RADON

RADON: DevOps for Serverless Computing

Speaker & Project coordinator:
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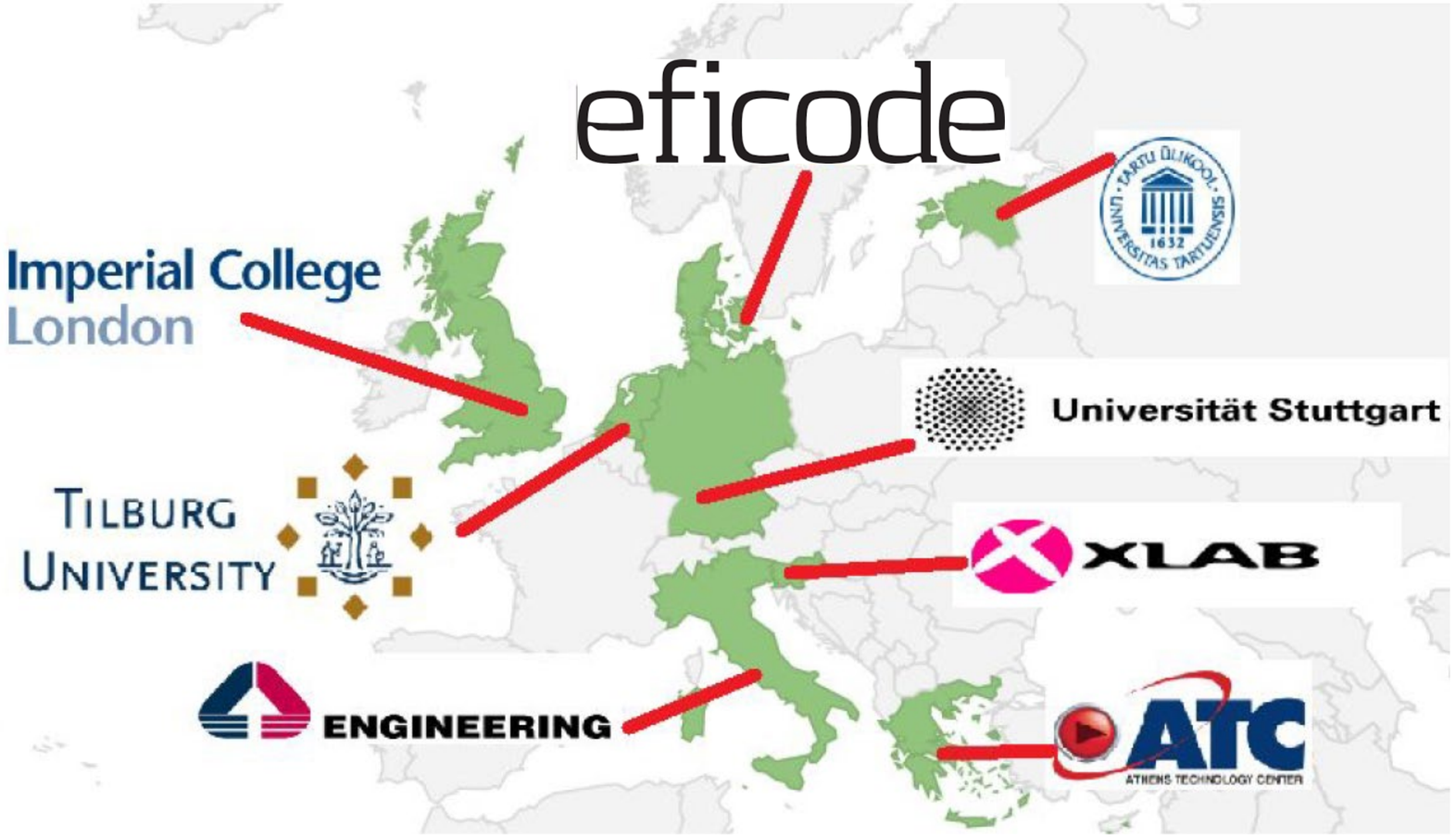
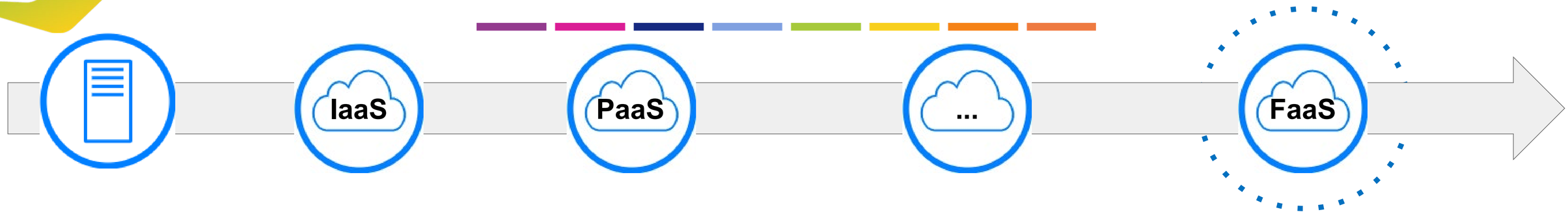
Imperial College London

RADON Consortium

- ICT-16-2018: Software Technologies
- 30 months project (Jan 2019 - Jun 2021) – 8 organizations

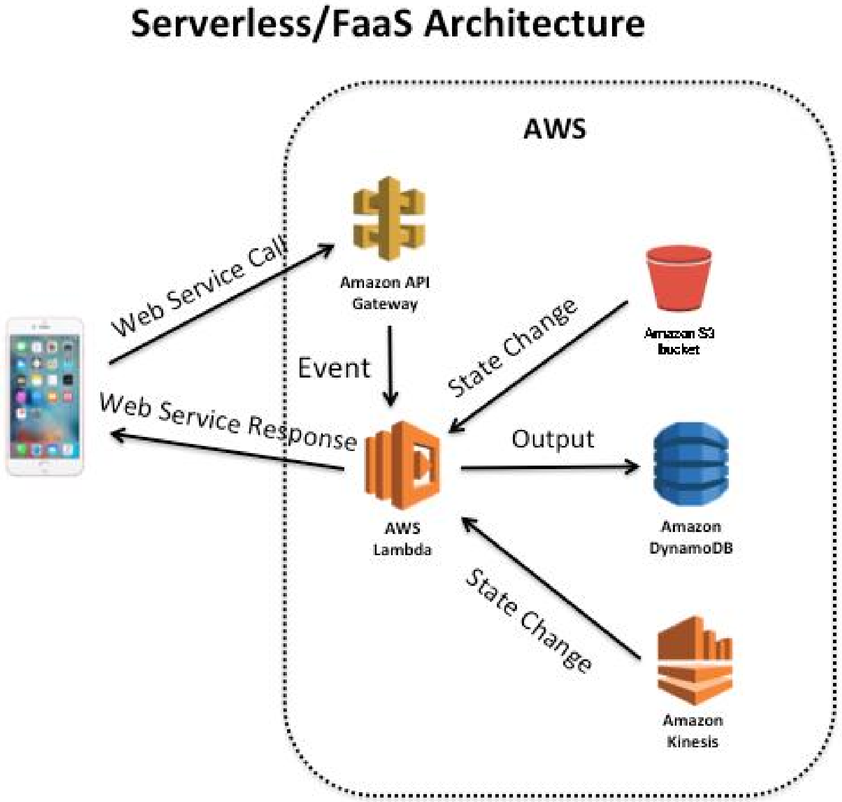


The Rise of Serverless FaaS



Serverless Function-as-a-Service (FaaS)

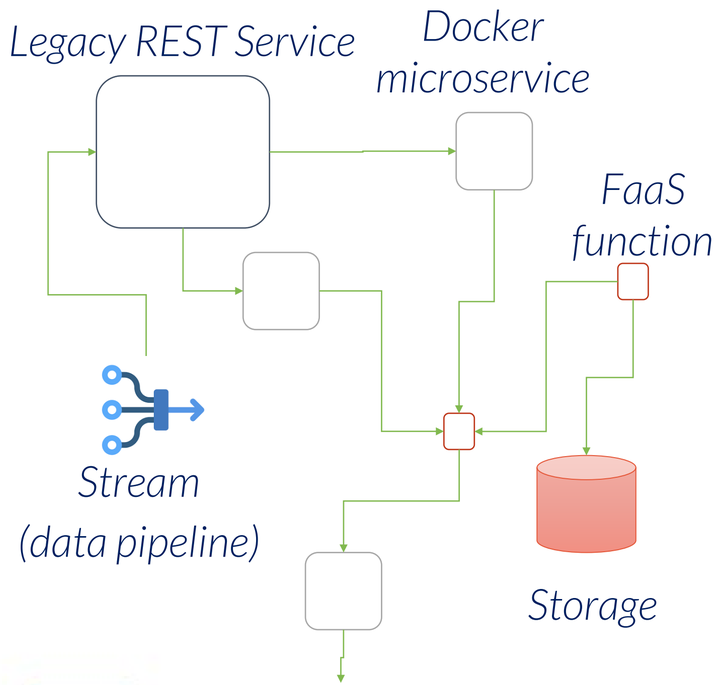
- Fine-grained functions hosted in the cloud and fully managed by the provider
- Cost-savings in event-driven workloads (e.g., IoT)
- Strong synergy with microservices
- Resource decoupling
  - stateless functions
  - state persisted via storage
  - state change can produce events



Source: Google Images

Challenges in DevOps for Serverless

- How to **deploy and update in continuous, DevOps fashion,** hybrid serverless-based applications?
- How to avoid vendor **lock-in**?
- How to choose an **optimal deployment** configuration respecting QoS requirements?
- How to **debug** infrastructure-as-code?
- How to best do **testing** and **monitor** outcomes?



Azure Functions

Amazon Lambda

APACHE OpenWhisk

docker

Google Cloud Functions

Benefits for the end user

RADON

A DevOps framework to help developing FaaS-based products without code & data lock-in

Embrace a technology shift

DevOps methods and tools
to automatically build & deploy
microservices & FaaS

Reduce the learning curve

Low cost and low risk

Multi-cloud serverless FaaS
Move/synch data between clouds
Compare and test alternatives
and their costs

Select best vendor
yet avoiding code & data lock-in risks

Embrace portability across business use cases

Hw/platform independent
TOSCA model facilitate reuse
and customization

Multi-tenant orchestration

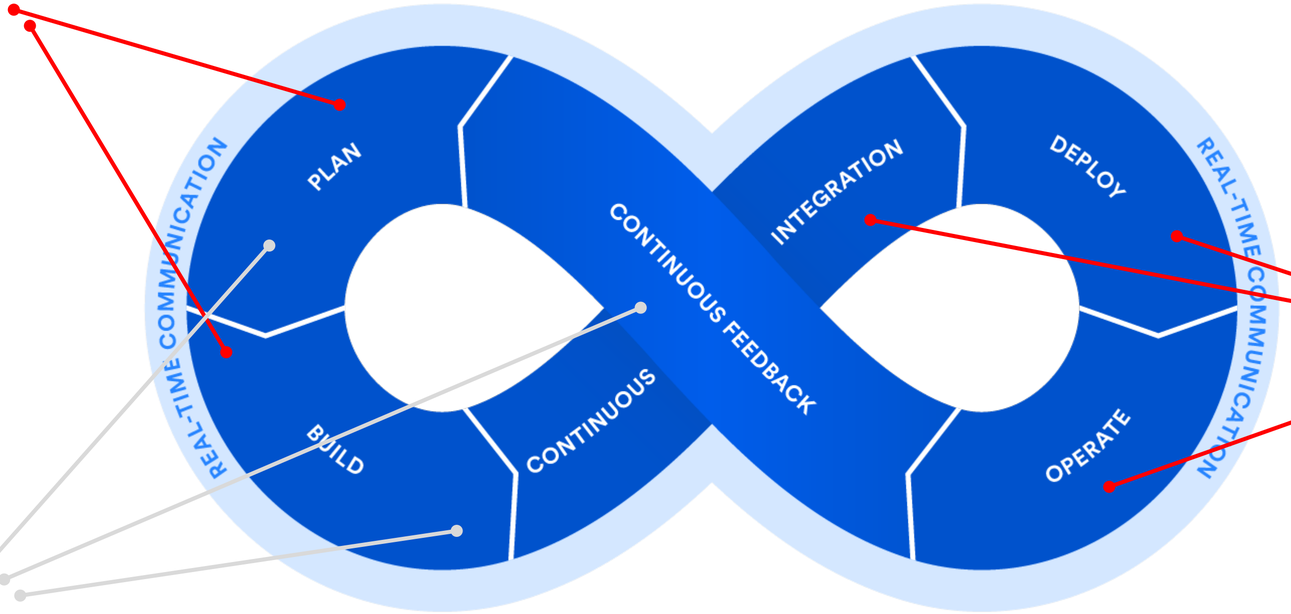
Model-based approach

RADON: modelling for serverless FaaS

- Easy-to-use composition of functions, microservices, storage, VMs, …
- Reuse modular element to assemble complex applications

1

Graphical Modeling



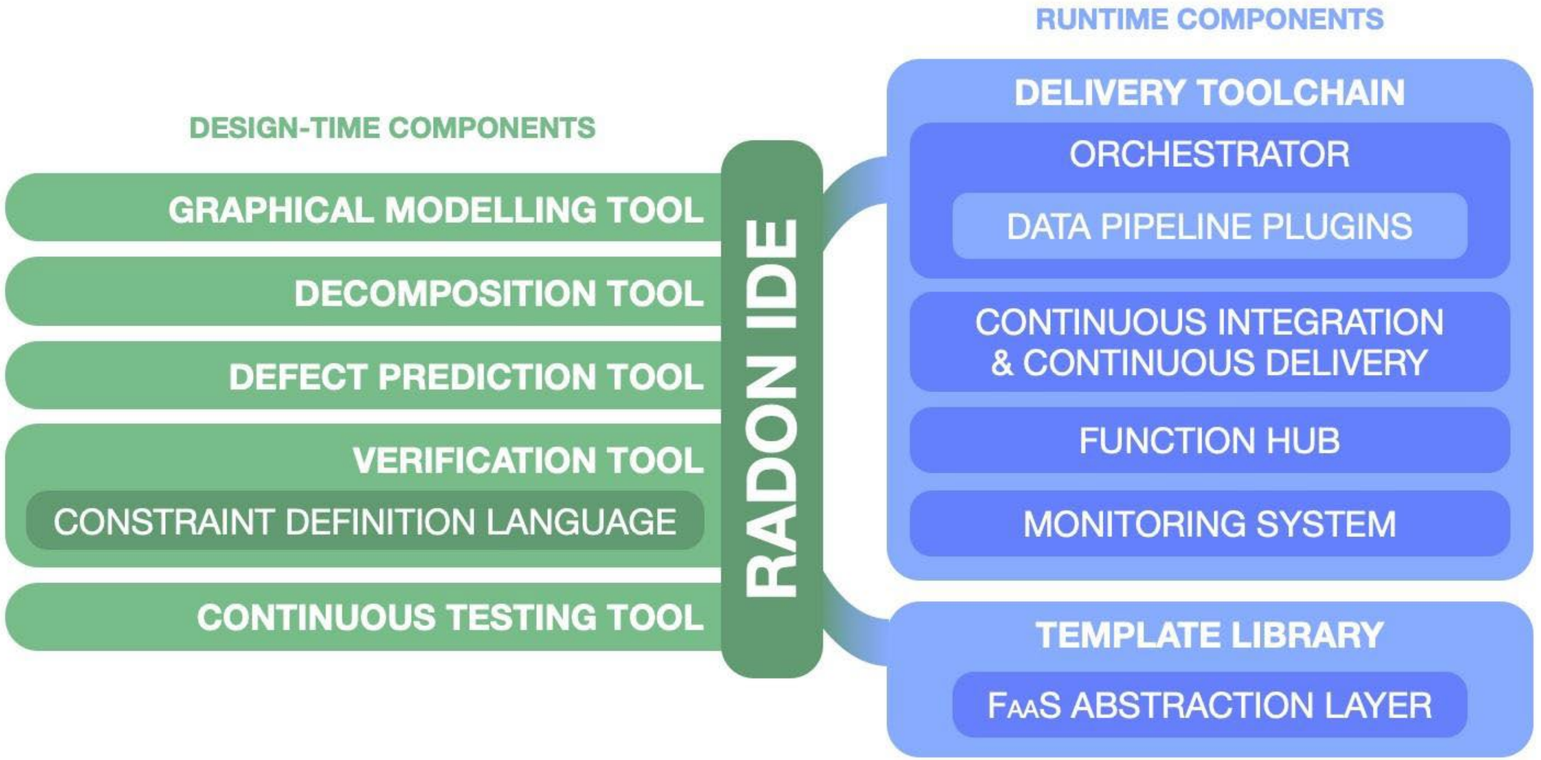
2

Model-based Delivery

3

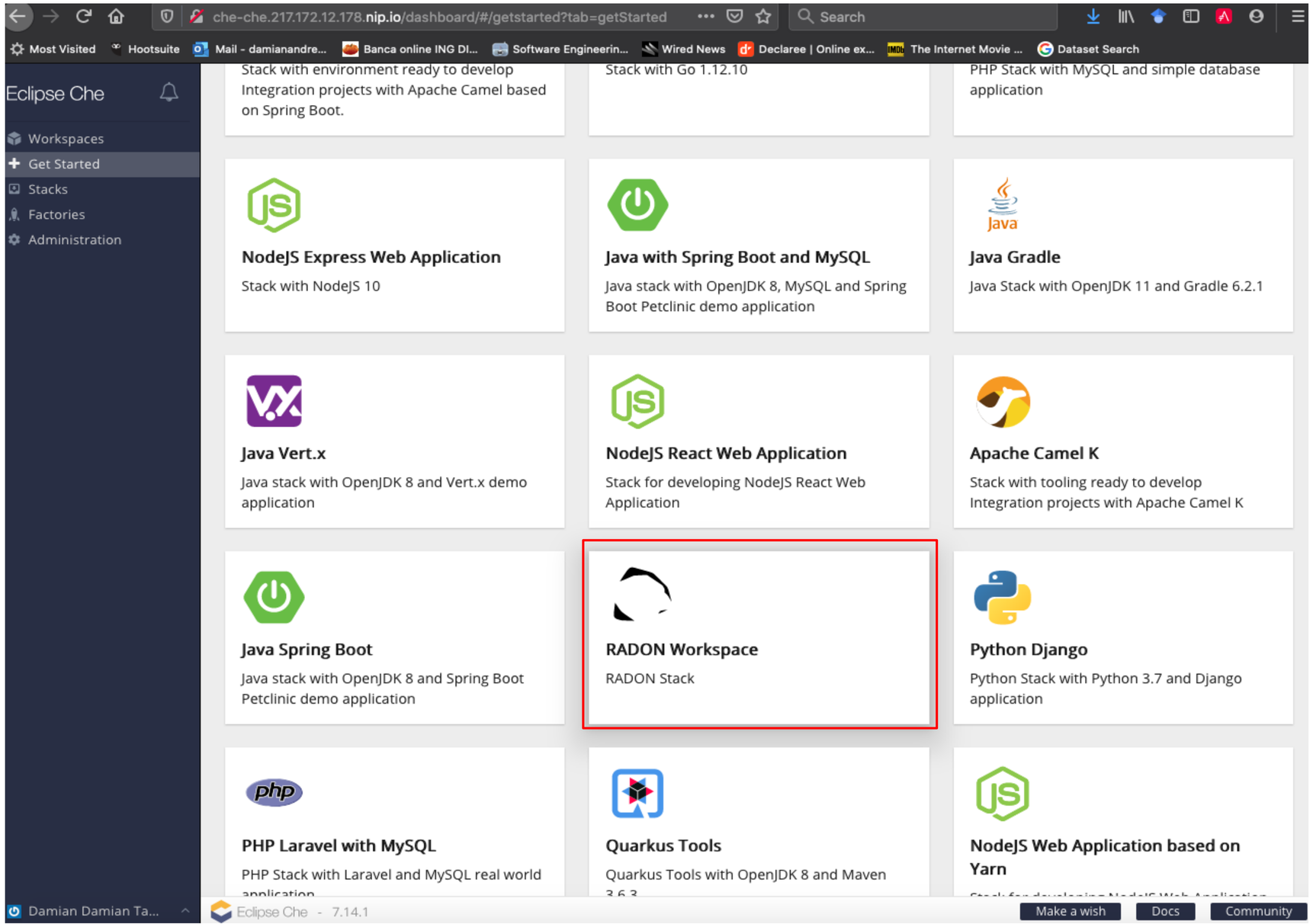
Quality Engineering

RADON Framework

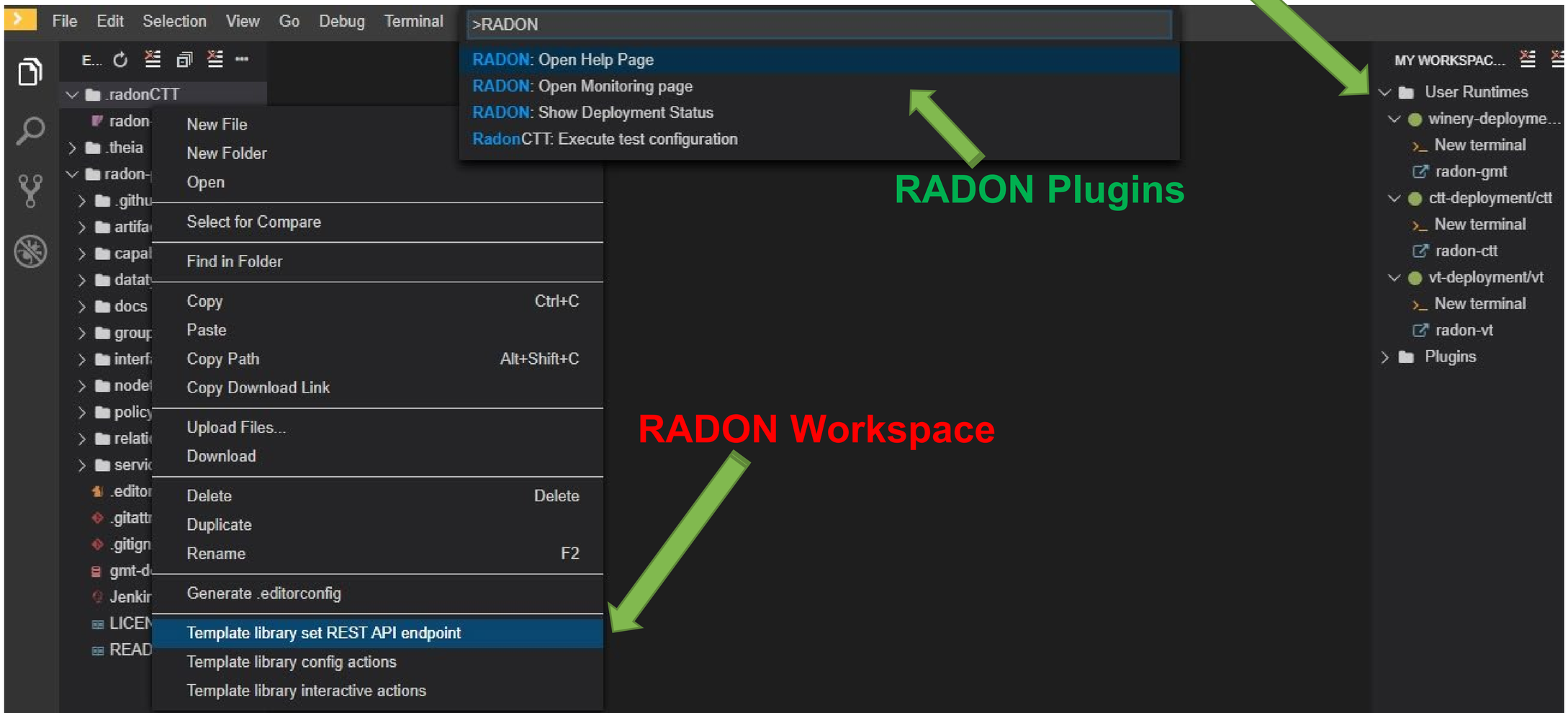


- Technical objectives*:*
  - A single **multi-user environment** to access all RADON artifacts;
  - A **front-end of the RADON methodology** enabling users to invoke RADON tools;

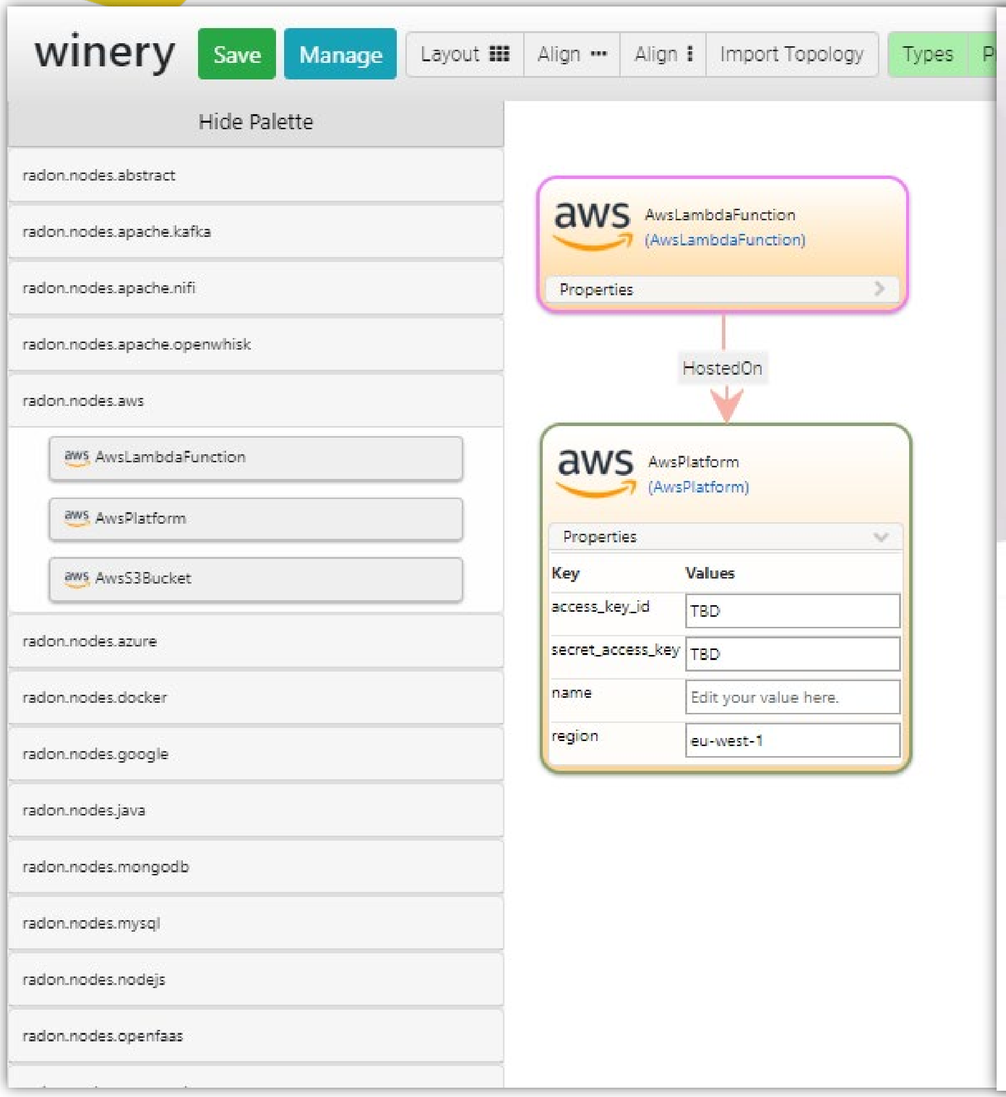
RADON IDE / Eclipse Che

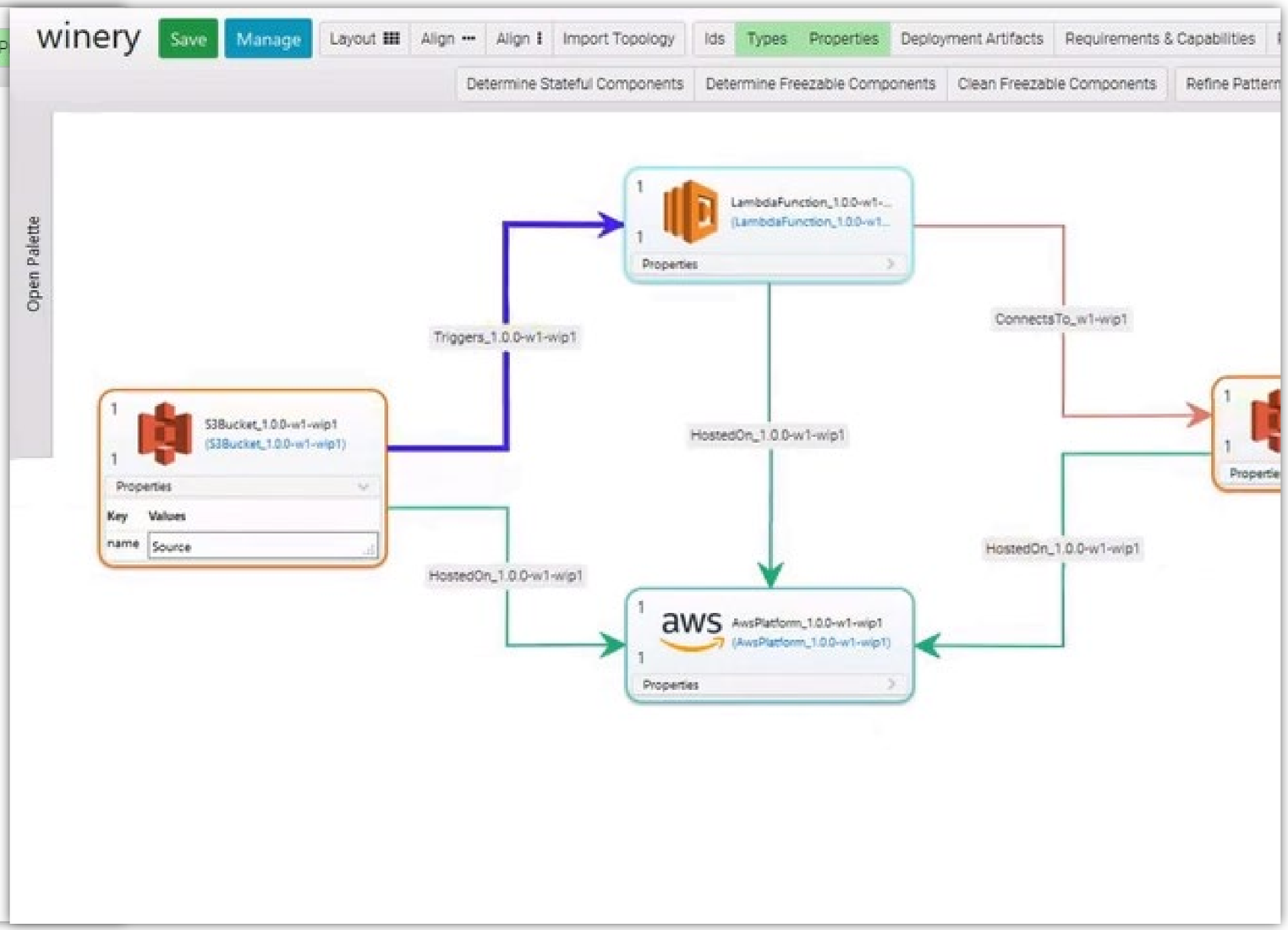


RADON IDE Integration

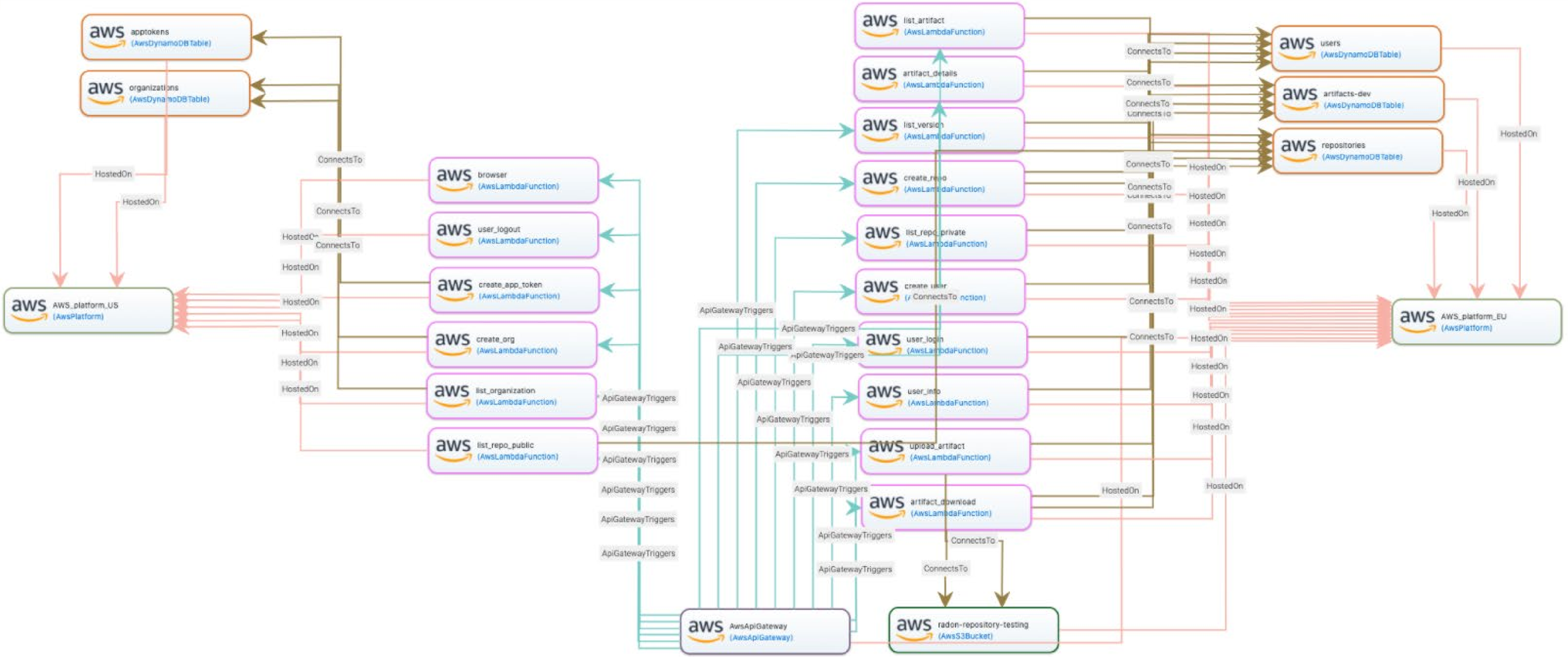


RADON Graphical Modeling



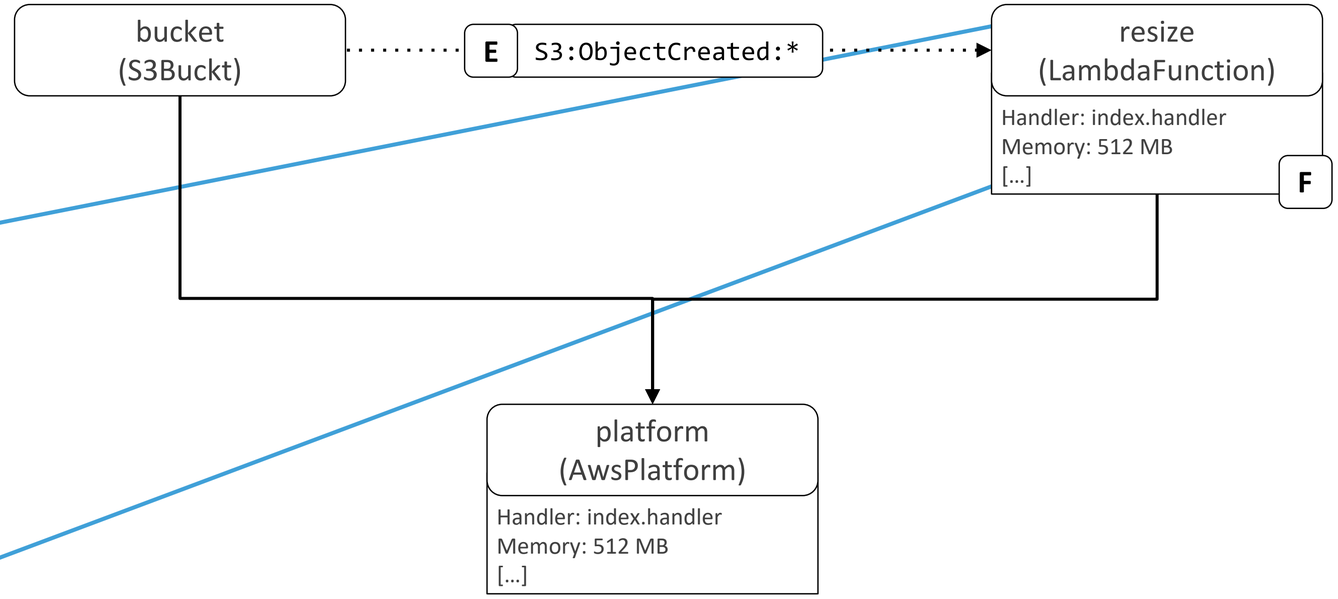


RADON Graphical Modeling



RADON Models

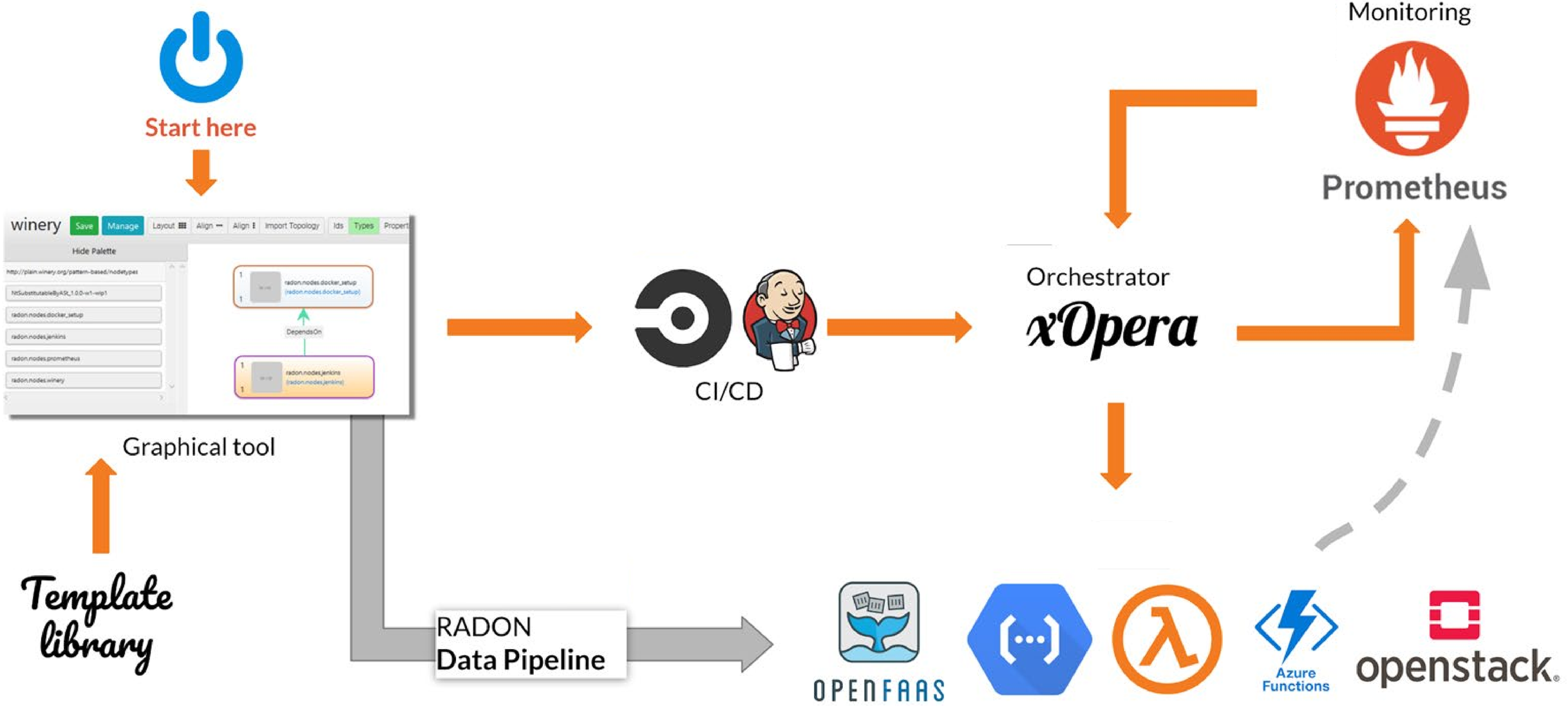

```
tosca_definitions_version: tosca_simple_yaml_1_3
  topology_template:
    node_templates:
      platform:
        type: radon.nodes.aws.AwsPlatform
        properties:
              # omitted for brevity
       resize:
        type: radon.nodes.aws.LambdaFunction
        properties:
          handler: index.handler
          memory: 512
              # ...
        artifacts:
          deployment_package:
            file: thumbnail.zip
            type: radon.artifacts.archive.Zip
        requirements:
          - host: platform
      bucket:
        type: radon.nodes.aws.S3Bucket
        requirements:
          - host: platform
          - invoker:
              node: resize
              relationship: trigger
```



Models **automatically deployable** using the RADON orchestrator.

Compatible with OASIS TOSCA standard.

RADON Delivery toolchain



Quality Guardrails in RADON

1. Create model
2. Run verification
e.g., GDPR constraints

Verification Tool

[All constraints verified]

1. Extract *product* metrics
(e.g. # lines of code)
2. Extract *delta* metrics
(between two successive releases)
3. Extract *process* metrics
(e.g., # modifications to the file in a release)
4. Run detection

Defect Prediction Tool

1. Create tests
2. Run tests

Continuous Testing Tool

DEPLOY

Application Source Code

```
int div(a, b):
  return a/b
```

Possible division by zero

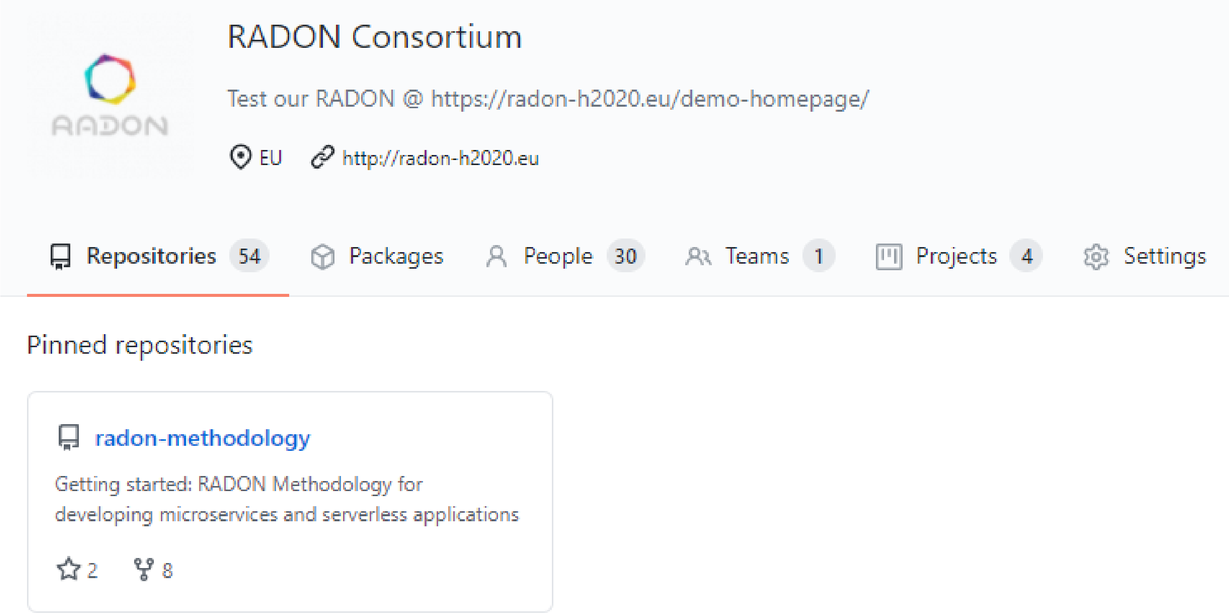
...

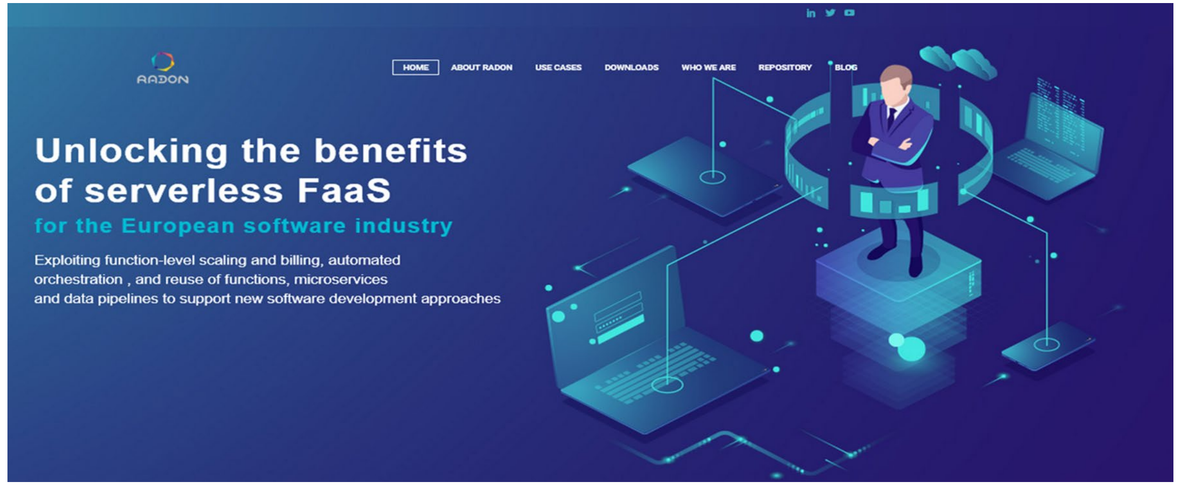
```
- name: "foo"
  include: es-template.yml
  when: es_templates
  when: es_templates | bool
```

Infrastructure Code

this makes the application behave wrongly

More about RADON





https://github.com/radon-h2020

https://radon-h2020.eu/

cf. YouTube videos

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