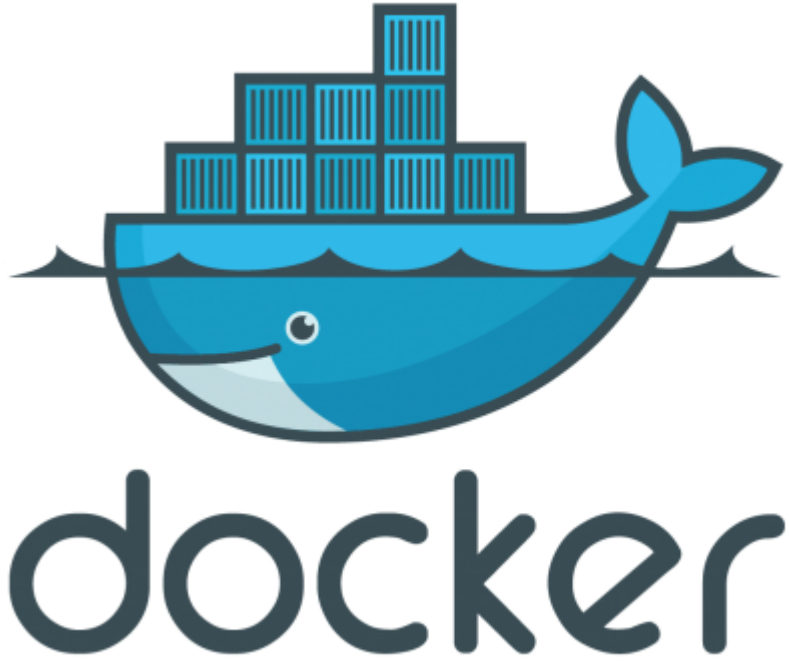
DOCKER FOR JAVA DEVS



2017-06-28 Code Garden Roma #AperiTech

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- technologist @ CNR
- java/scala
- devops

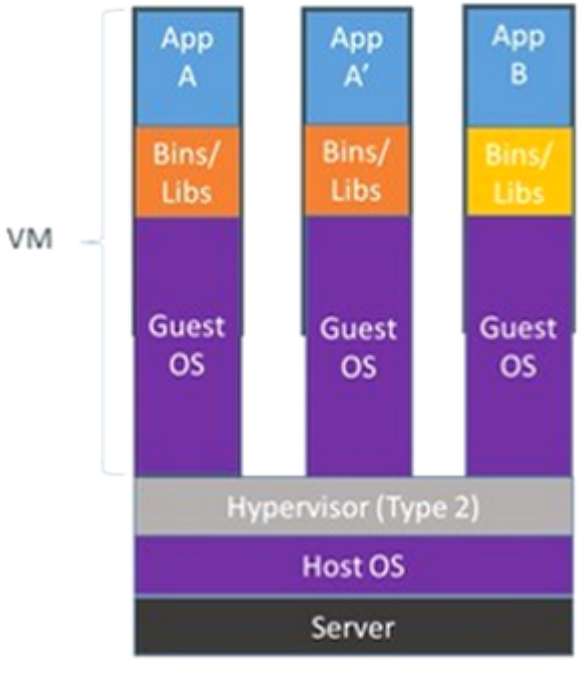
AGENDA

- Docker commands
- Java development with Docker
- from monolith to microservices
- ~~production~~

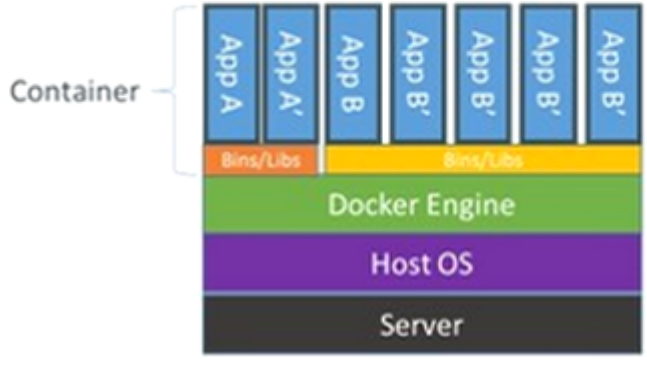
DOCKER

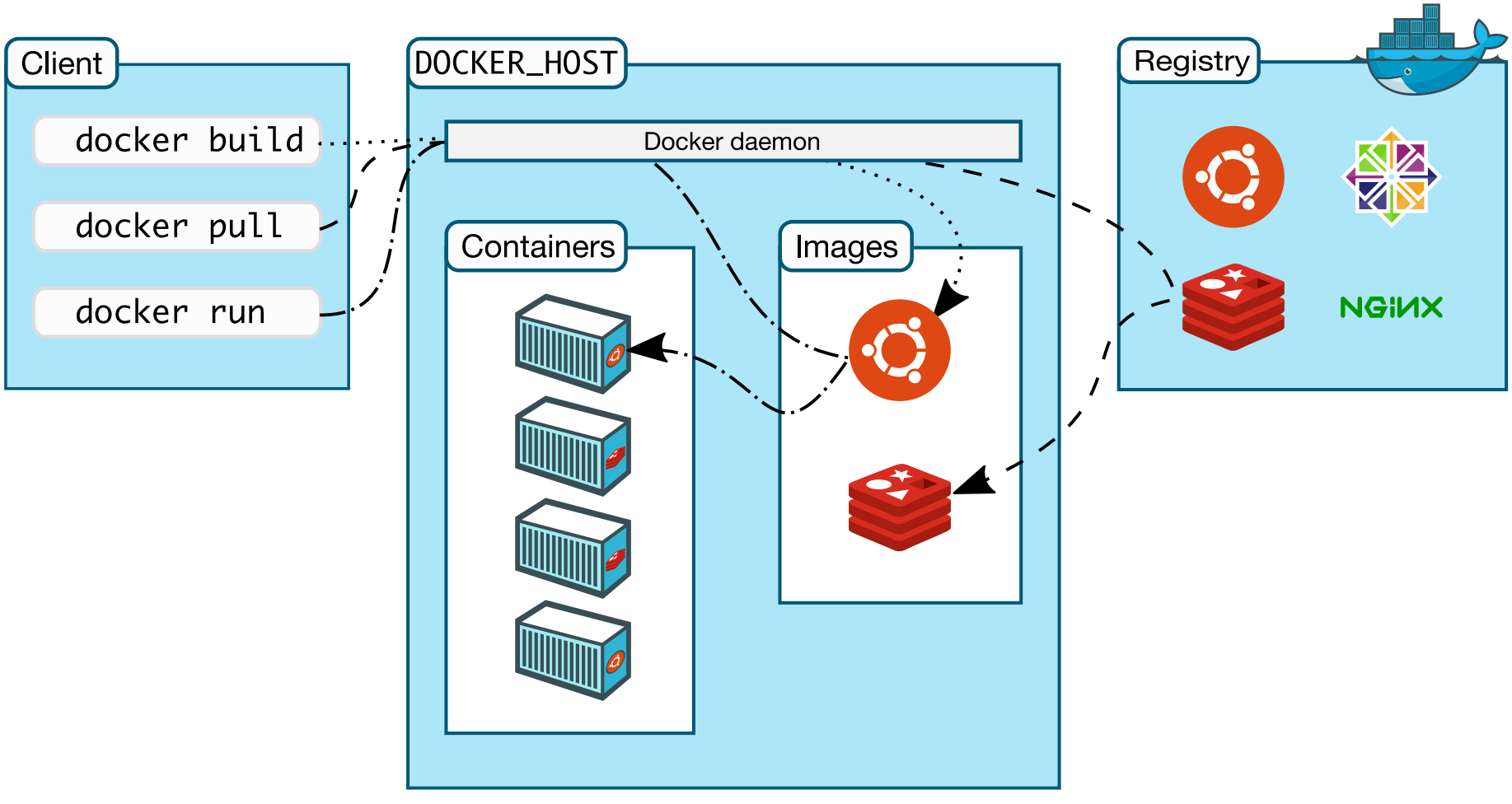
- Container virtualization
- Build, pack, ship and run applications as containers
- Build once, run in many places (Write once, run anywhere?)
- Isolated and content agnostic

Containers vs. VMs



Containers are isolated, but share OS and, where appropriate, bins/libraries




Client
docker build
docker pull
docker run
DOCKER_HOST
Docker daemon
Containers
Images
Registry
NGINX

GETTING STARTED

HELLO WORLD

```
docker run --rm \
  --name hello-world \
  hello-world
```

https://hub.docker.com/_/hello-world/

(JAVA) HELLO WORLD

```
docker run --rm \
  --name hello-java \
  openjdk \
  javac -version
```

```
docker run --rm \
  --name hello-java \
  openjdk:7-jre-alpine \
  java -version
```

- **java** image deprecated
- https://hub.docker.com/r/library/openjdk/tags/
  - alpine / debian
  - jre / jdk
  - 6 / 7 / 8 / 9
- legal issues with Oracle JDK

TOMCAT

```
docker run --rm \
  --name tomcat \
  --publish 8180:8080 \
  tomcat:8-alpine
```

http://localhost:8180/

VOLUMES

```
docker run --rm --name hello-tomcat \
  --volume $(pwd)/hello.war:/usr/local/tomcat/webapps/hello.wa
  --publish 8180:8080 \
  tomcat:8-alpine
```

http://localhost:8180/hello/

```
docker exec hello-tomcat \
  ip address show
```

```
docker exec --tty --interactive hello-tomcat sh
```

BUILDING IMAGES

```
vim Dockerfile
```

```
docker build --tag francescou/hello .
```

```
docker run --rm francescou/hello
```

```
docker run --rm \
  --env '-Xmx64m' \
  --publish 8787:8787 \
  francescou/hello
```

LINKS

```
docker run --name my-redis redis:3-alpine
```

```
docker run --rm --name webapp \
  --link my-redis:my-redis \
  --volume $(pwd)/spring-boot-redis.jar:/app.jar \
  openjdk:8-jre-alpine \
  java -jar /app.jar
```

JAVA DEVELOPMENT WITH DOCKER

MAVEN

```
docker run --rm \
  --volume $(pwd)/spring-boot-redis/:/app/ \
  --workdir /app/ \
  maven:3.5-alpine \
  mvn clean package -DskipTests
```

MULTI-STAGE BUILDS

```
FROM maven:3.3.9-jdk-8-alpine as build-env
COPY ./spring-boot-redis/ /app/
WORKDIR /app
RUN mvn package -DskipTests

FROM gcr.io/distroless/java
WORKDIR /app
CMD ["app.jar"]
COPY --from=build-env /app/target/*.jar app.jar
```

```
docker build --tag francescou/spring-boot-redis \
  --file Dockerfile.multistep .
```

https://github.com/jzaccone/office-space-dockercon2017/

JBOSS/WILDFLY

```
docker run --rm \
  --name wildfly \
  --publish 8787:8787 \
  --publish 8080:8080 \
  jboss/wildfly:10.1.0.Final \
  wildfly/bin/standalone.sh --debug -b 0.0.0.0
```

SPRING-BOOT DEVTOOLS

```
docker run --rm \
  --name spring-boot \
  --publish 8180:8080 \
  --publish 8787:8787 \
  --publish 35729:35729 \
  --volume /home/francesco/.m2/repository/:/root/.m2/repositor
  --volume $(pwd)/spring-boot-devtools/:/app/ \
  --workdir /app/ \
  maven:3.5-alpine \
  mvn spring-boot:run -Drun.jvmArguments="-Xdebug -Xrunjdwp:tra
```

INTEGRATION TESTING

```
import org.testcontainers.containers.*;
// Set up a redis container

@ClassRule
public static GenericContainer redis =
    new GenericContainer("redis:3.0.2")
            .withExposedPorts(6379);
```

https://github.com/testcontainers/testcontainers-java-examples/tree/master/spring-boot

MULTI-CONTAINER APPLICATIONS

DOCKER COMPOSE

```
elasticsearch:
  image: docker.elastic.co/elasticsearch/elasticsearch
  environment: ['http.host=0.0.0.0']

kibana:
  image: docker.elastic.co/kibana/kibana
  ports: ['127.0.0.1:5601:5601']
  depends_on: ['elasticsearch']

logstash:
  image: docker.elastic.co/logstash/logstash
  volumes:
    - ./logstash.conf:/.../logstash/pipeline/logstash.conf
  depends_on: ['elasticsearch']
```

```
docker-compose --file docker-compose.yml \
  docker-compose-dev.yml up
```

SWARM MODE

- scaling, load balancing, service discovery
- self-healing and self-organizing

```
docker stack deploy --compose-file docker-compose.yml
```

```
HEALTHCHECK --interval=5m --timeout=3s \
  CMD curl --fail http://localhost/ || exit 1
```

CASE STUDY

migration of a J2EE monolith to microservices

PERSONAL FINANCES WEBAPP

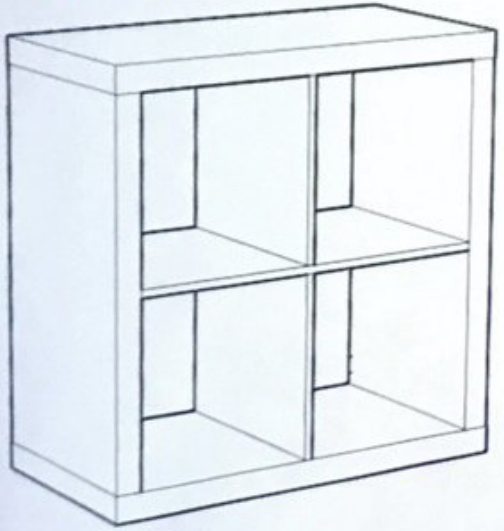
- incomes/expenses items, savings and account settings
- statistics - track cash flow dynamics in account lifetime
- notifications

MONOLITH

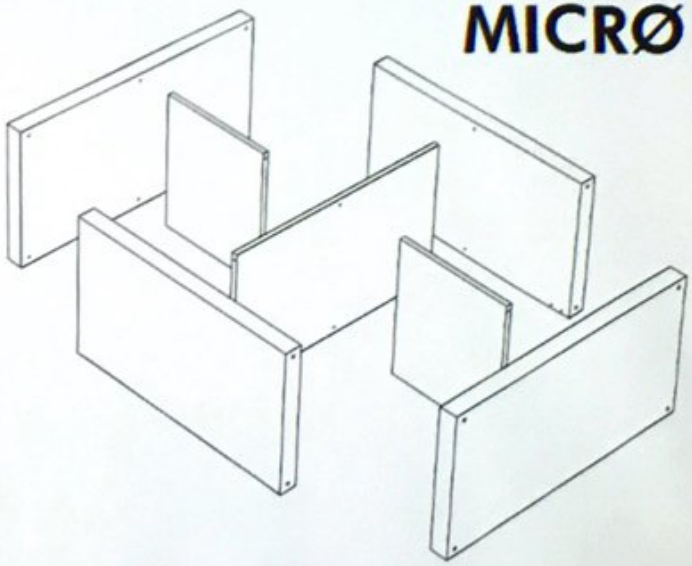
- J2EE monolith
- RDBMS (MySQL/Oracle)
- JBoss 4
- JMS
- hard to maintain/monitor
- harder to evolve

Monoliths versus microservices?

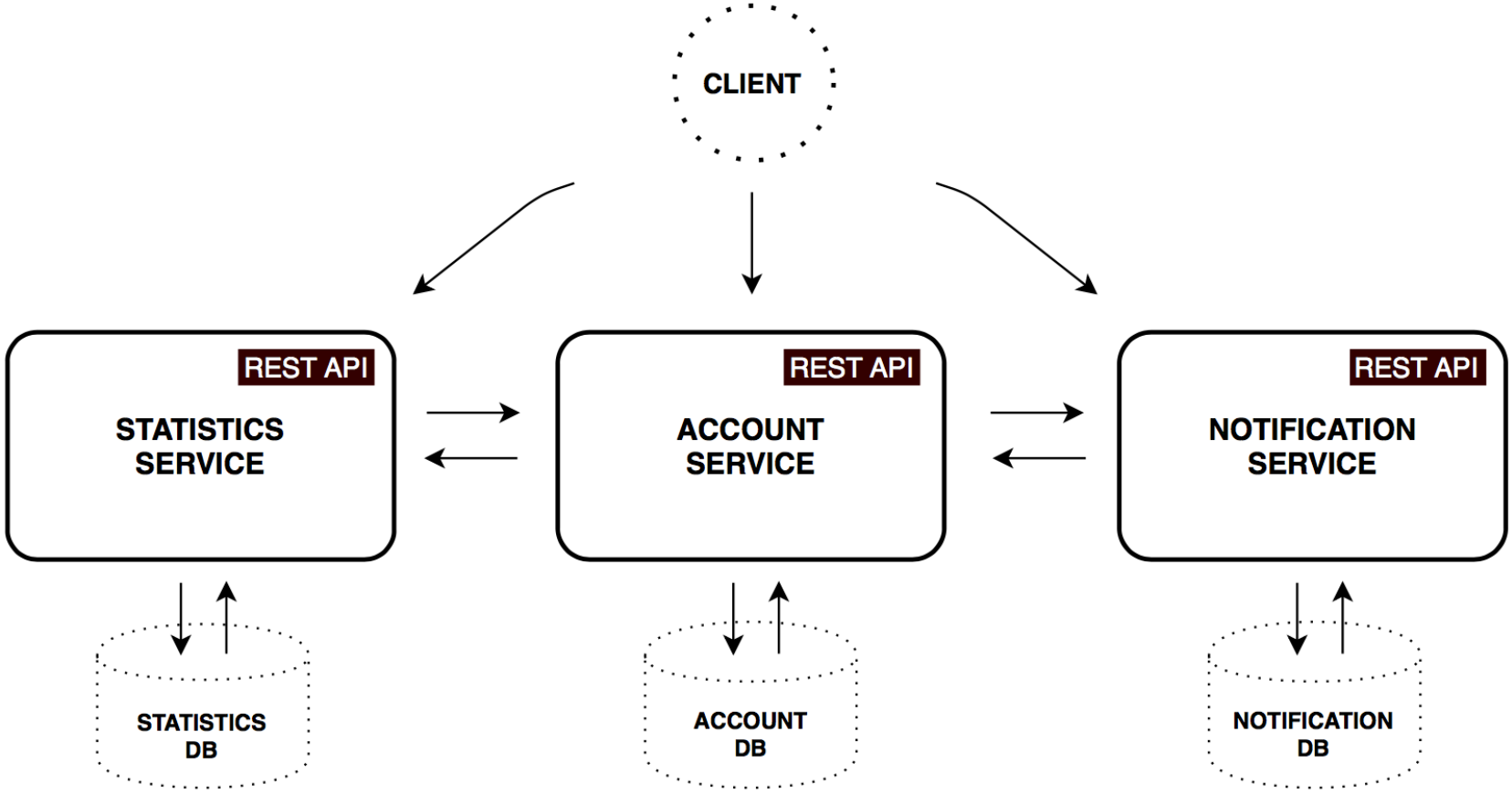
MÖNÖLIT



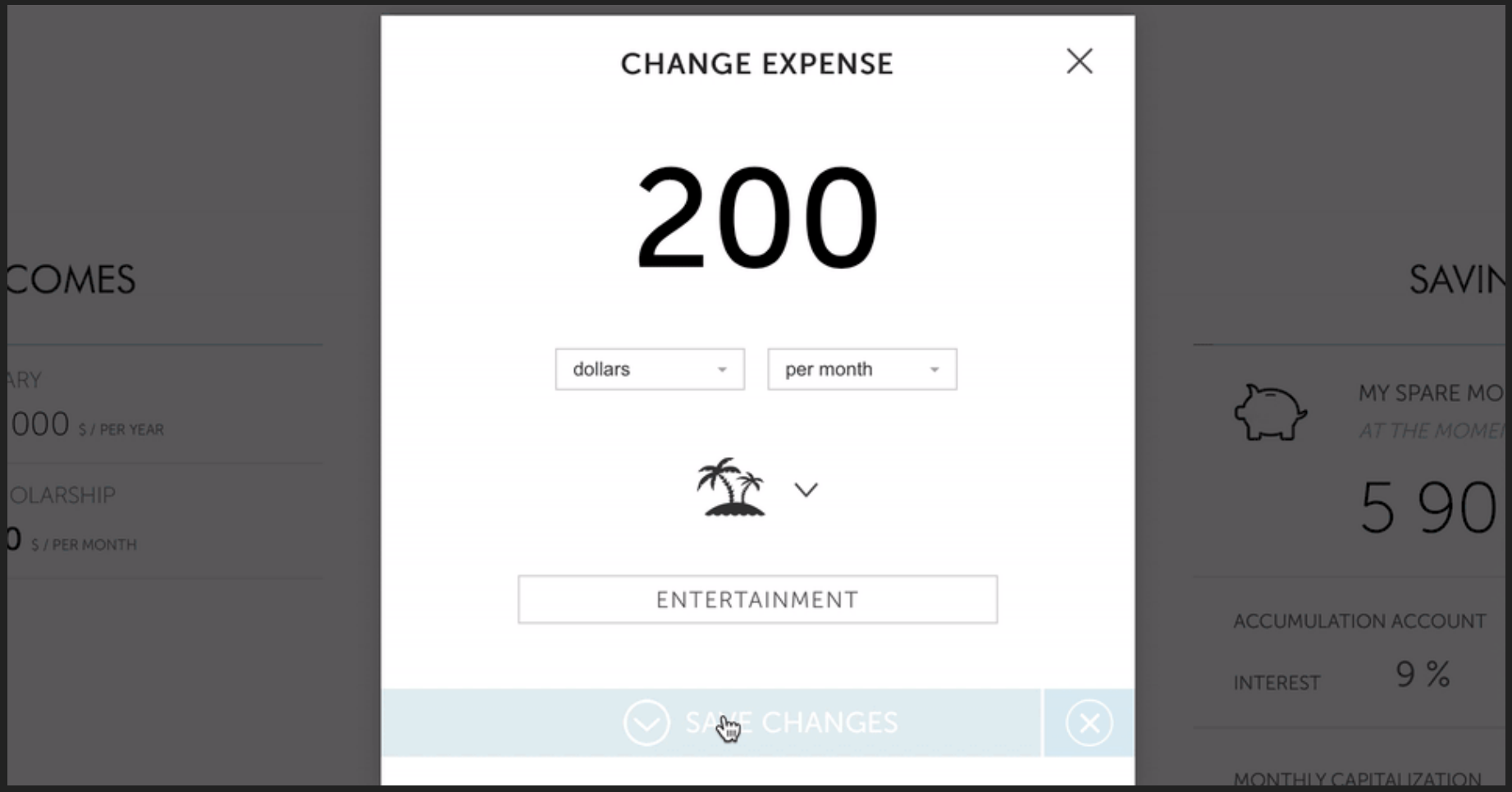
MICRØ



IKEA
Design and Quality
IKEA of Sweden


CLIENT
REST API
STATISTICS SERVICE
REST API
ACCOUNT SERVICE
REST API
NOTIFICATION SERVICE
STATISTICS DB
ACCOUNT DB
NOTIFICATION DB

MICROSERVICES W/SPRING CLOUD


CHANGE EXPENSE
200
dollars
per month
ENTERTAINMENT
SAVE CHANGES
COMES
SAVIN
MY SPARE MO
5 90
ACCUMULATION ACCOUNT
INTEREST
9 %
MONTHLY CAPITALIZATION

SAMPLE PROJECTS

- https://github.com/sqshq/PiggyMetrics
- http://www.kennybastani.com/2015/07/spring-cloud-docker-microservices.html

INTEGRATION

CLOUD

- AWS Container service
- Azure container service

CI

- Jenkins plugin
- Gitlab CI
- TravisCI

CD

- Netflix OSS spinnaker
- drone.io

CONCLUSIONS

PROS

- accelerate innovation
- portability across machines
- quick experimentation
- test/prod parity

CONS

- security (avoid running as `root`)
- persistent containers (e.g. databases)
  - Why Databases Are Not for Docker Containers
  - Is Docker Good for Your Database?
  - volume drivers?
- `-Xmx` vs `--memory`
  https://youtu.be/yHLAaA4gPxw?t=26m50s
  - `docker run --name memory-test --memory 16m francescou/memory-test`

RESOURCES

- https://docs.docker.com/get-started/
- http://labs.play-with-docker.com/
- https://codefresh.io/blog/java_docker_pipeline/
- http://jberkus.github.io/perplexed/
- https://docs.docker.com/engine/docker-overview/
- https://youtu.be/yHLAaA4gPxw
- https://youtu.be/y9lYnEDSVEc
- https://blog.jessfraz.com/post/docker-containers-on-the-desktop/

QUESTIONS ?