CHALMERS
UNIVERSITY OF TECHNOLOGY

Joel Scheuner ✉ scheuner@chalmers.se @joe4dev
Software Engineering Division | Computer Science and Engineering Department

Programming Abstractions for Composing Serverless Applications

Motivation

"Why is there no cloud button?"
UC Berkely Professor [1]

"[…] but if I can move one layer up where I'm just writing business logic and the code gets split up appropriately, that's real magic."
Serverless is eating the stack [2]

"We don't yet have the Rails of serverless"
Comment on Serverless is eating the stack [2]

→ We need programming model abstractions to build and compose larger Serverless applications.

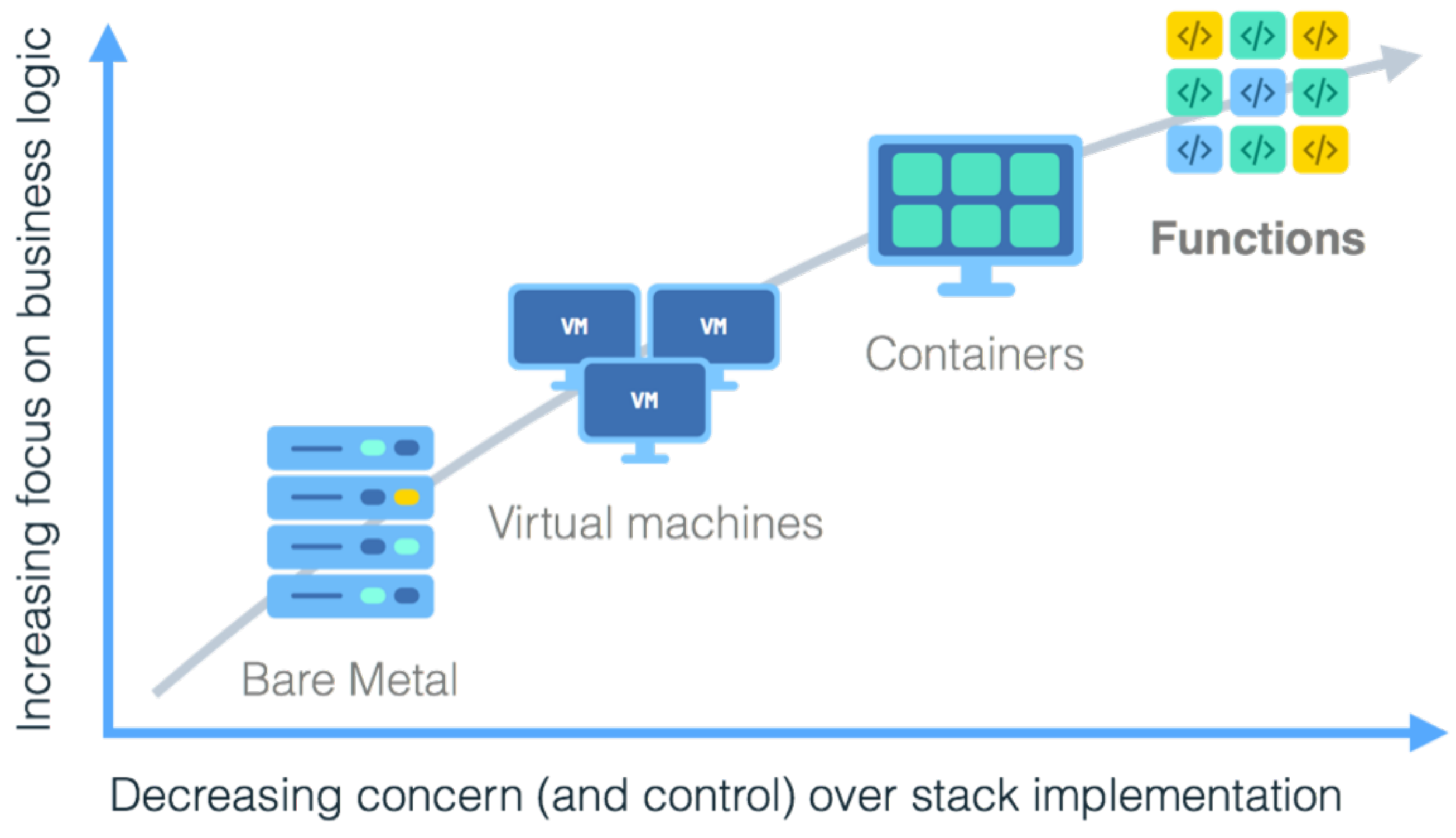
Background

What is Serverless?

A cloud-native platform [3]

- for short-running, stateless computation
- end even-driven applications
- which scales up and down instantly and automatically
- and charges for actual usage at millisecond granularity

Why Serverless?


Increasing focus on business logic
Functions
Containers
VM
VM
VM
Virtual machines
Bare Metal
Decreasing concern (and control) over stack implementation

Research Question

How can we map (existing) single-machine code into applications composed of scalable cloud functions?

Related Work

[1] PyWren: run Python code in AWS Lambda

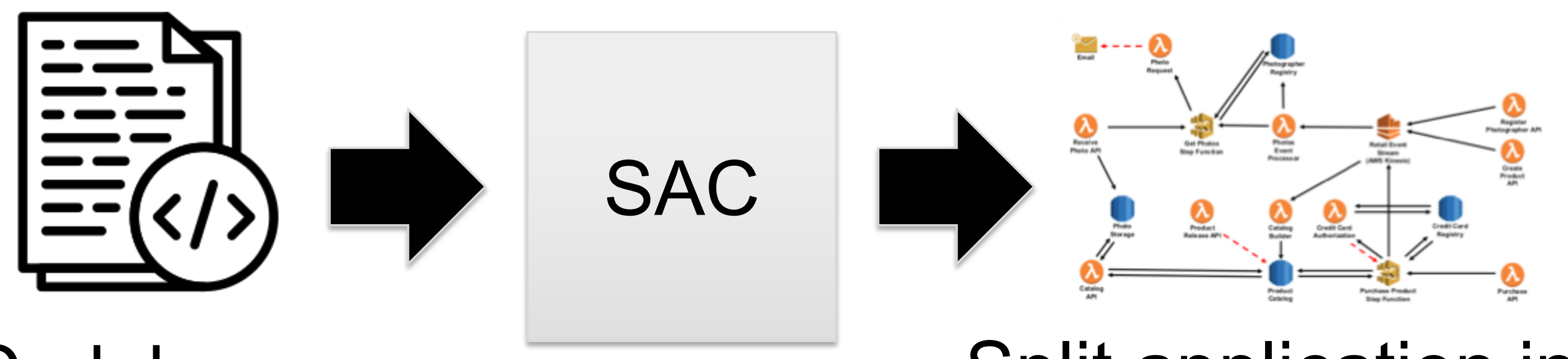
[4] The Serverless Trilemma: black box, substitution principle, no double-billing

[5] Apache OpenWhisk Composer: new programming model for composing cloud functions

[6] AWS Step Functions: serverless orchestration for modern applications as visual state machine

[7] Fission: Workflow-based function composition

Serverless AppCode (SAC) Prototype



Codebase

Split application into small deployment units

Challenges

- Notion of side-effects
- Integration of 3rd party services

Future Work

- Extend prototype and test with use cases
- Optimize deployment at runtime based on live monitoring data

References

[1] Occupy the cloud: distributed computing for the 99%, E. Jonas et al., Symposium on Cloud Computing (SoCC), 2017

[2] Serverless is eating the stack. URL: https://read.acloud.guru/serverless-is-eating-the-stack-and-people-are-freaking-out-and-they-should-be-431a9e0db482

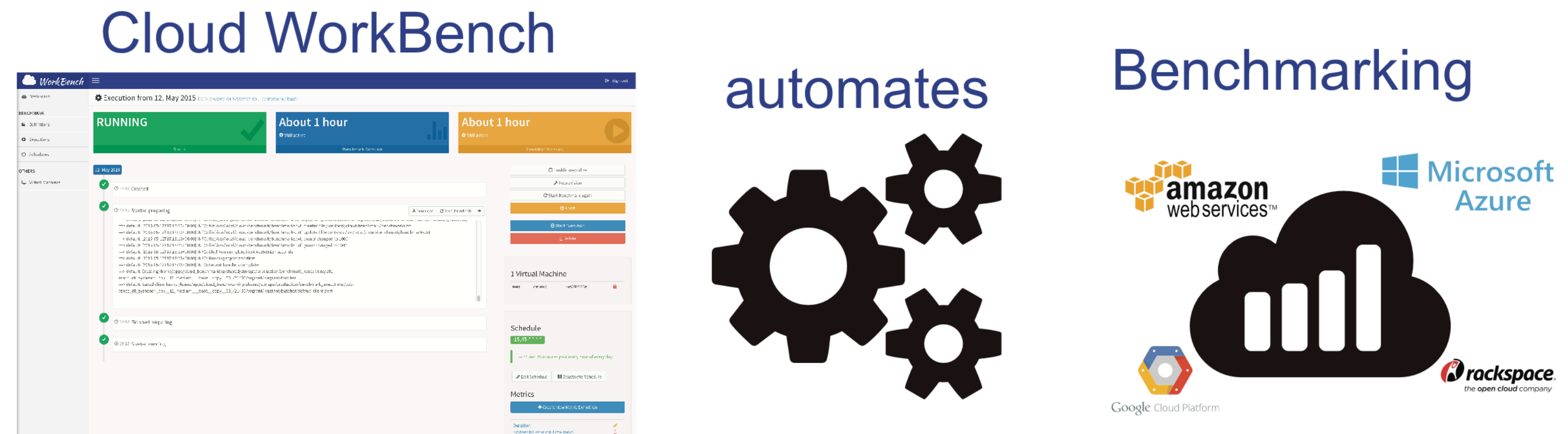
[3] Status of Serverless Computing and Function-as-a-Service(FaaS) in Industry and Research, G. Fox et al. Report from the 1st Workshop on Serverless Computing (WoSC), 2017

[4] The Serverless Trilemma: Function Composition for Serverless Computing, I. Baldini et al., Onward!, 2017

[5] https://github.com/apache/incubator-openwhisk-composer

[6] https://aws.amazon.com/step-functions/

[7] Addressing Performance Challenges in Serverless Computing, E Van Eyk, 2018



Cloud WorkBench automates Benchmarking IaaS Cloud Providers

Recent Publications

- Estimating Cloud Application Performance Based on Micro-Benchmark Profiling, IEEE CLOUD'18
- Performance testing in the cloud. How bad is it really?, preprint, 2nd
- A Cloud Benchmark Suite Combining Micro and Applications Benchmarks, QUDOS'18@ACM/SPEC ICPE

https://github.com/sealuzh/cloud-workbench