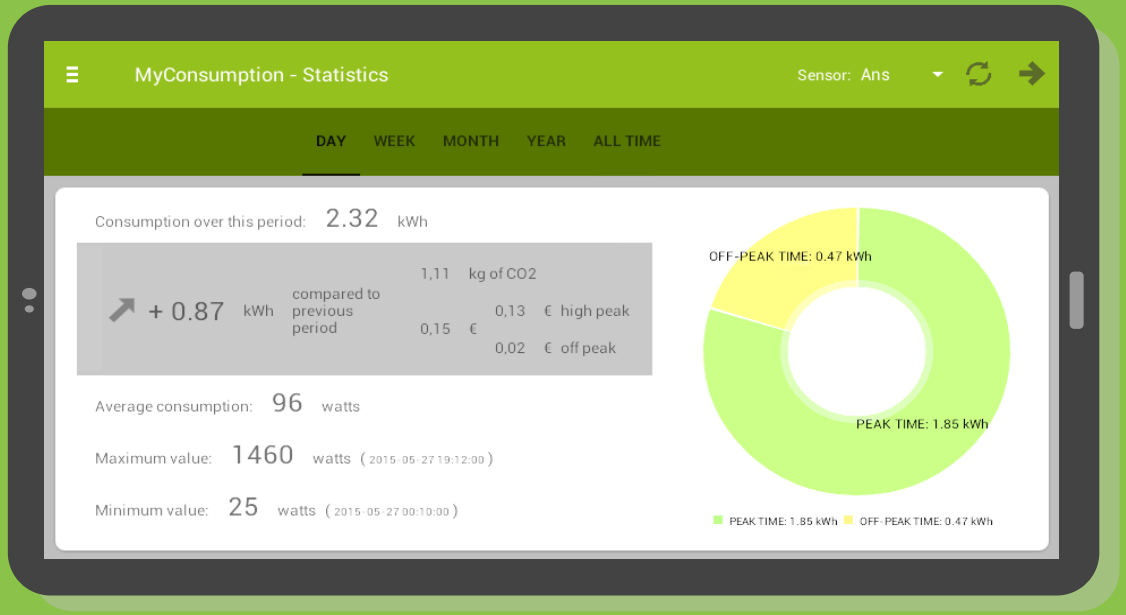


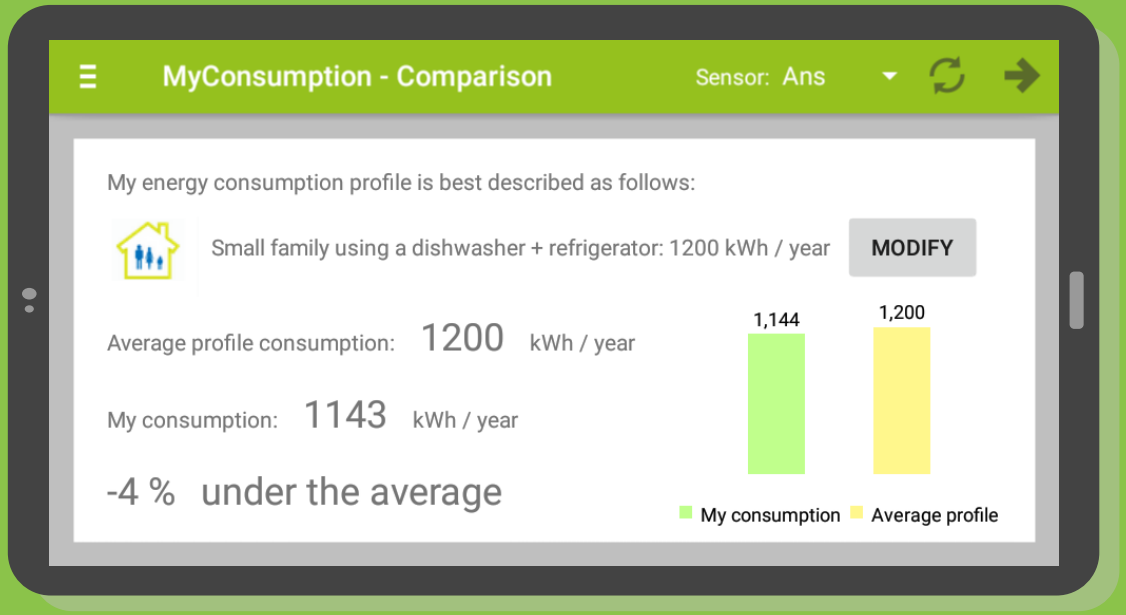
DESIGN:
FEATURES

Line chart of the consumption



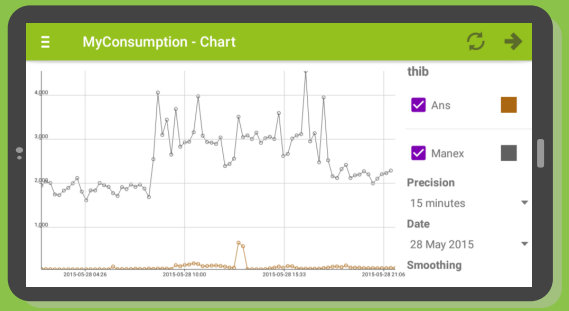
DESIGN:
FEATURES

Statistics screen



DESIGN:
FEATURES

Profile comparison



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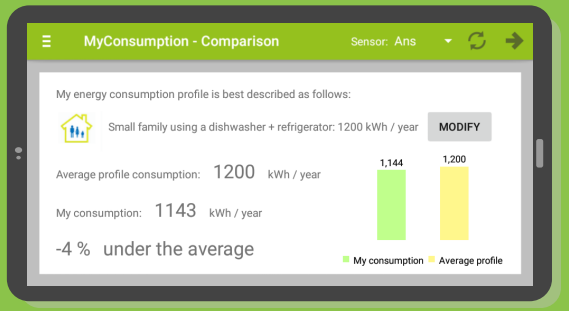

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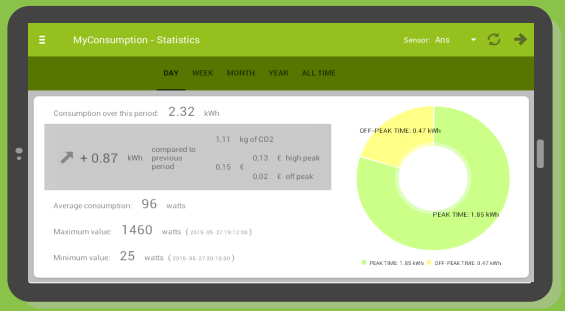


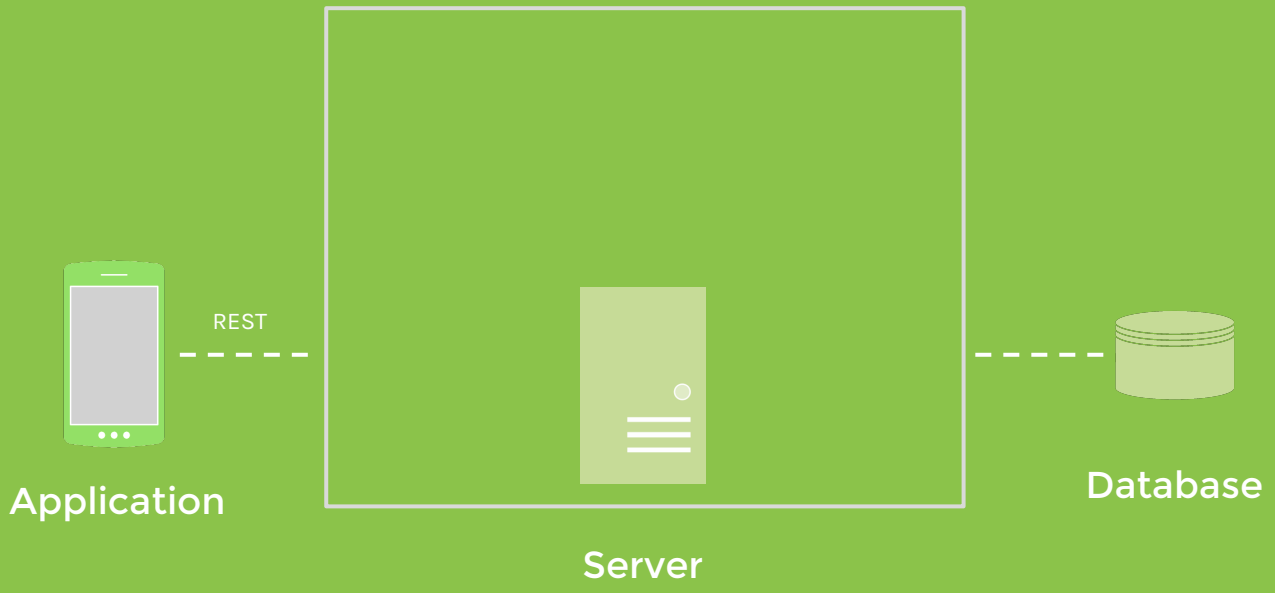
Statistics screen

Other features

- User management
- Add/delete sensors
- Off-line sync
- Notifications
- Preferences
- ...

DESIGN: FEATURES

MAIN ARCHITECTURE OF THE SERVER



IMPLEMENTATION: BACK END

Example: GET request `http://myconsumption.s23y.com/users/thib`

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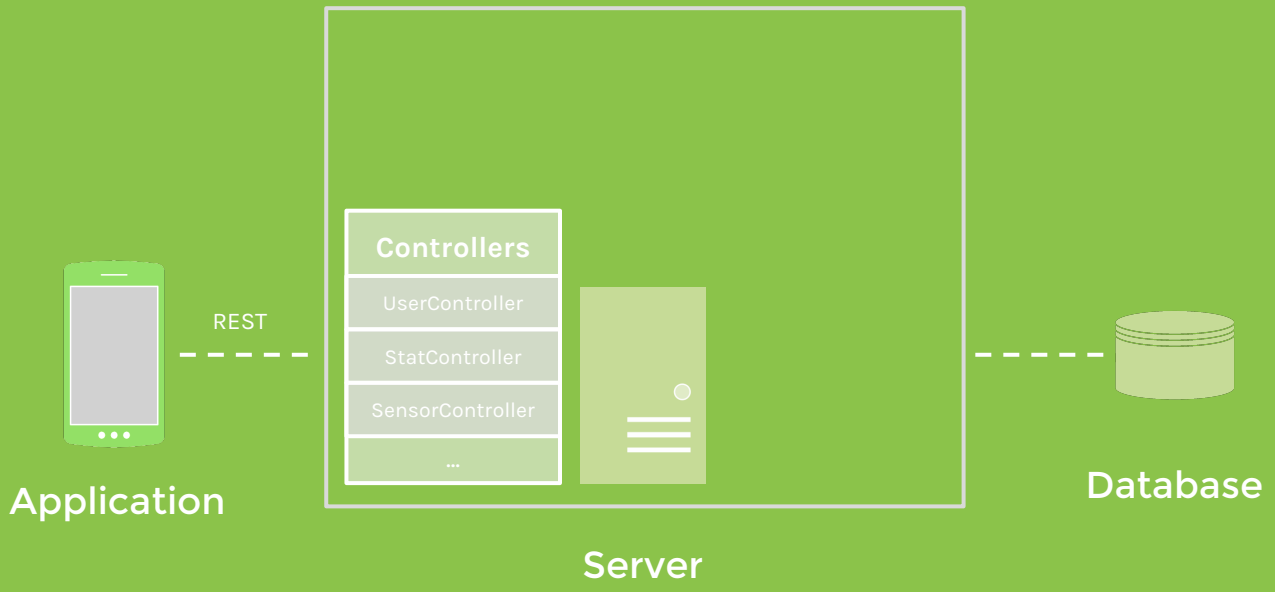

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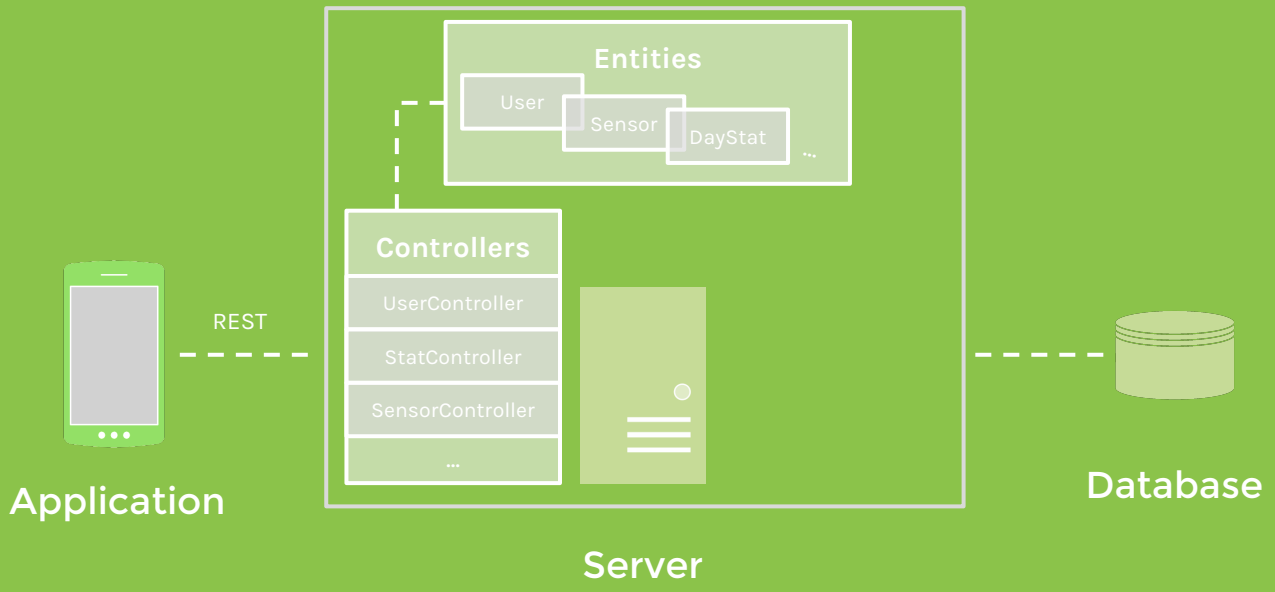

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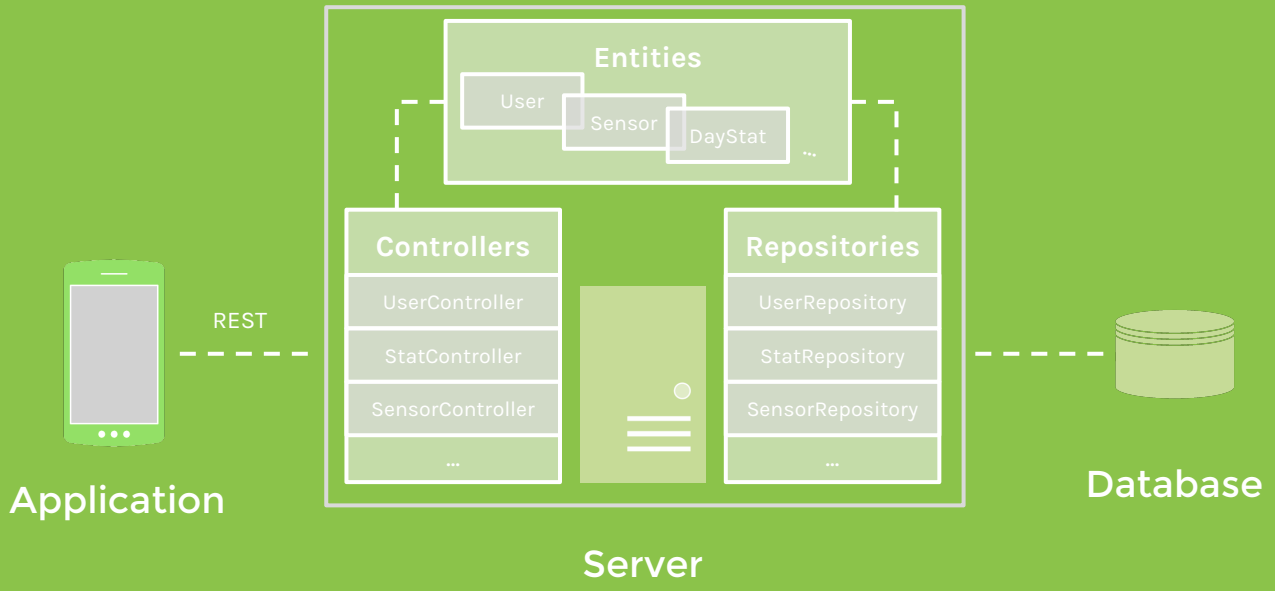

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IMPLEMENTATION: BACK END

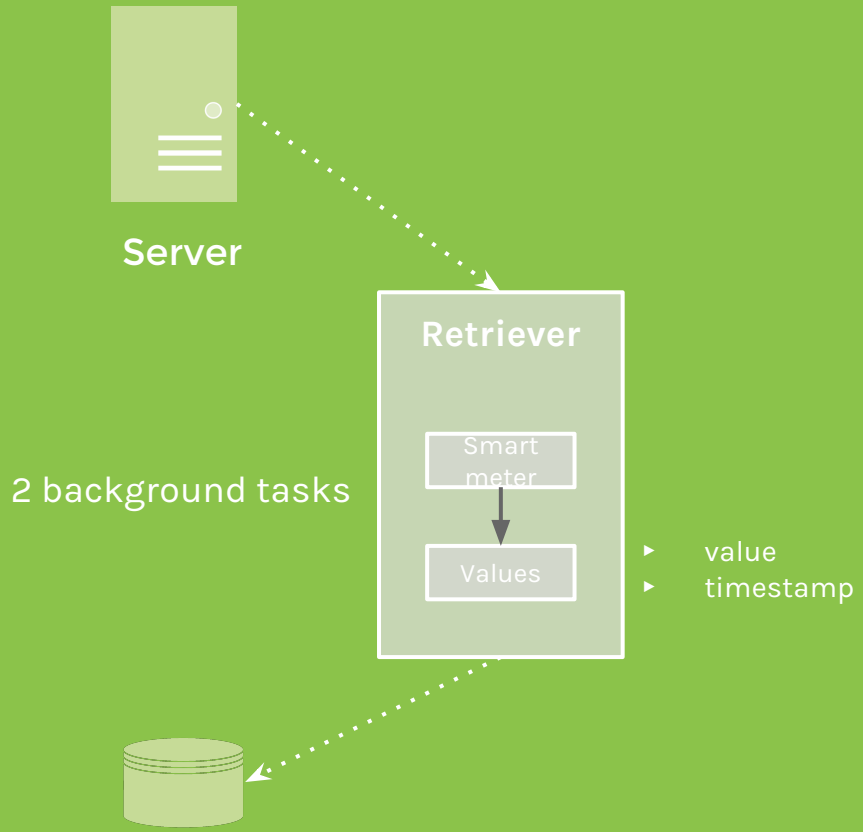
RETRIEVER AND STATISTICS UPDATER

Server

2 background tasks

IMPLEMENTATION:
BACK END

RETRIEVER AND STATISTICS UPDATER



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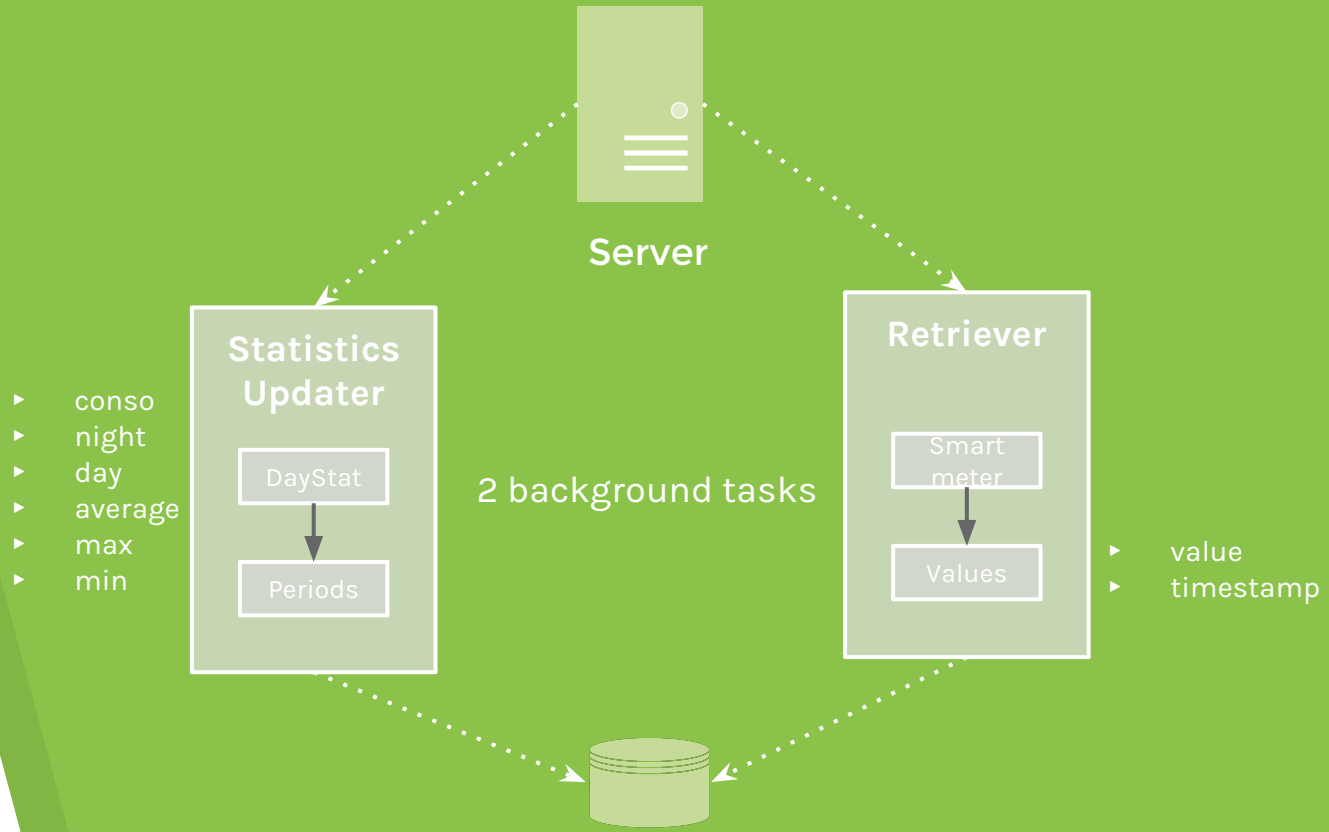
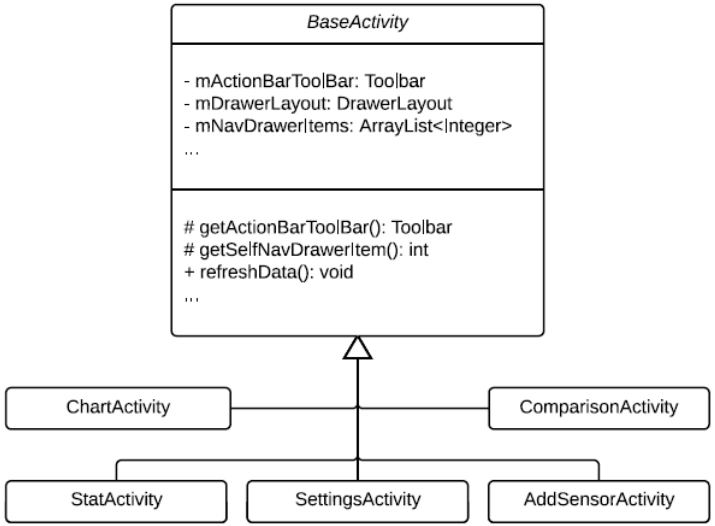


IMPLEMENTATION: BACK END

IMPLEMENTATION: FRONT END

BaseActivity

Main activities extend an abstract class.

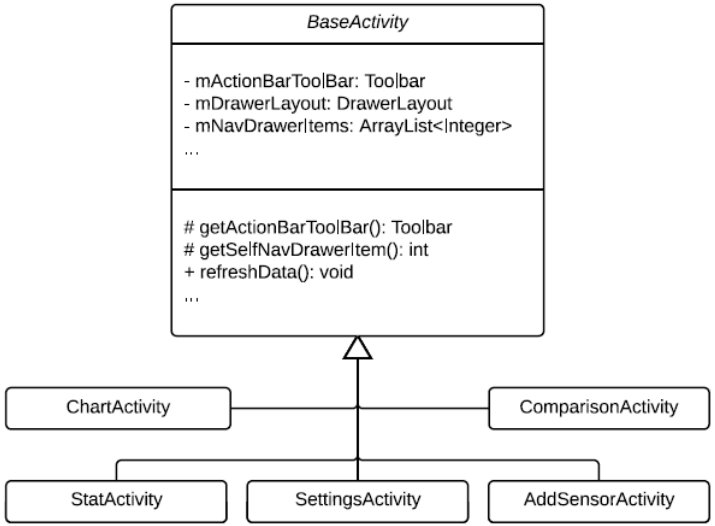


IMPLEMENTATION: FRONT END

BaseActivity

Main activities extend an abstract class.

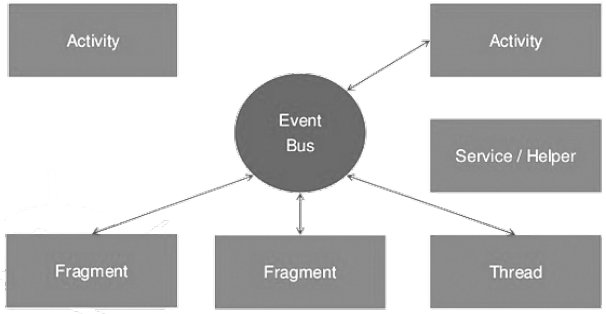
- Allow to share:
  - methods
  - widgets



IMPLEMENTATION: FRONT END

EventBus

Internal communication based on the *observer* pattern



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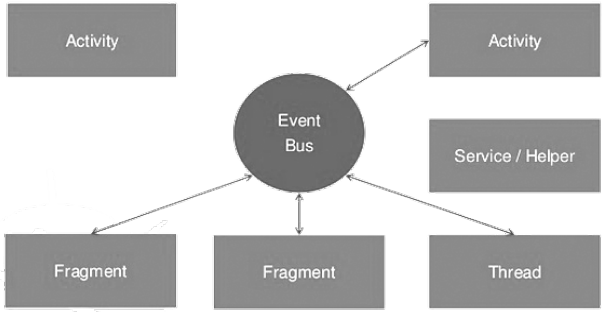

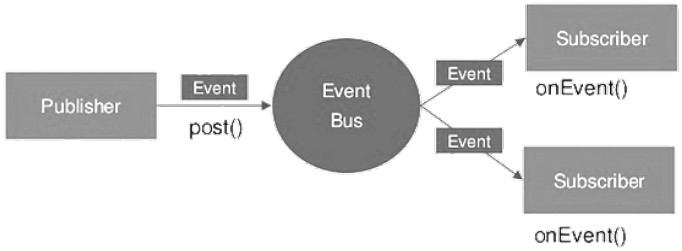

IMPLEMENTATION: SECURITY

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- **HTTPS** ready to be set up but no certificate for now
- Users can only access their **own content**

4.

TESTS

TESTING PART

- Design **validation**

TESTING PART

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- **Unit** tests

TESTING PART

- Design validation
- Unit tests

FAST

INDEPENDENT

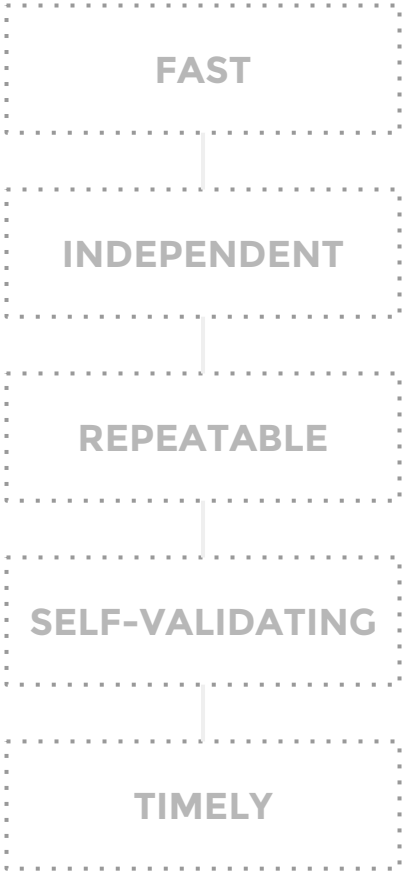
REPEATABLE

SELF-VALIDATING

TIMELY

TESTING PART

- Design **validation**
- **Unit** tests
- Deployment
  - Two smart meters
  - Server on a vm
  - Several Android devices



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CONCLUSION

CONCLUSION AND FUTURE WORK

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  - Synchronization, distribution and backup of data
  - Securing the exchanges between server and app
- As a result, many ways **to check one's consumption**:
  - Line chart, statistic, a comparison profile
  - Responses to abnormal cases
- From my point of view, **good and extensible energy monitoring system** which meets the requirements

CONCLUSION AND FUTURE WORK

- Porting the app to another platform
- Adding intelligence to the system
- Control electrical appliances
- …

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Rich and interesting **experience**, with **many challenges**

- Learned and discovered many tools and framework
- Opportunity to have a professional working experience
- Mobile development area & open-source

THANK YOU FOR
YOUR **ATTENTION**

Questions?