Migrating the INTO-CPS Application to the Cloud

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Agenda

Introduction

- The INTO-CPS Project
- The INTO-CPS Tool Chain
- The INTO-CPS Application

The INTO-CPS Cloud Application

- Adding Multi-User Support and Cloud Based Co-simulation
- Technologies of the Cloud-based INTO-CPS Application
- Architecture of the Cloud Version of the INTO-CPS Application

Conclusion

- Discussion
- Future Work: Migrating Missing Desktop Application Features

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INtegrated TOol chain for model-based design of CPSs

Integrated Tool Chain for Model-based Design of Cyber-Physical Systems

The aim of INTO-CPS project is to create an integrated "tool chain" for comprehensive Model-Based Design (MBD) of Cyber-Physical Systems (CPSs). The tool chain will support the multidisciplinary, collaborative modelling of CPSs from requirements, through design, down to realisation in hardware and software. This will enable traceability at all stages of the development.

> Click here if you are interested in the project publications, status reports, etc.

Case Studies

Agriculture Case Study

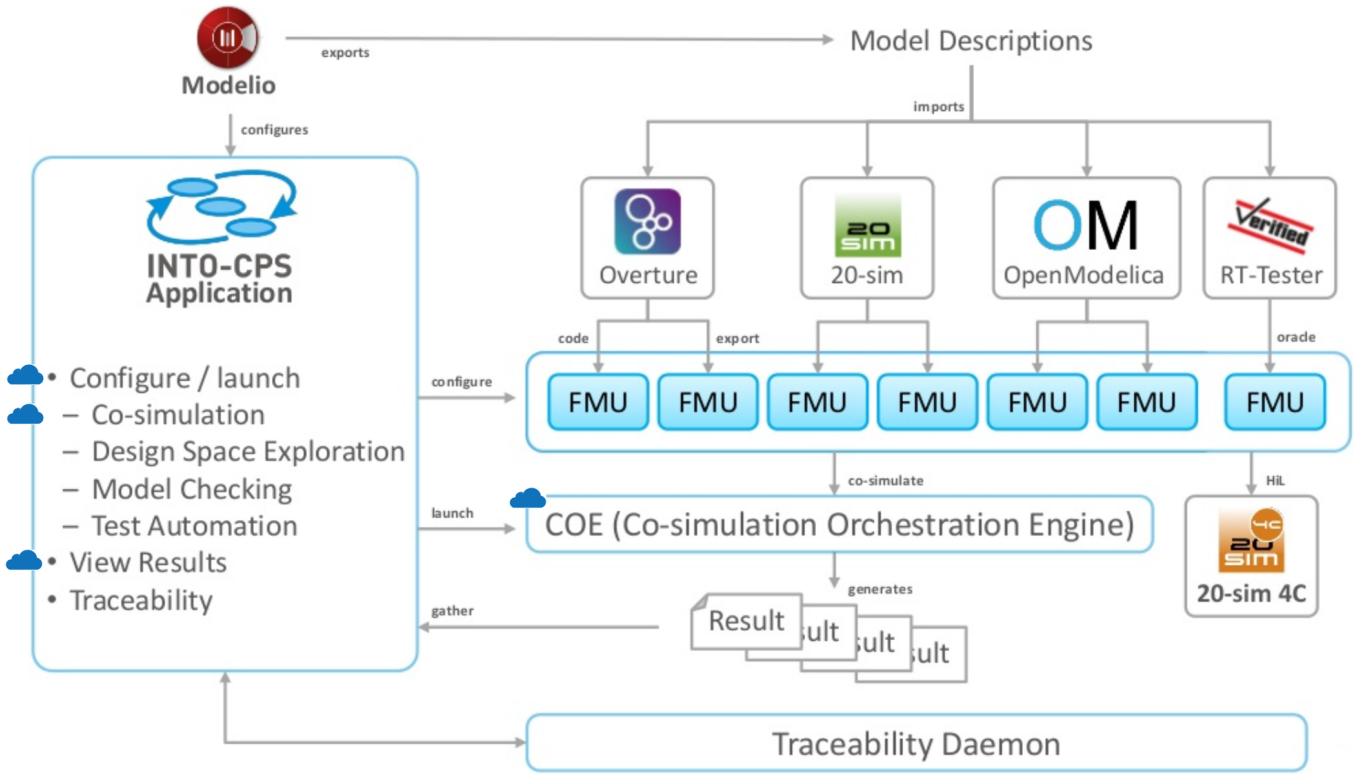
Railways Case Study

Automotive Case Study

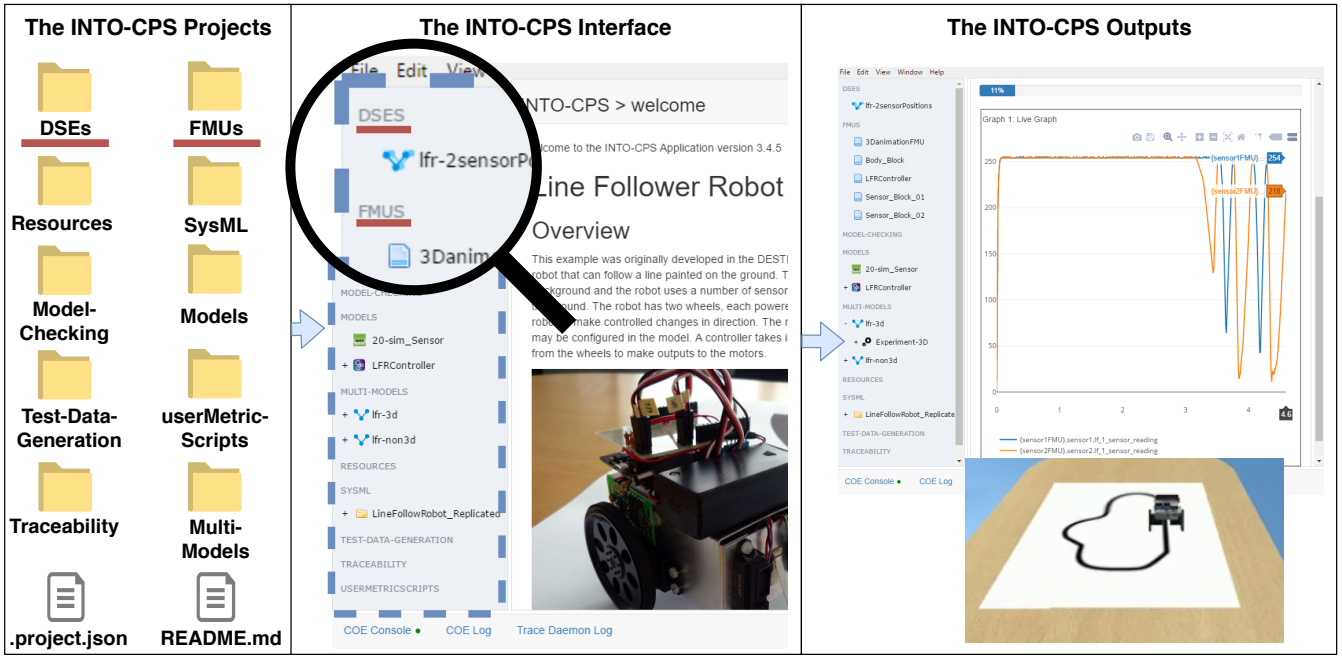
Building Automation Case Study

- EU Cordis webpage

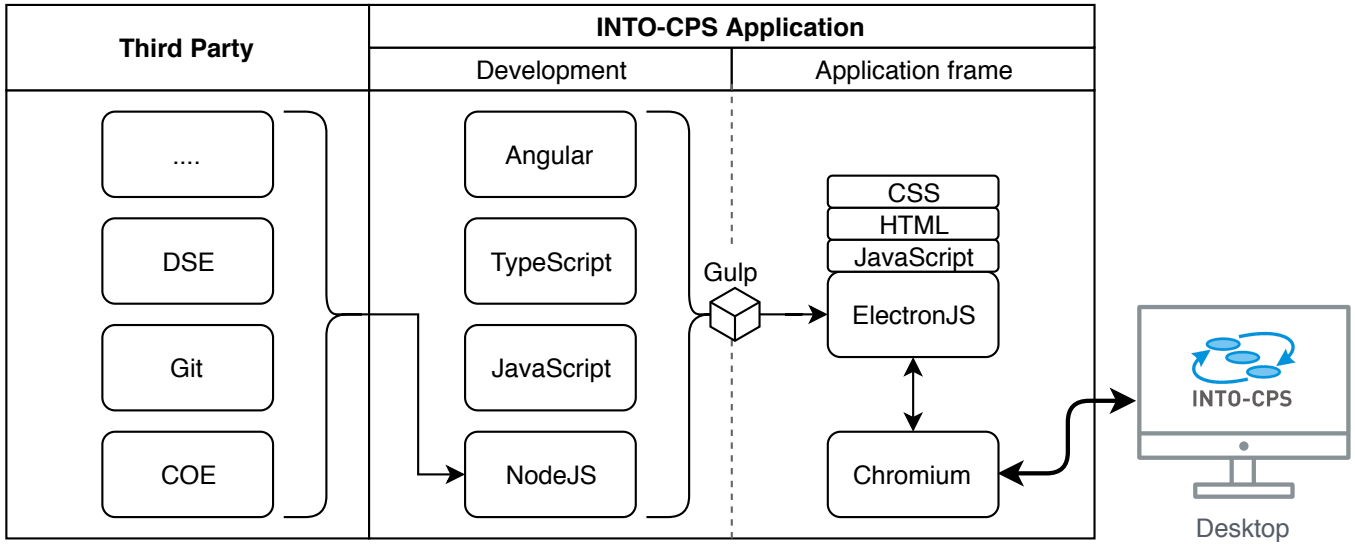
The INTO-CPS Tool Chain



The INTO-CPS Application



The INTO-CPS Technologies



Drawback: Frustrated Users

Troublesome installs ❄

Practice shows that the integration of the diverse tools in the INTO-CPS tool chain forces the installation of several software packages, and multiple versions of some...

Unexpected performances ❄❄

Moreover, as specifications vary, variations in performance are often observed.

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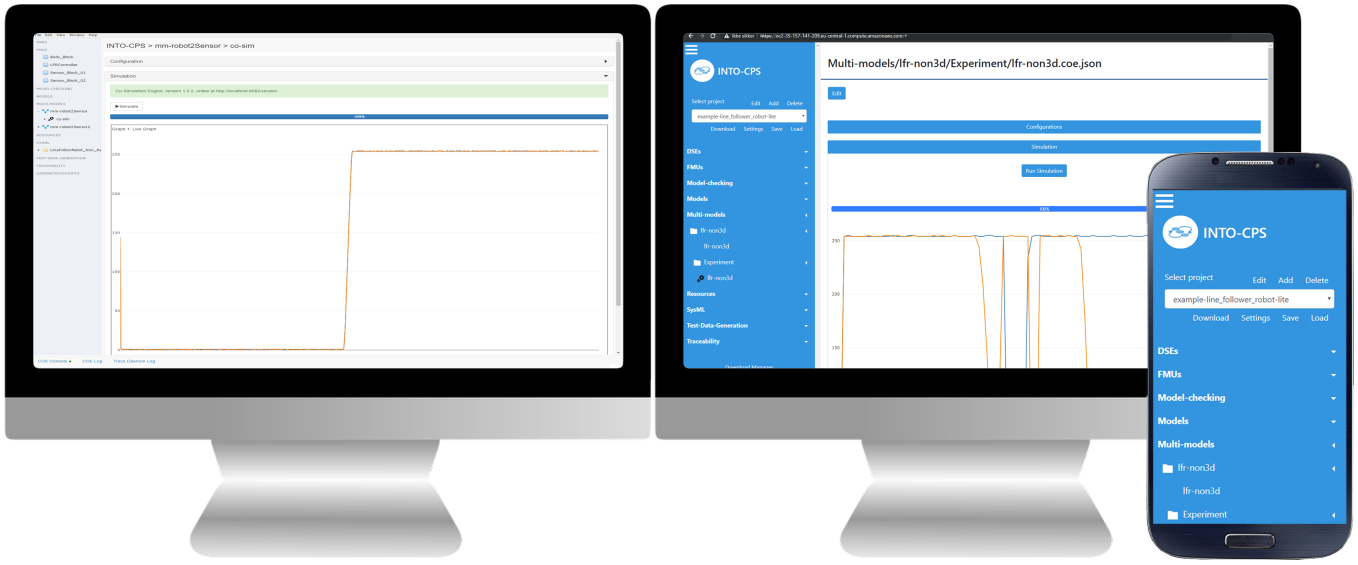
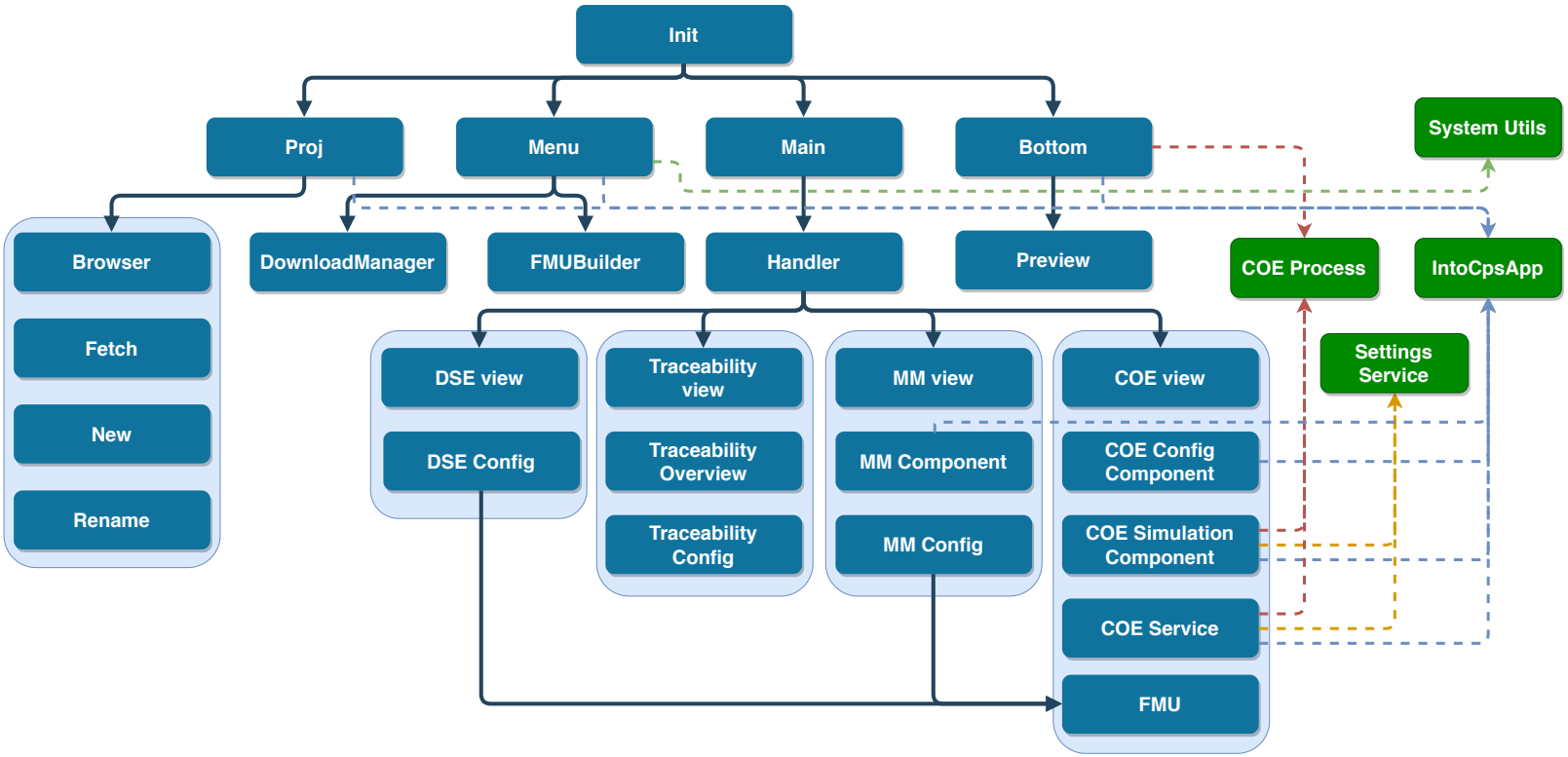
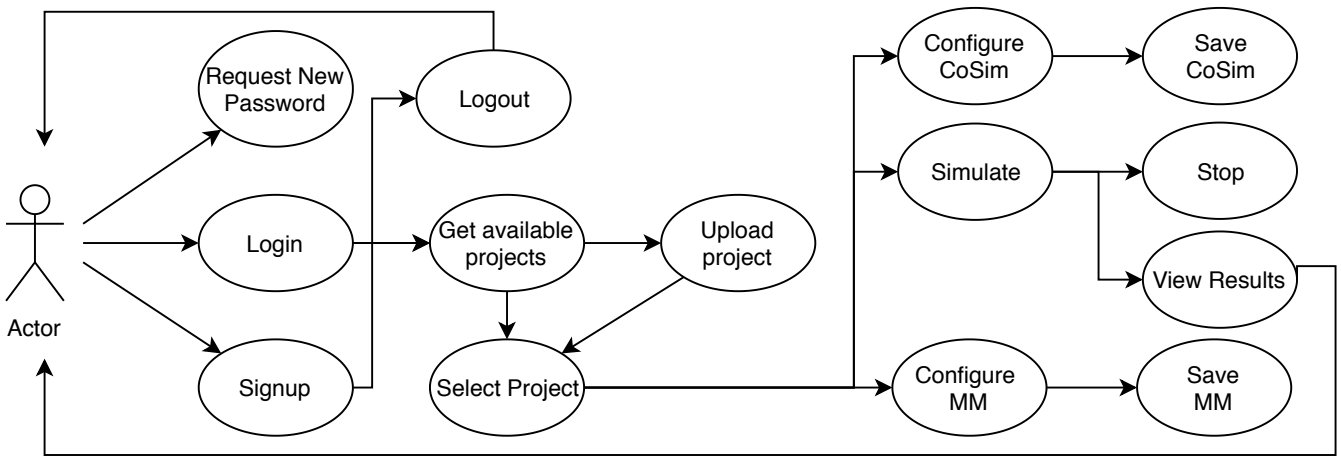
The INTO-CPS Cloud Application



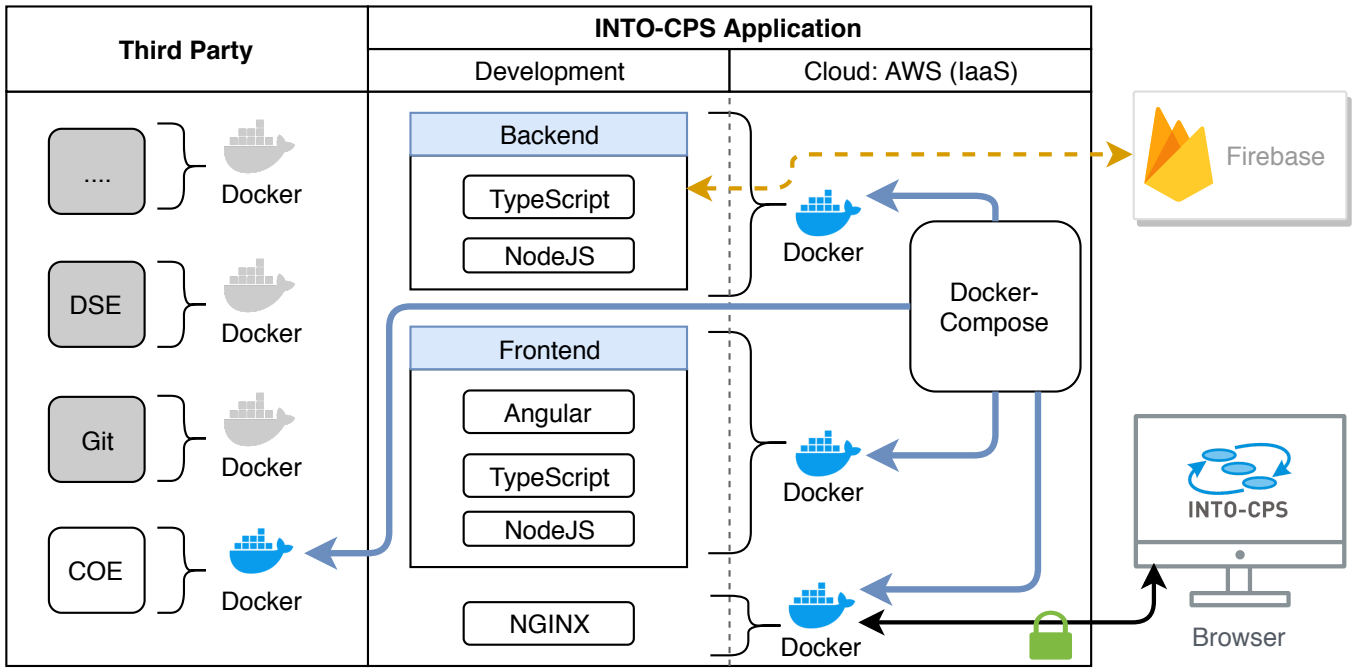
R.E. Architecture diagram of the INTO-CPS Application codebase



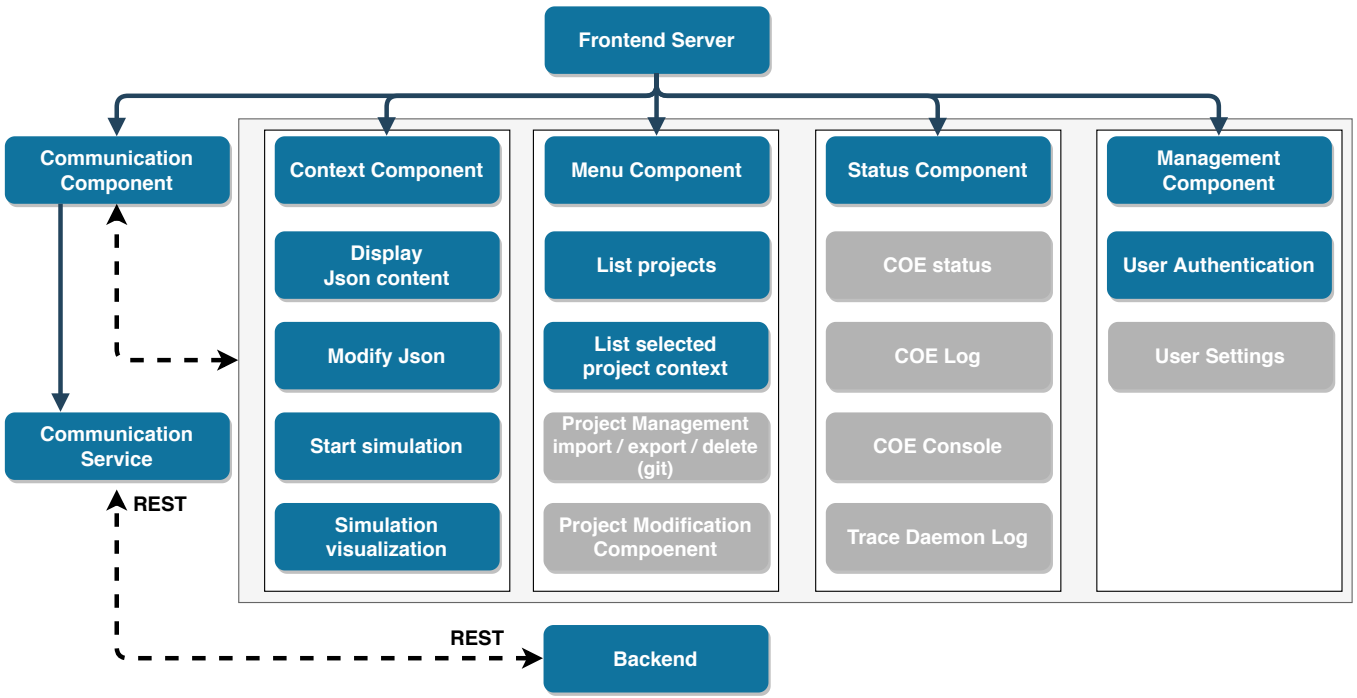
Cloud issues: Adding Multi-User Support and Cloud Based Co-simulation



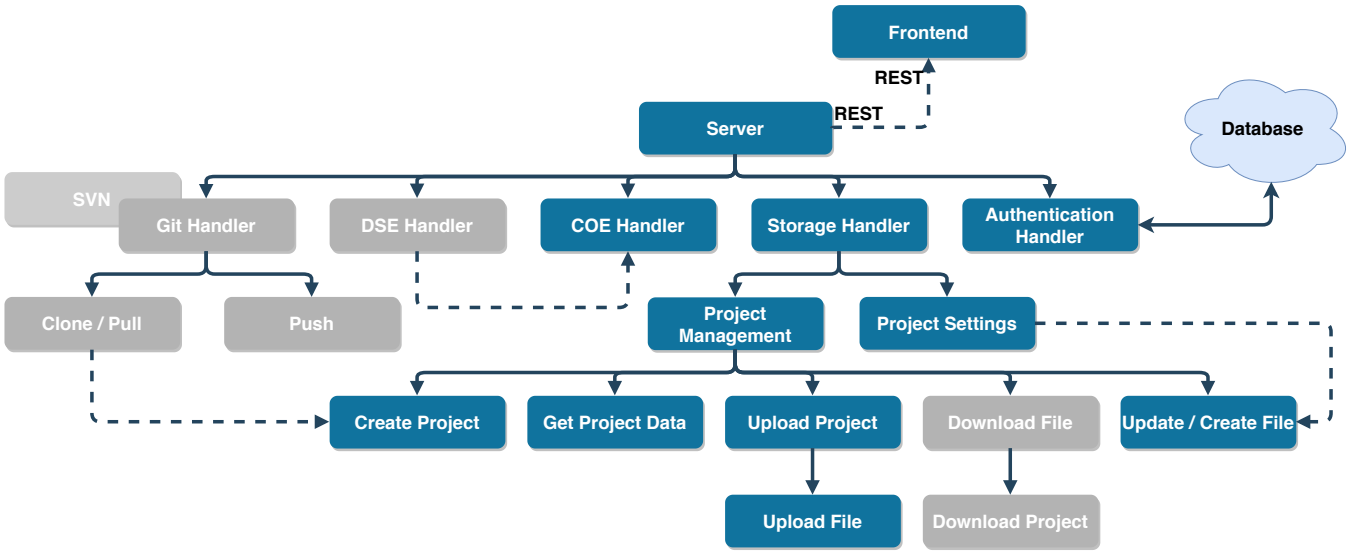
Technologies of the Cloud-based INTO-CPS Application



Frontend Micro-service



Backend Micro-service



COEs Container and Pooling

```
FROM openjdk:11-oracle
COPY coe.jar coe.jar
COPY coe.sh coe.sh
RUN yum install net-tools -y
RUN mkdir -p /data
ADD . /data
RUN  chmod +x ./coe.sh
RUN ls
CMD ["./coe.sh"]
EXPOSE 8082
```

Dockerfile

```
#!/bin/sh
# My first script
echo "Hello Coe!"
echo $(ls)
myIP=$(ifconfig eth0|grep 'inet '|awk '{print $2}')
echo $myIP
myPATH='/data/'
cd $myPATH
coes='coes/'
mkdir -p $coes$myIP
cd $coes$myIP
$(java -jar ../../../coe.jar)
```

coe.sh

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Discussion

- Software development was carried out over 80 days including: the migration of existing components:
  - project management UI
  - co-simulation launching and visualization UI
- Developed from scratch the many cloud specific components absent in the desktop version:
  - authentication
  - encrypted web connection
  - shared COEs pool
- Code available at the INTO-CPS Association github
  - https://github.com/INTO-CPS-Association/into-cps-application-cloud

Future Work: Migrating Missing Desktop Application Features

- Logging
- Download Manager
- Single File Upload
- DSE & Traceability & Test Case Generation
- Git