

Beyond Microbenchmarks

The SPEC-RG Vision for
A Comprehensive Serverless Benchmark

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HotCloudPerf @ ICPE 2020



SPEC RG CLOUD Serverless Activity

Exploring community-wide (performance) challenges in serverless computing.



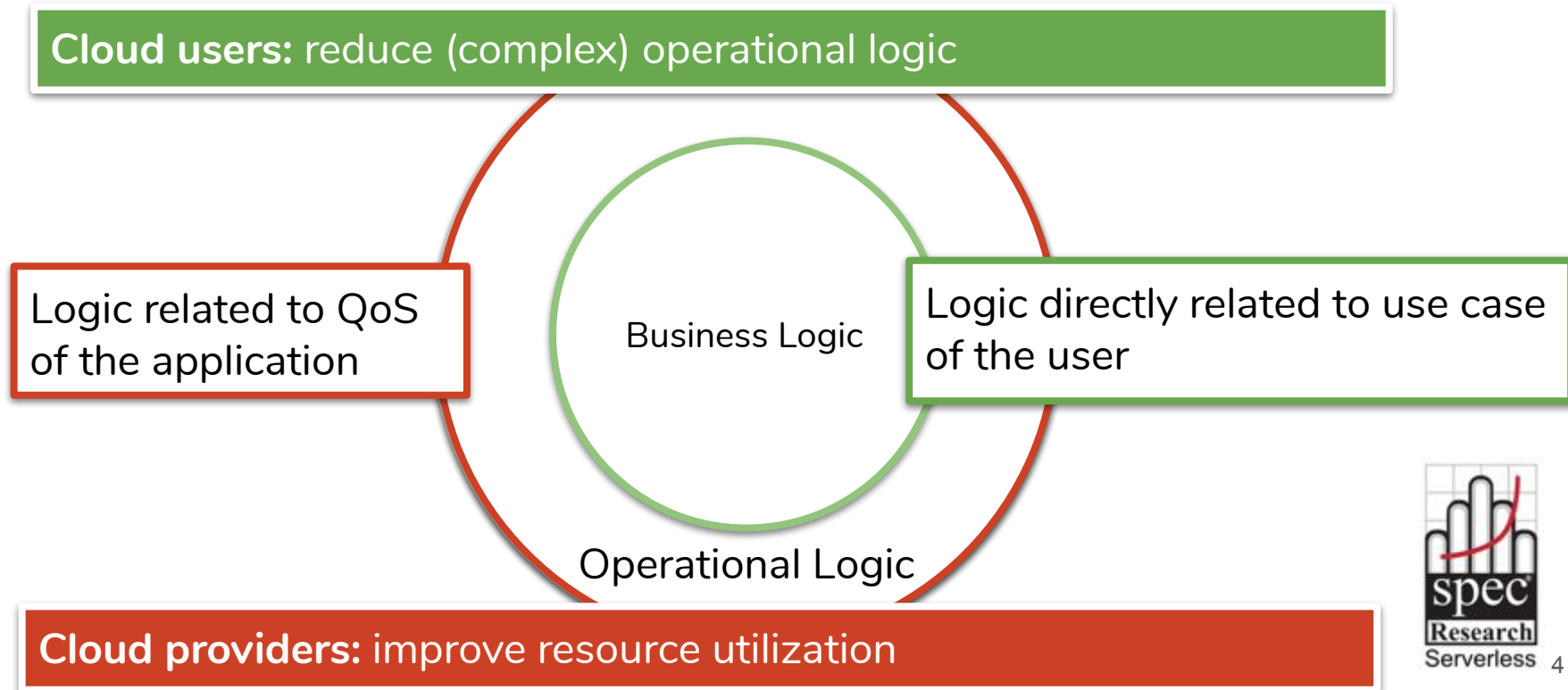
<https://research.spec.org/working-groups/rg-cloud.html>

Outline

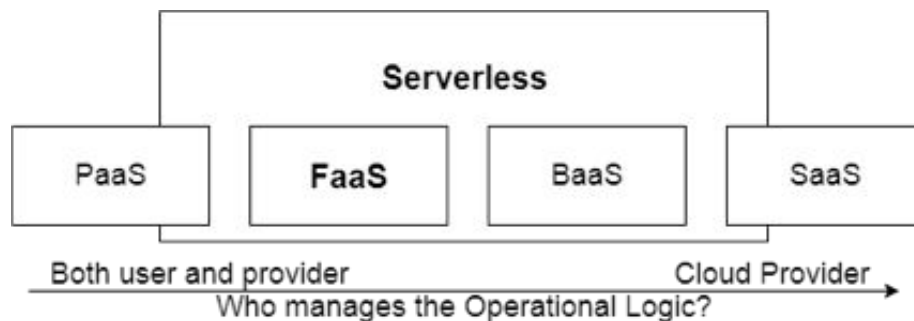
1. An introduction to serverless computing.
2. Their current state and challenges.
3. Motivations for a (new) serverless benchmark.
4. Goals and design of the benchmark.
5. Roadmap

Serverless computing is in a desperate need of more benchmarks, which require your expertise.

Decomposing cloud applications



Serverless and Function-as-a-Service



Serverless Computing

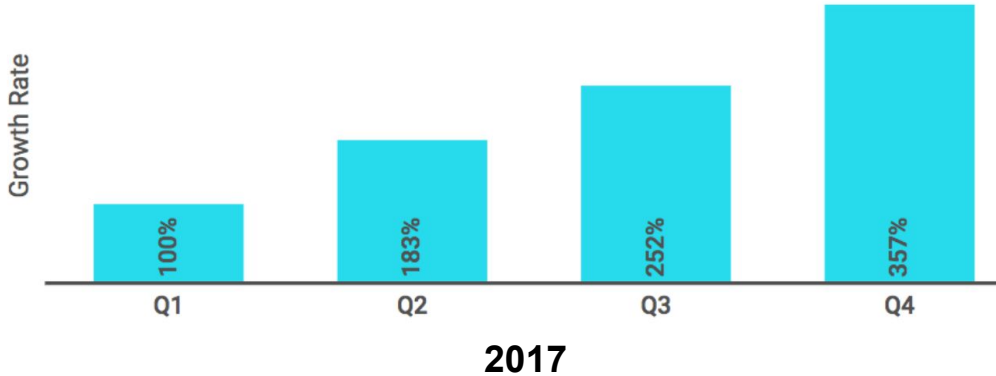
1. Minimal operational logic
2. Granularly billed, by usage
3. Event-driven executions

Function-as-a-Service (FaaS)

- A form of serverless computing
- User provides a function (source)
- cloud provider deploys and manages the function

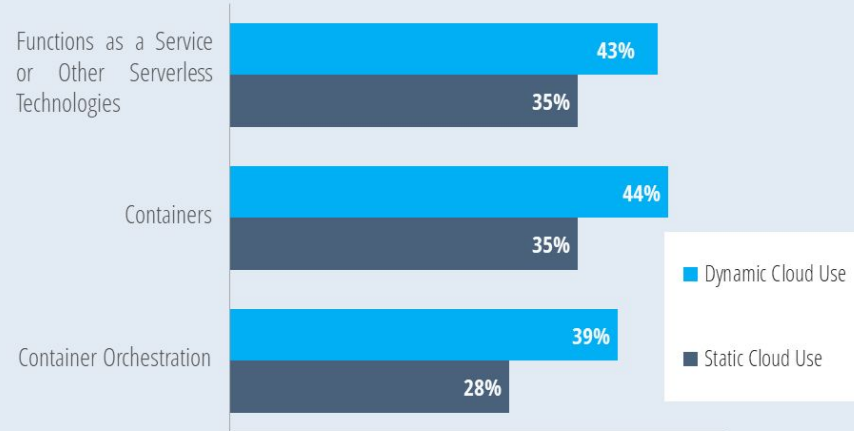
Function-as-a-Service Market estimated to be worth **\$7.72 Billion** by 2021

Adoption of FaaS (AWS Lambda)



Gartner 2017 Function-as-a-Service is one of the top trends in cloud computing.

Serverless Matches Container Adoption



Source: The New Stack Analysis of a February 2017 survey of 500+ IT professionals (<https://newrelic.com/content/dam/newrelic/resources/ebooks/cloud-survey-report-ebook.pdf>). Static Cloud: Public cloud used to some extent but applications are managed like before. Dynamic Cloud: A significant portion of strategic workloads are run in the public cloud and the enterprise is able to agilely re-allocate resources.

THE NEW STACK

Tools



Security



Framework



Hosted Platform



Installable Platform

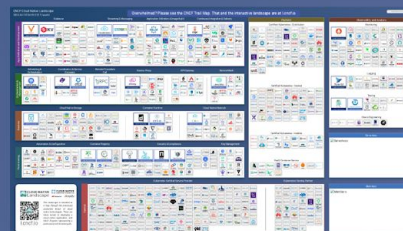


s.cncf.io

Serverless computing refers to a new model of cloud native computing, enabled by architectures that do not require server management to build and run applications. This landscape illustrates a finer-grained deployment model where applications, bundled as one or more functions, are uploaded to a platform and then executed, scaled, and billed in response to the exact demand needed at the moment



Cloud Native Landscape



Key problem: how to compare FaaS platforms?

Conceptually

Functionally

Architecturally

Performance-wise



Azure
Functions

or



Amazon
Lambda

Challenges of benchmarking FaaS platforms

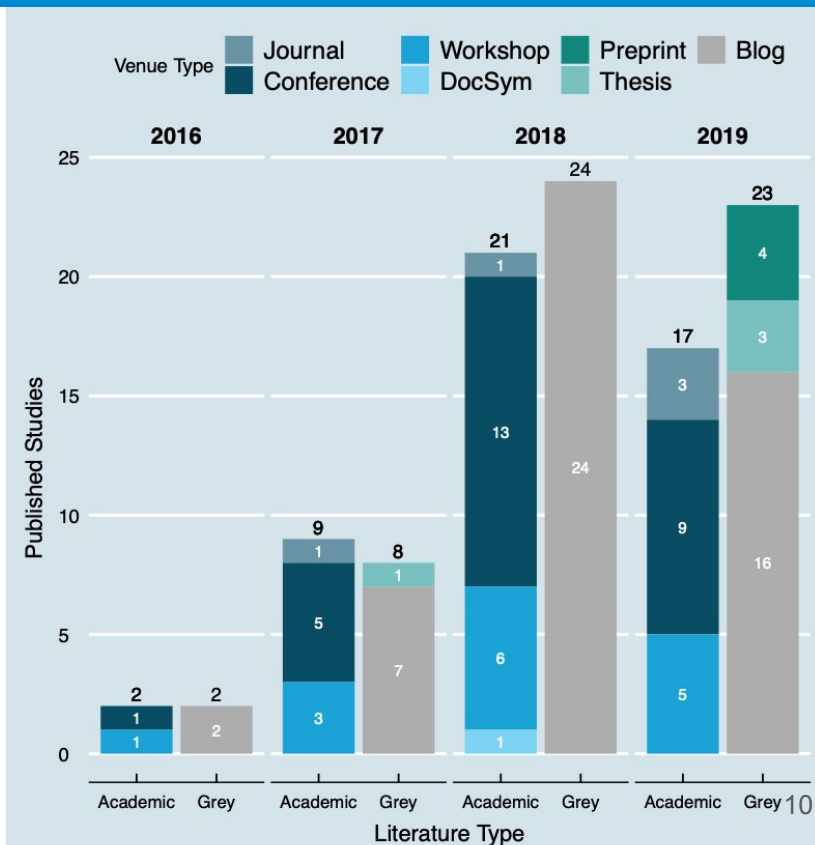
1. Performance requirements
2. Opaqueness of the systems
3. System heterogeneity
4. Complex ecosystems

The need for yet another serverless benchmark

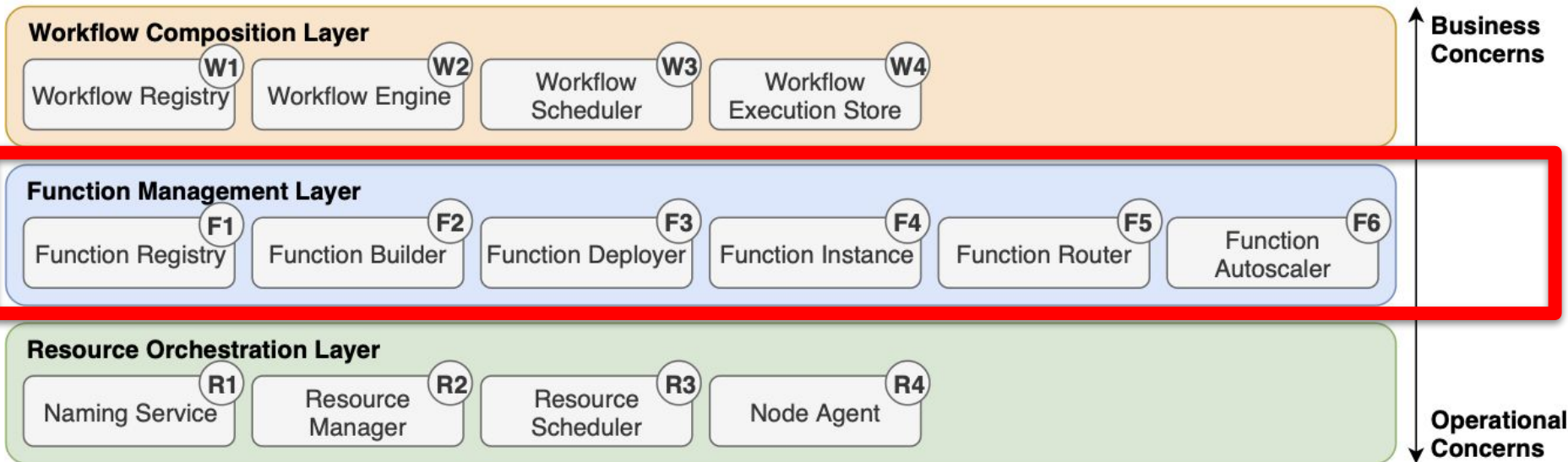
Prior performance evaluation studies exist, but tend to use microbenchmarks to focus only on...

1. Hardware-resource performance
2. Start-up latency
3. Concurrency and elasticity

Scheuner, Joel, and Philipp Leitner. "The State of Research on Function-as-a-Service Performance Evaluation: A Multivocal Literature Review." arXiv preprint arXiv:2004.03276 (2020).



Scope of the serverless benchmark



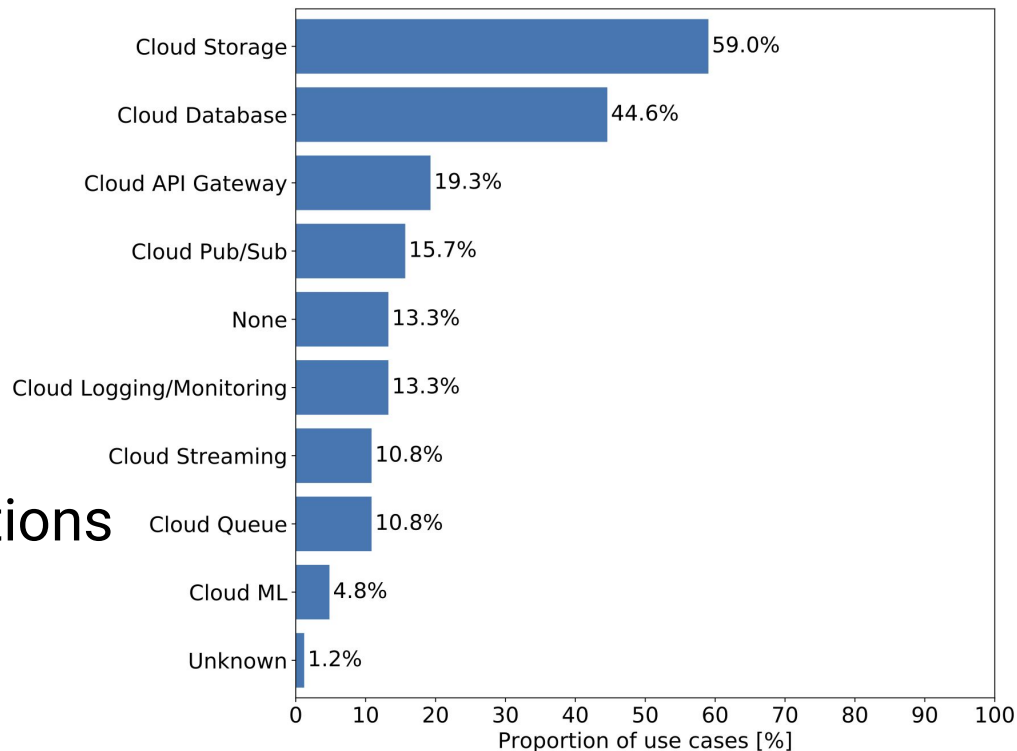
Scope of the serverless benchmark (2)

Focus on cost

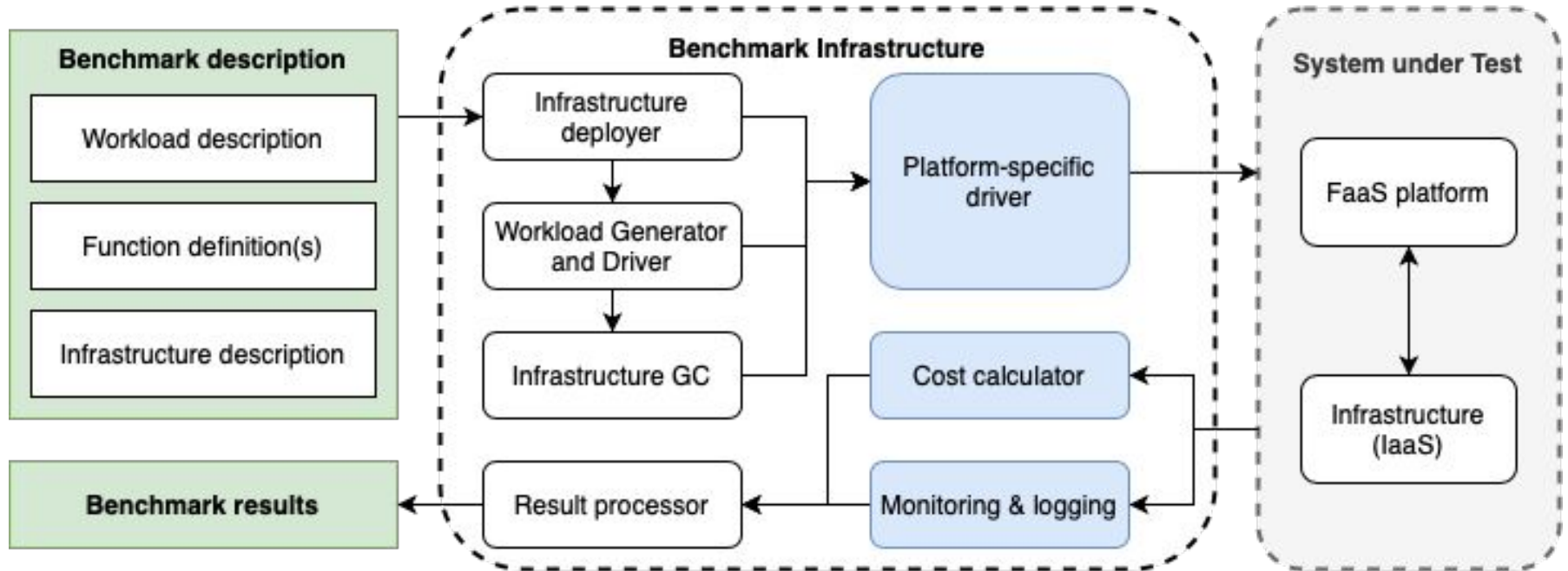
Support open-source platforms

Realistic applications

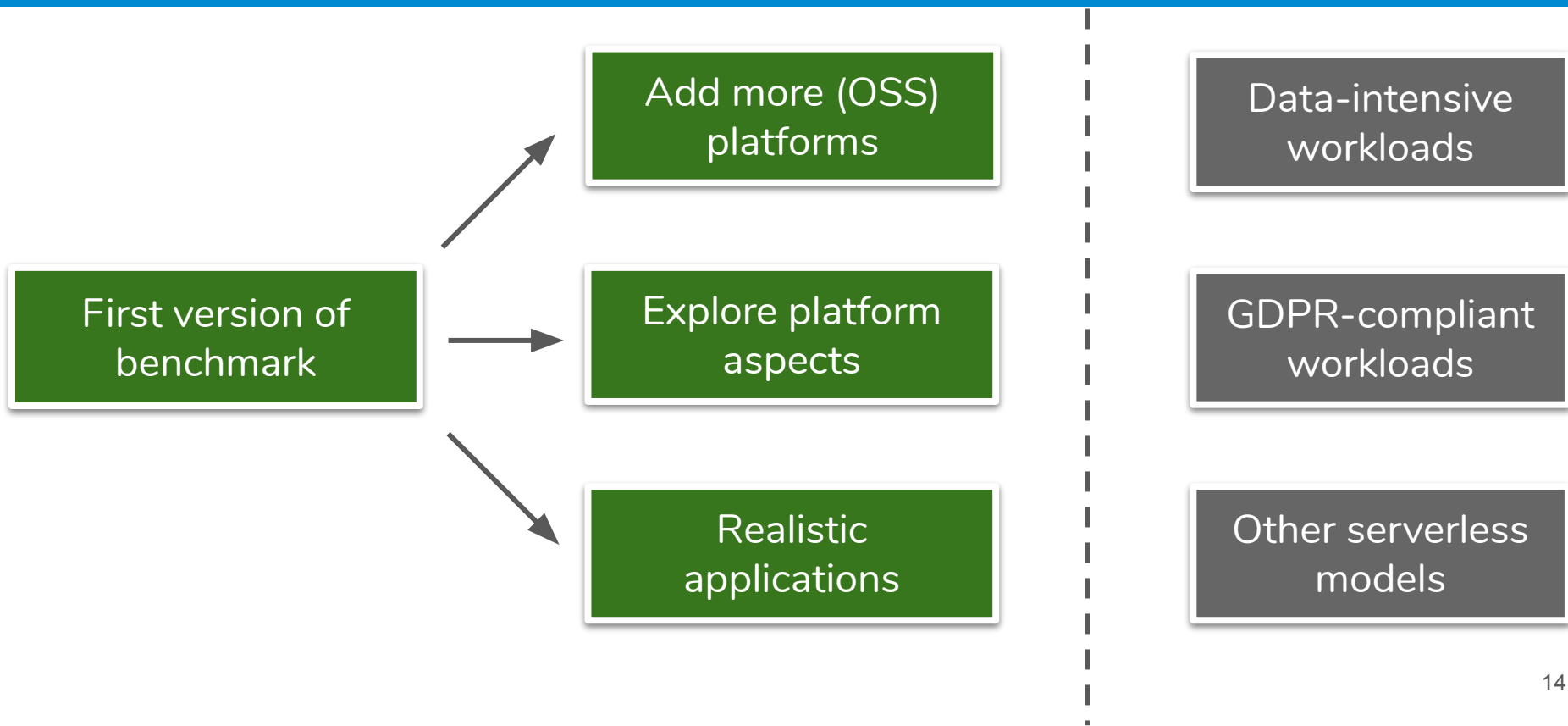
Evaluate external service integrations



Serverless benchmark design



Roadmap and future work



Take-away message

Serverless computing is (still) in a desperate need of more benchmarks, which require your expertise.

Interested in serverless computing? Join us!



<https://research.spec.org/working-groups/rg-cloud.html>



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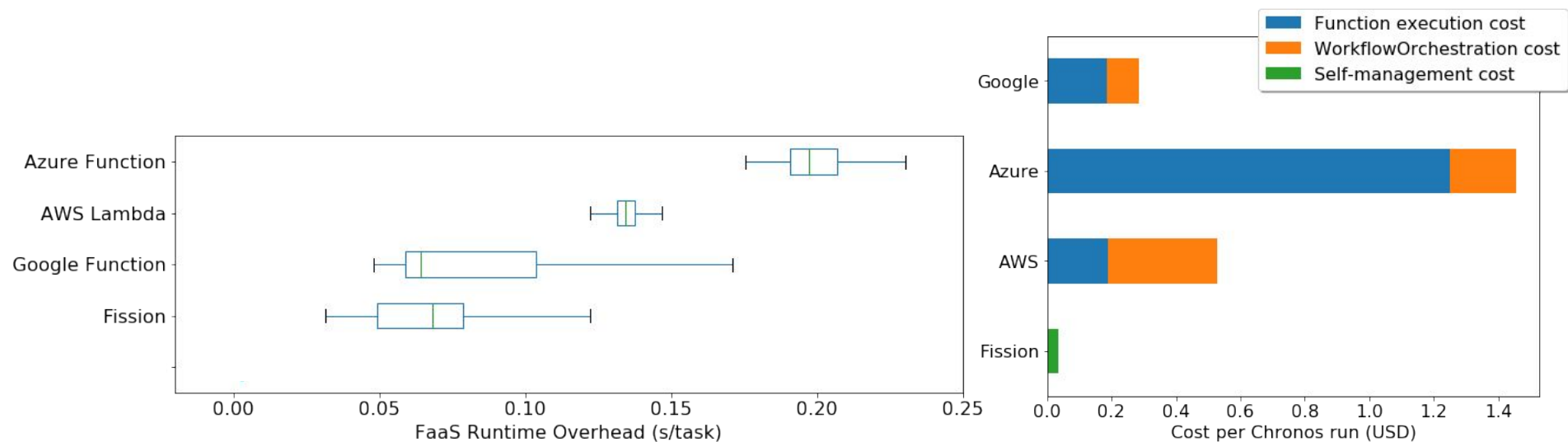


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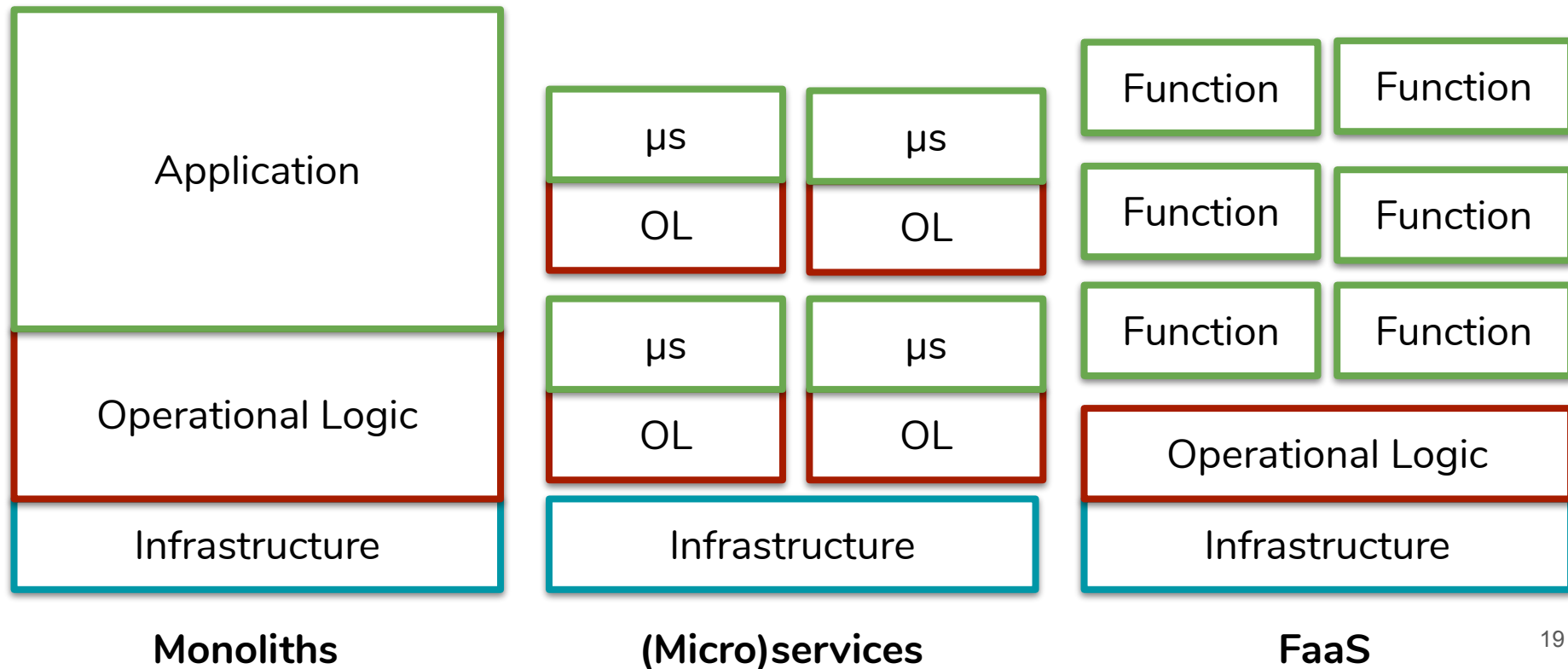
Additional Slides

Challenges of benchmarking FaaS platforms (2)

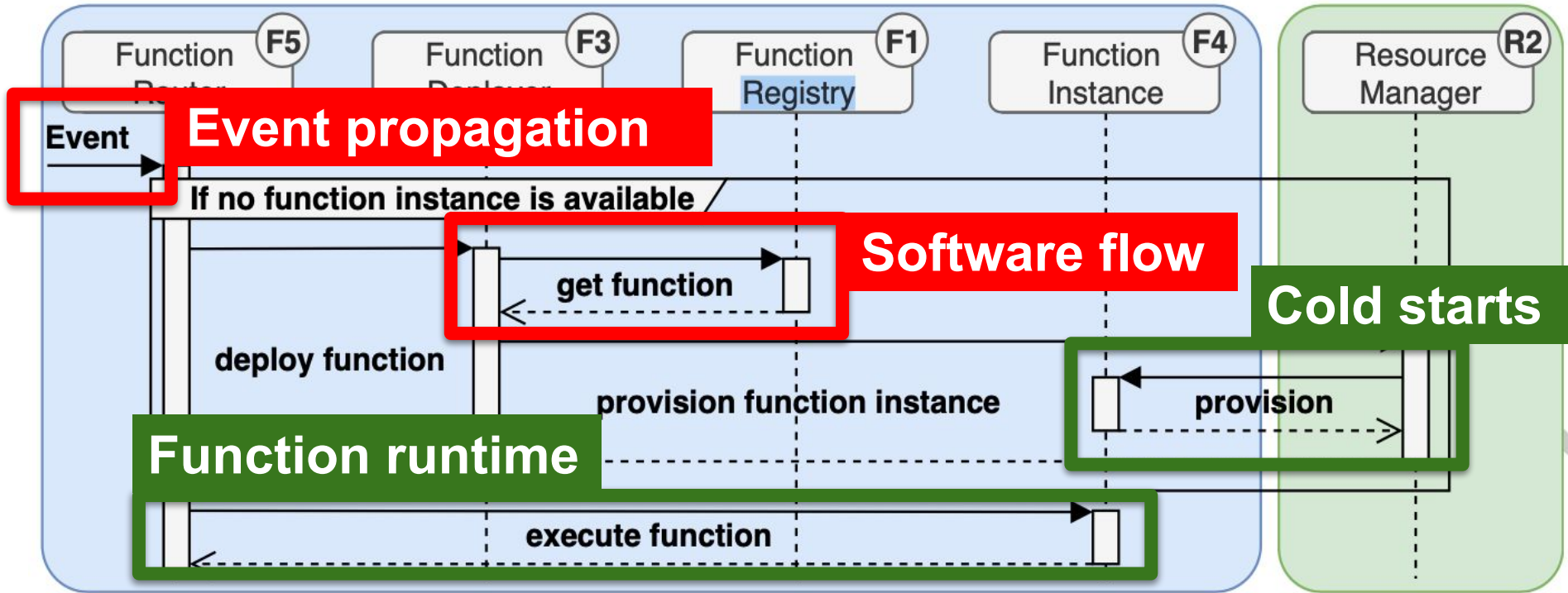


Motivating experiments: performance and cost differences are non-negligible.

Evolution of cloud application architectures



Scope of the serverless benchmark (2)



The goal of SPEC RG CLOUD - Serverless

Contributing to a deeper understanding of serverless and FaaS architectures, with a focus on performance (evaluation).

2017 - Initial exploration of serverless concepts [1]

2018 - Further exploration of serverless performance [2]

2019 - Reference architecture for FaaS platforms [3]

2020 - Use case survey and serverless benchmark

Further reading



[1] The SPEC Cloud Group's Research Vision on FaaS and Serverless Architectures

Second International Workshop on Serverless Computing (WoSC@Middleware 2017)

[2] A SPEC RG Cloud Group's Vision on the Performance Challenges of FaaS Cloud Architectures

9th ACM/SPEC International Conference on Performance Engineering (ICPE 2018)

[3] The SPEC-RG Reference Architecture for FaaS: From Microservices and Containers to Serverless Platforms

IEEE Internet Computing (Nov/Dec issue, 2019)