RADON

RADON: Rational Decomposition and Orchestration for Serverless Computing

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Serverless Function-as-a-Service

- FaaS: function calls directly served from the cloud, thus featuring autoscaling
  - As of now, the most frequently encountered instance of serverless platform

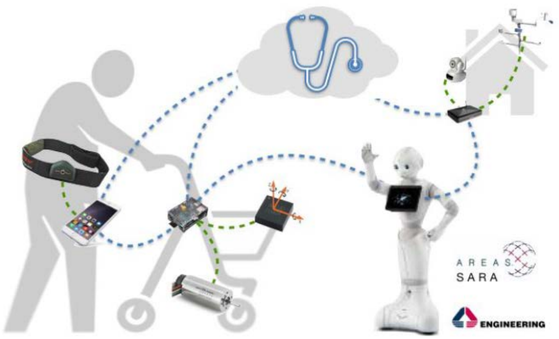
```java
package com.example.lambda.demo;

import com.amazonaws.services.lambda.runtime.Context;
import com.amazonaws.services.lambda.runtime.RequestHandler;

public class Hello implements RequestHandler<Object, String> {

    @Override
    public String handleRequest(Object input, Context context) {
        context.getLogger().log("Input: " + input);

        // TODO: implement your handler
        return "Hello from Lambda!";
    }
```

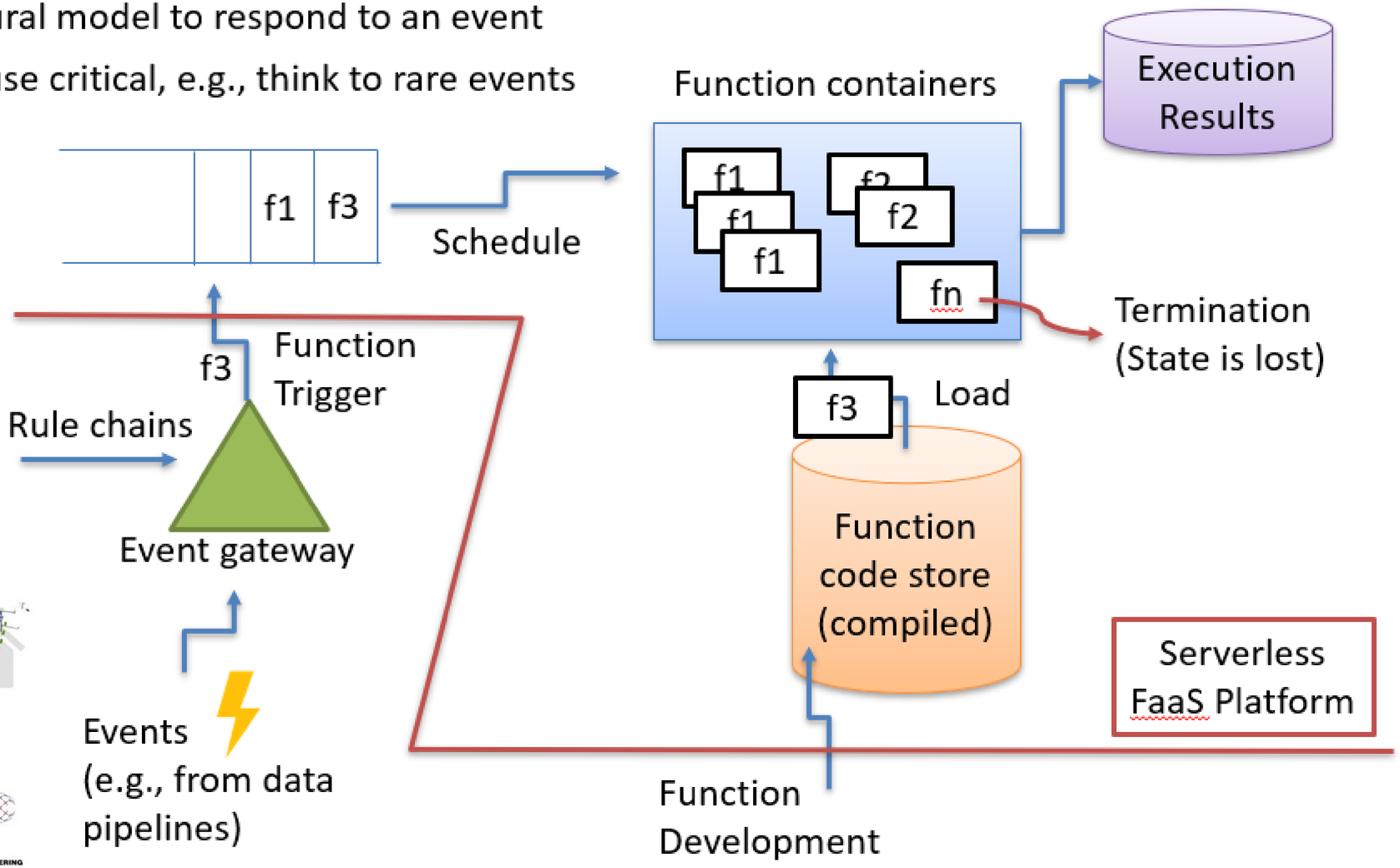
```
com.example.lambda.demo.Hello Lambda Console
Skip uploading function code since no local change is found...
Invoking function...
=================== FUNCTION OUTPUT ===================
"Hello, AWS Lambda!"
=================== FUNCTION LOG OUTPUT ===================
START RequestId: 5287a47b-baa9-11e7-b87a-c1cfa64acbad Version: $LATEST
Input: AWS LambdaEND RequestId: 5287a47b-baa9-11e7-b87a-c1cfa64acbad
REPORT RequestId: 5287a47b-baa9-11e7-b87a-c1cfa64acbad Duration: 37.27 ms      Billed Duration: 100 ms      Memory S
```

Event-driven processing via FaaS

FaaS natural model to respond to an event

Pay-per-use critical, e.g., think to rare events





Ref: P. Leitner *et al.*, A Mixed-Method Empirical Study of Function-as-a-Service Software Development in Industrial Practice, 2017.

FaaS vendor lock-in

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RADON envisioned research agenda

A **DevOps framework** to help the ISVs adopting **serverless FaaS** without vendor lock-in

Integrated framework & IDE

Eclipse Che

Modelling environment

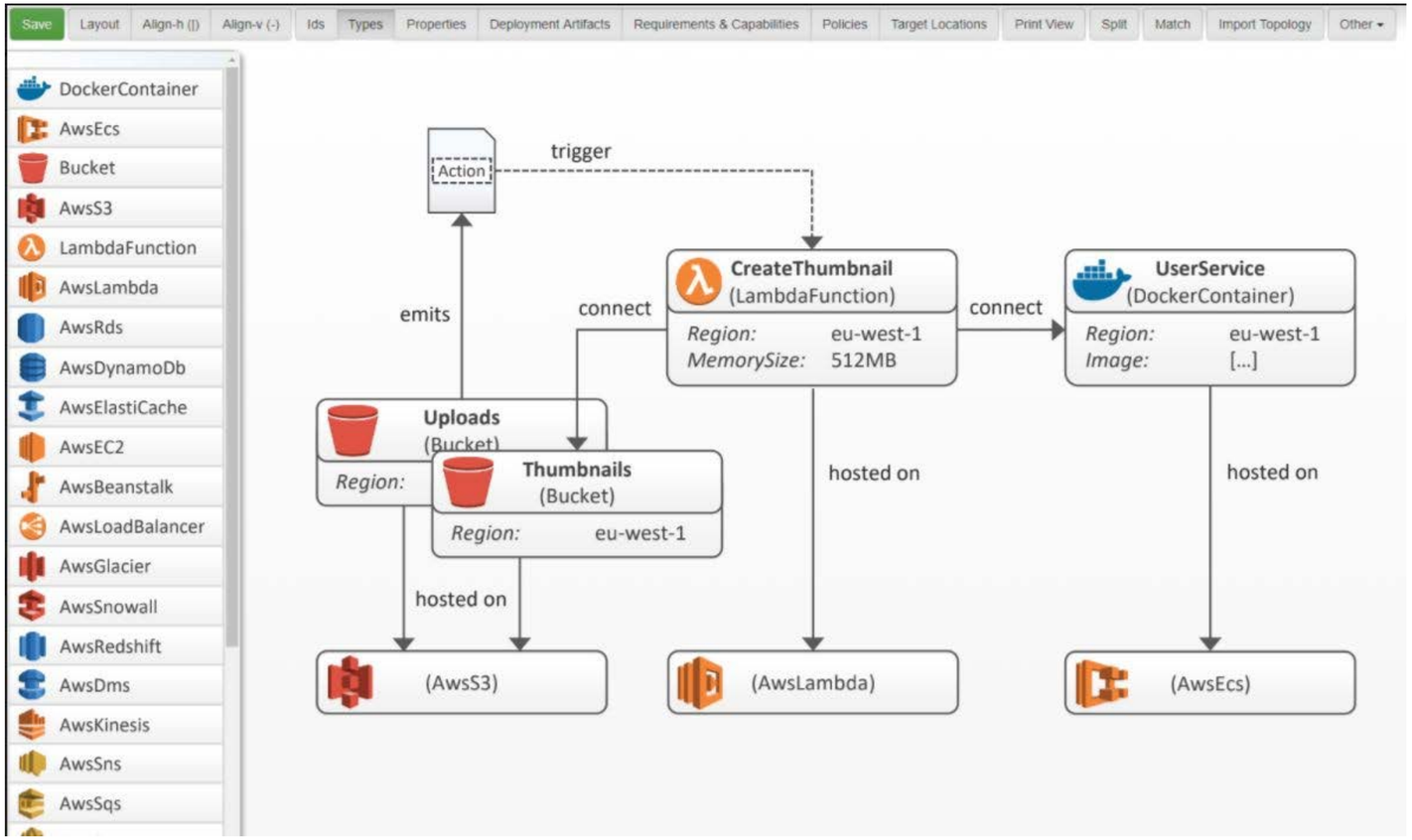
Runtime env.

FaaS abstraction layer

QA Tools

Challenge: modelling for serverless FaaS

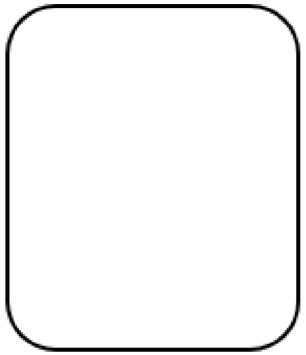
- Serverless FaaS needs to be supported by existing orchestration and topology models/tools (e.g., **TOSCA**, …).
- How to best express **events, data, and application behaviour** in the model?



Challenge: decomposition trade-offs

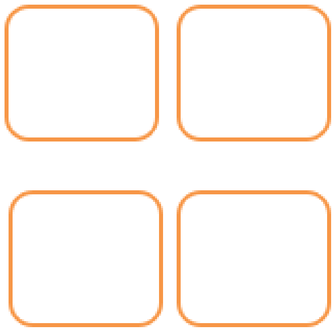
- What is the optimal size for a service taking into account for **constraints**?
- How do we converge through development cycles towards an **optimal architecture**?
- How to model and predict QoS?

Monolith



+ Simplified arch.
+ Less to deploy
+ Less to manage
- Inflexible
- Slow updates

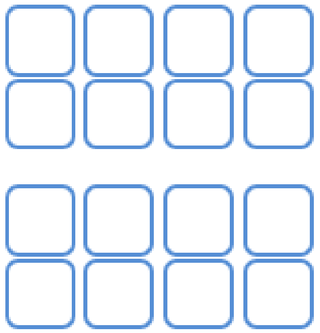
SOA



+ Separation of concerns
+ Specular to business
- Pre-cloud
- No infrastructure focus

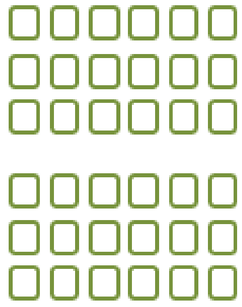
Microservices

Canonical (container based)



+ Container-based
+ Easy to migrate
+ Reproducibile
+ Vendor-agnostic
- Manual admin
- Running costs

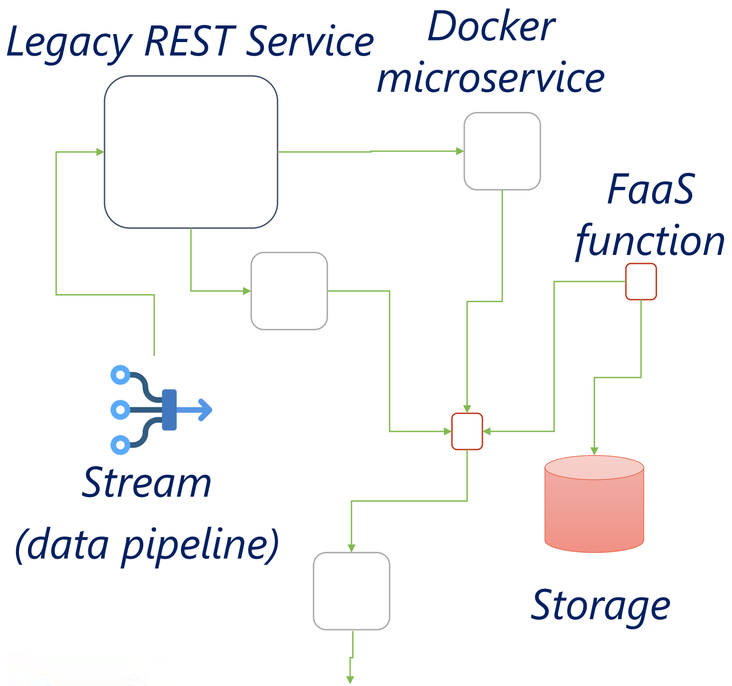
Serverless FaaS (platform)



+Scalability
+Cost
+Zero admin
-Resource limits
-Size limit
-Vendor lock-in

Challenge: runtime operations and delivery

- How to **deliver in DevOps fashion** hybrid serverless-based applications?
- How to **harmonize events** in multi-cloud environments?
- How to choose a **optimal deployment** configuration respecting QoS?
- What should we **monitor** and where?



Azure Functions

Amazon Lambda

APACHE OpenWhisk

docker

Google Cloud Functions

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… more at the poster session!

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