Rapid prototyping of cloud applications with open source tools

(A research perspective)

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Cloudification Approaches

Approach 1: 'Medieval Cloudification'
(alias: Virtual Machines)

your app

the cloud

[Source: annor.de]
Cloudification Approaches

Approach 2: 'Guru Cloudification'
(alias: Containers)
Cloudification Approaches

Approach 3: 'Back to the Future Cloudification' (alias: Functions and Unikernels)

your app

functions

[Source: tfaw.com]
## Approach Comparison

Highly scientific, interdisciplinary, 10 person minutes effort.

<table>
<thead>
<tr>
<th>Approach</th>
<th>Technology</th>
<th>Where to Run</th>
<th>How to Build</th>
</tr>
</thead>
<tbody>
<tr>
<td>Medieval</td>
<td>VMs</td>
<td>OpenStack, CloudStack, ...</td>
<td>vmdebootstrap, Packer</td>
</tr>
<tr>
<td>Guru</td>
<td>Containers</td>
<td>Kubernetes, OpenShift, CF, ...</td>
<td>Dockerfiles, Packer</td>
</tr>
<tr>
<td>Back to the Future</td>
<td>Functions, Unikernels</td>
<td>OpenWhisk, Funktion, Snafu...</td>
<td>Podilizer, Termite, Lambada</td>
</tr>
<tr>
<td>Hybrid</td>
<td>all combined!</td>
<td>???</td>
<td>???</td>
</tr>
</tbody>
</table>

Mission of the SPLab: Make it easier to get your apps running in the cloud as successful services, independent of technology, economically viable, through rapid prototyping.
Service Prototyping Lab

Our team (including fellow ICCLabbers)
Lab Competencies

- People
- Qualifications
- Technical Means
- Engagement

Your Challenges

- SPLAB
- Your Commercial Success

- Labsite
- Open Source Software
- Rapid Publications
- Reproducible Testbeds
Lab Research Initiatives

Service Prototyping Lab - Your academic partner for complex cloud projects

Service Prototyping Lab

- **Cloud-Native Applications** (concepts, patterns, designs)
  - prepare suitable design
  - measure and metter

- **Service Tooling** (advanced cloudification tools)
  - add revenue flow

- **Cloud Accounting and Billing** (rating, charging, billing)
  - automate cloud-readiness
  - advance application features

- **Cloud Robotics** *(hybrid cloud-robotic platforms and applications)*
- **Cloud Applications Management** *(deployment, orchestration)*
- **Cloud Infrastructure** *(enablers for deploying and running applications)*

* in conjunction with the ICCLab for platform-level research and innovation

Software Application Engineer

SaaS Provider
Research: Cloud-Native Applications

Why cloud-native?

- leveraging microservice advantages
- fully exploiting capabilities of cloud computing environment
- aiming for high resilience, elasticity and cost effectiveness
- using adaptivity to maintain vendor independence
Cloud-Native Applications Spotlight

Challenge of Swiss company:

«Migrate document management into the cloud»

Our research contribution:

• identification of legacy structure → in-house development / consulting
• outlining modernisation steps
• critical verification of vendor claims (microservice compositions, DBaaS)
• extension with new features: microbilling, advanced multi-tenancy
• experiments to confirm prototypical direction

Outcome:

Confidence that product will be successful in the next decade
Research: Service Tooling

Today’s tooling is inadequate
- ancient IDEs and toolchains
- newer developments: all-cloud, but aimed at replacing, rather than extending
- more tools are needed to make cost-effective production of cloud apps viable

\[\text{Python} \rightarrow \text{Podilizer} \rightarrow \text{Lambda} \]
\[\text{Java} \rightarrow \text{RAML} \rightarrow \text{dockerised mockup service}\]
Service Tooling Spotlight

Challenge of Swiss company:

«Complement our portfolio with a serverless offering»

Our research contribution:

• review and comparison of state of the art
• architecture for multi-tenant isolated function execution
• migration tools for functions currently deployed in other cloud providers

Outcome:

Serverless offering is actively marketed and will be piloted
Research: Cloud Accounting & Billing

How cloud billing evolved...

<table>
<thead>
<tr>
<th>Year</th>
<th>Unit</th>
<th>Measurement</th>
</tr>
</thead>
<tbody>
<tr>
<td>1997</td>
<td>months</td>
<td>resources</td>
</tr>
<tr>
<td>2007</td>
<td>hours</td>
<td>resources</td>
</tr>
<tr>
<td>2017</td>
<td>milliseconds</td>
<td>resources</td>
</tr>
<tr>
<td>2027</td>
<td>milliseconds</td>
<td>biz metric</td>
</tr>
</tbody>
</table>

How to assess the business value of code...

- rules specifications
- iterative refinement
- differentiated rating and charging
Cloud Accounting & Billing Spotlight

Challenge of Swiss company:

«Lack of flexible automated billing solution for cloud services»

Our research contribution:

• architecting a cloud-native, microservice-driven framework
• scalable rule engine capable of modelling complex billing models
• stress tests to benchmark the created framework processing capacity
• real world use case studies validating the flexibility claims

Outcome:

Several known community deployments, growing and active community around our solution
Service Prototyping Lab

How to partner with us

How to get the best results
• identify your challenges & pain points
• let us do the rest (dividing research/innovation/engineering work)
• data point: after about 21 months → 24 code repositories @ GitHub