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Developing a Resource Efficiency Benchmark

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November 13, 2020

11th Symposium on Software Performance 2020, 12.–13. November 2020, Leipzig, Germany

https://se.informatik.uni-wuerzburg.de/
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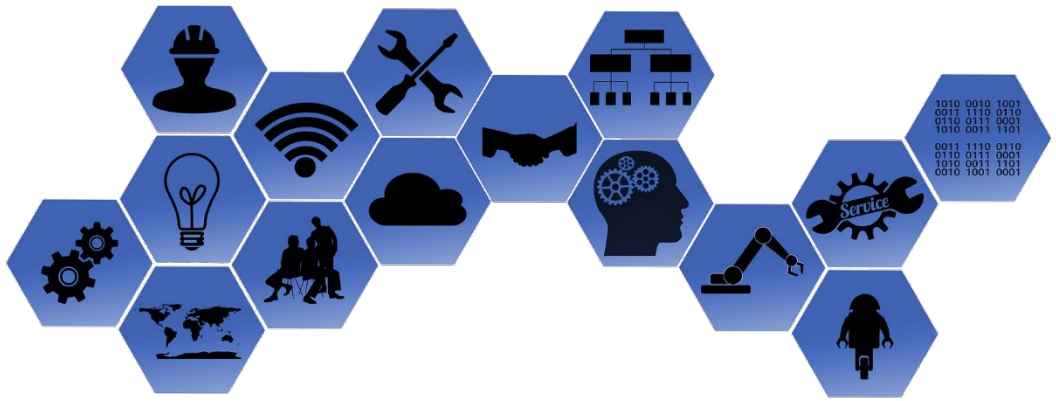
Motivation



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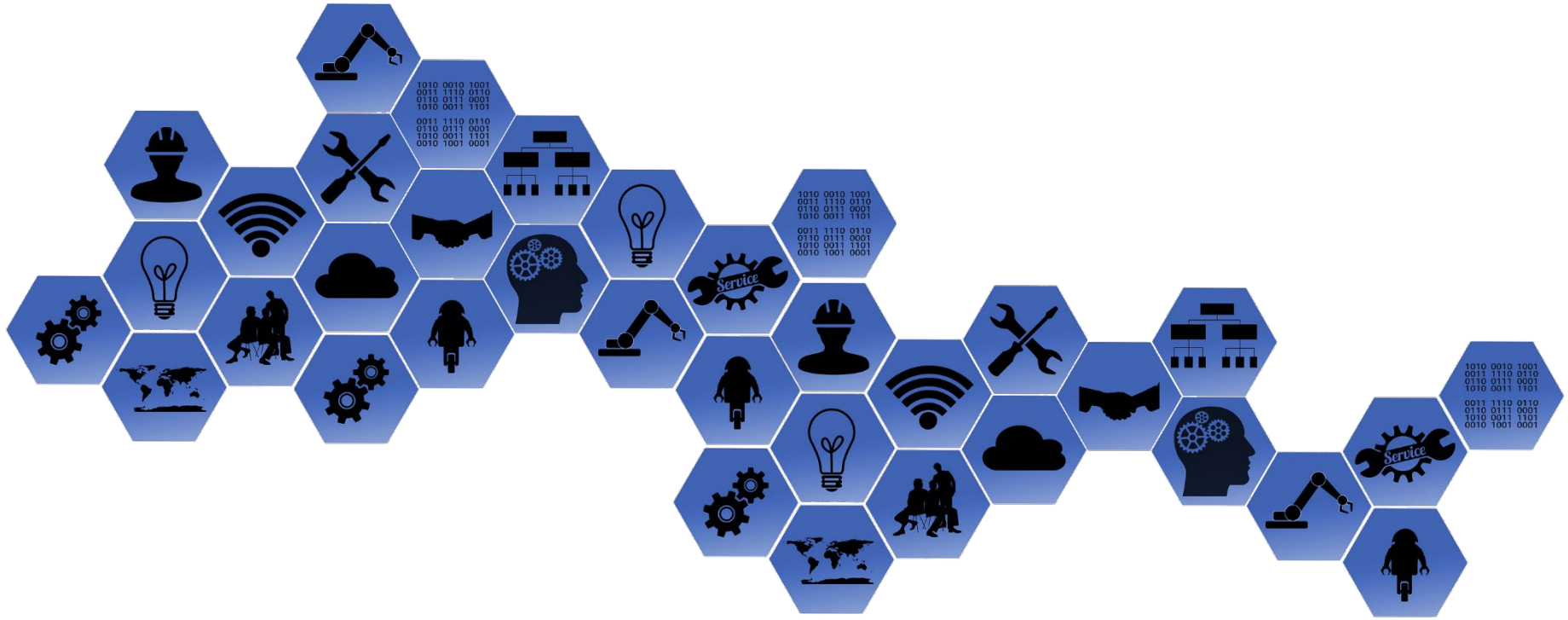

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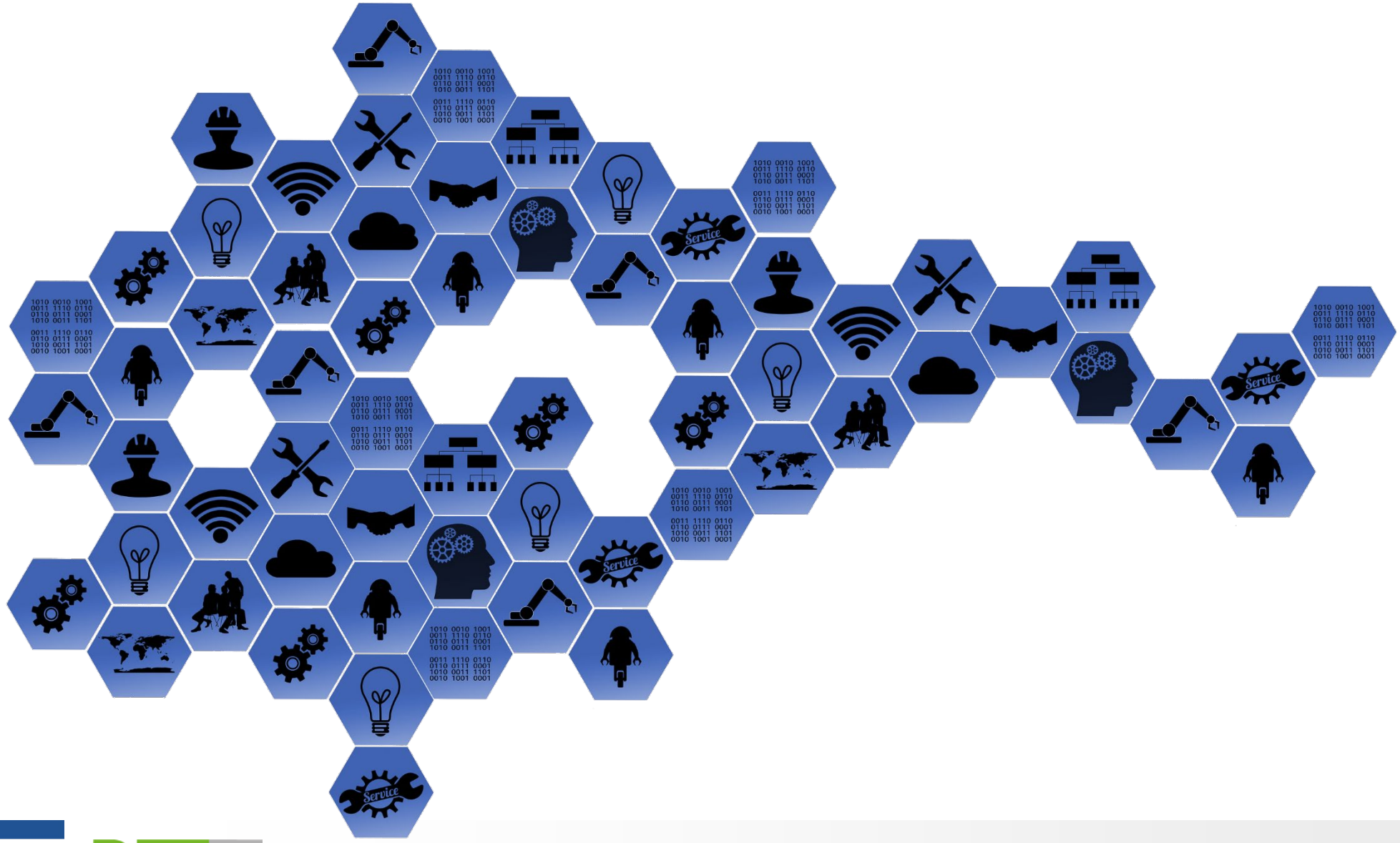

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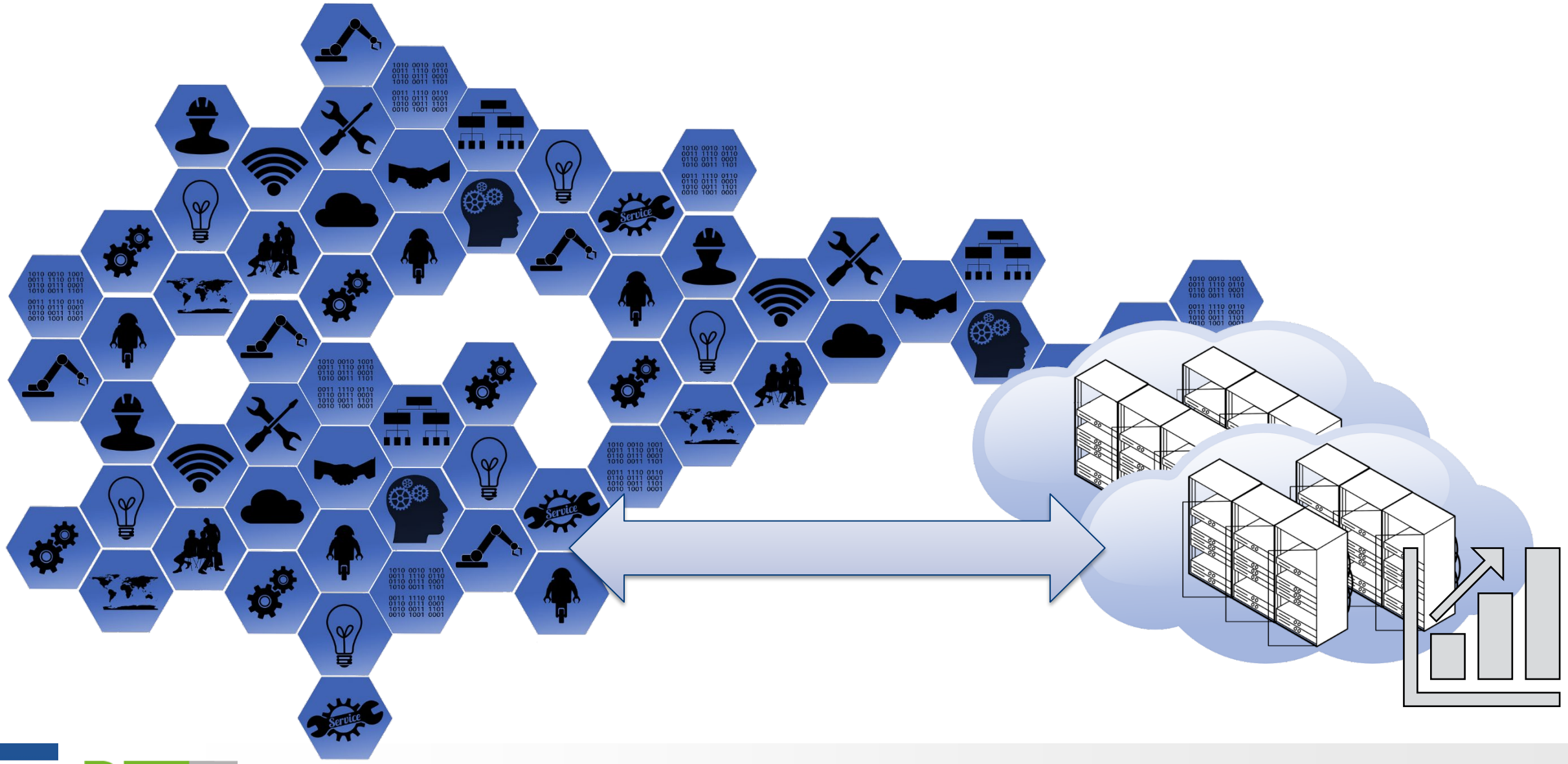
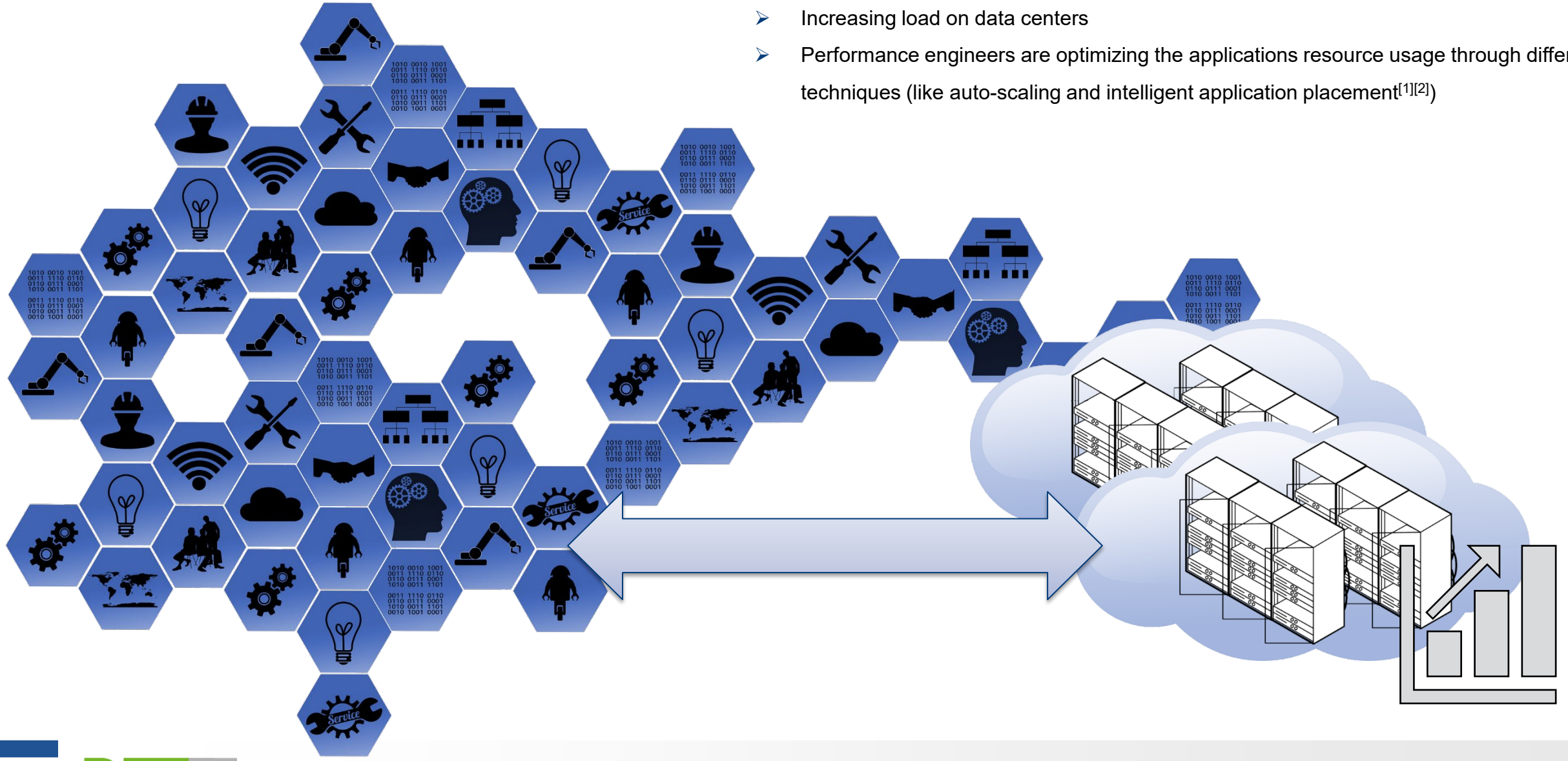


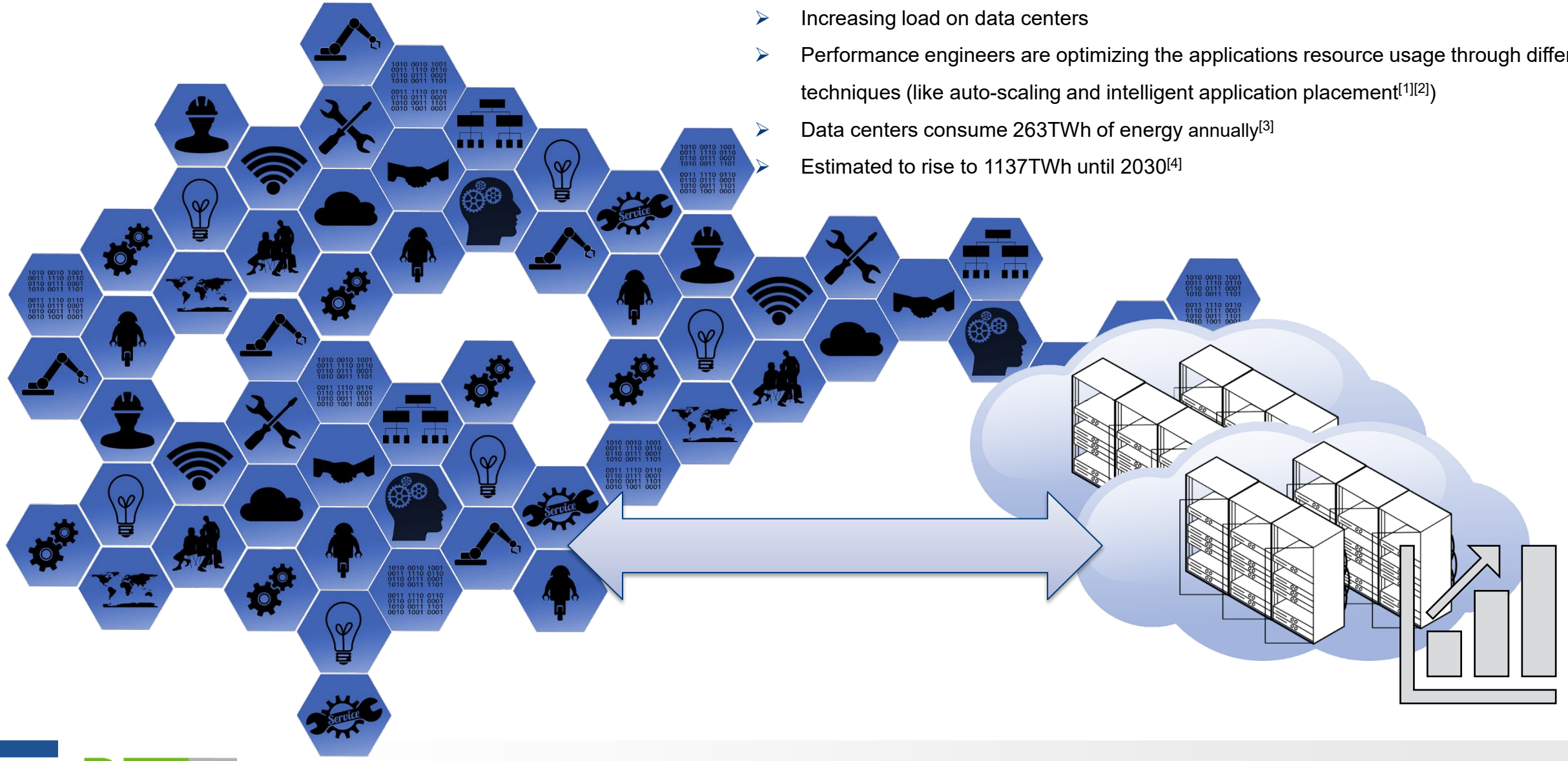
Motivation

- Increasing load on data centers
- Performance engineers are optimizing the applications resource usage through different techniques (like auto-scaling and intelligent application placement[1][2])



Motivation

- Increasing load on data centers
- Performance engineers are optimizing the applications resource usage through different techniques (like auto-scaling and intelligent application placement[1][2])
- Data centers consume 263TWh of energy annually[3]
- Estimated to rise to 1137TWh until 2030[4]



Motivation

- Hardware manufacturers try to counteract the energy wastage, but technological advances cannot keep up with cloud computing demand[5]
- A multitude of benchmarks or rating tools exist that stress hardware with defined workloads and load levels
  - SPECpower_ssj 2008
  - SPEC CPU 2017
  - SPEC Cloud Iaas 2018
  - TPC-A/B/C/D/R/H/W …
  - STREAM
- Existing benchmarks do not measure the resource efficiency of software. They measure the hardware
- Measuring software is difficult. Hard- and software are coupled

Goals

1. Software vendors should be able to get an understanding of the resource consumption of their software

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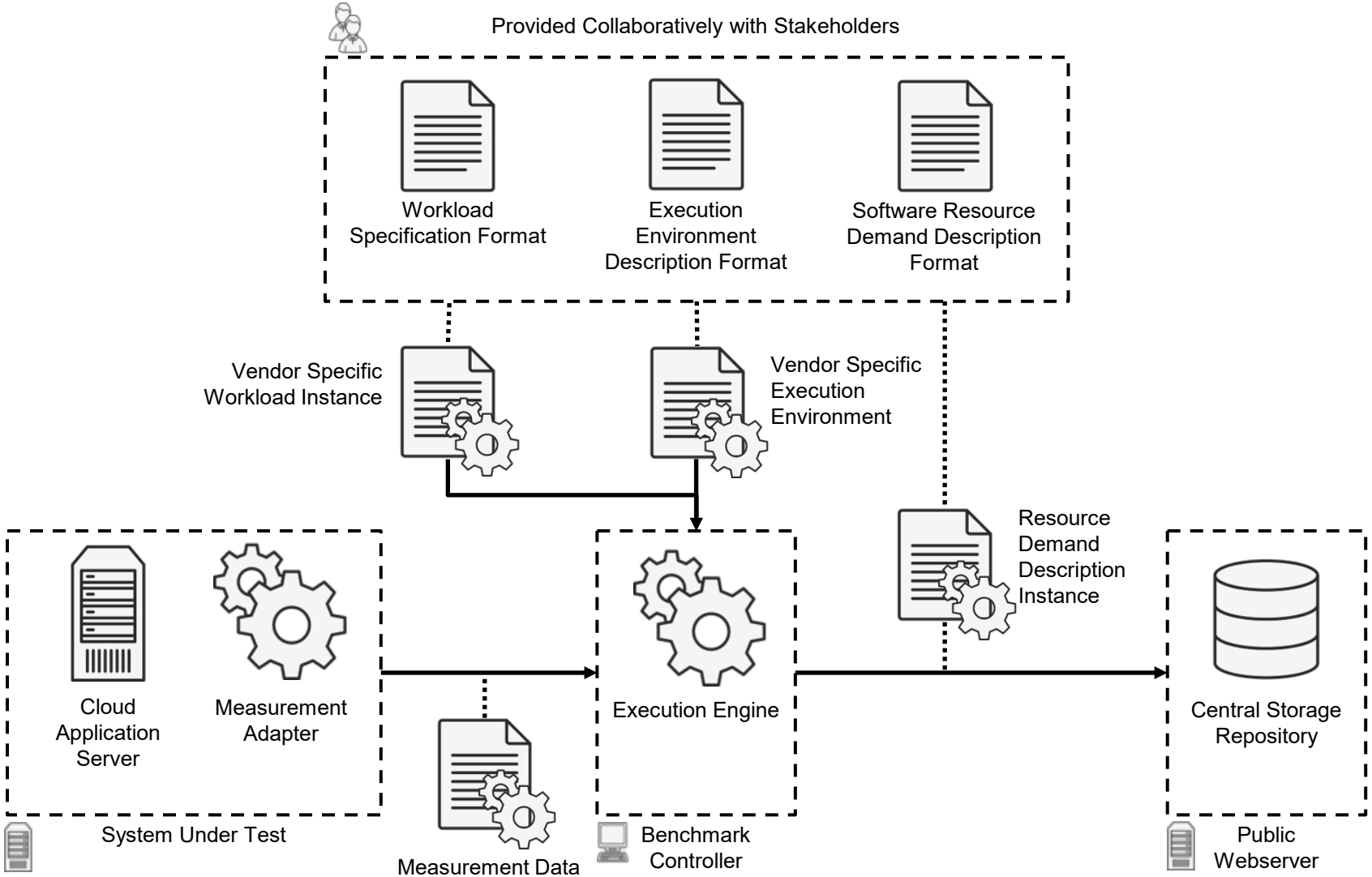
2. Software buyers should be able to compare the software of different vendors in terms of their resource efficiency

3. Spark competition between the software vendors to make their software more efficient and thus, in the long term, reduce the data center growth as the software systems require fewer resources

Challenges

1. How to describe the resource demand of software?
2. How to specify and standardize workloads?
3. What are possible incentives to increase awareness and acceptance?

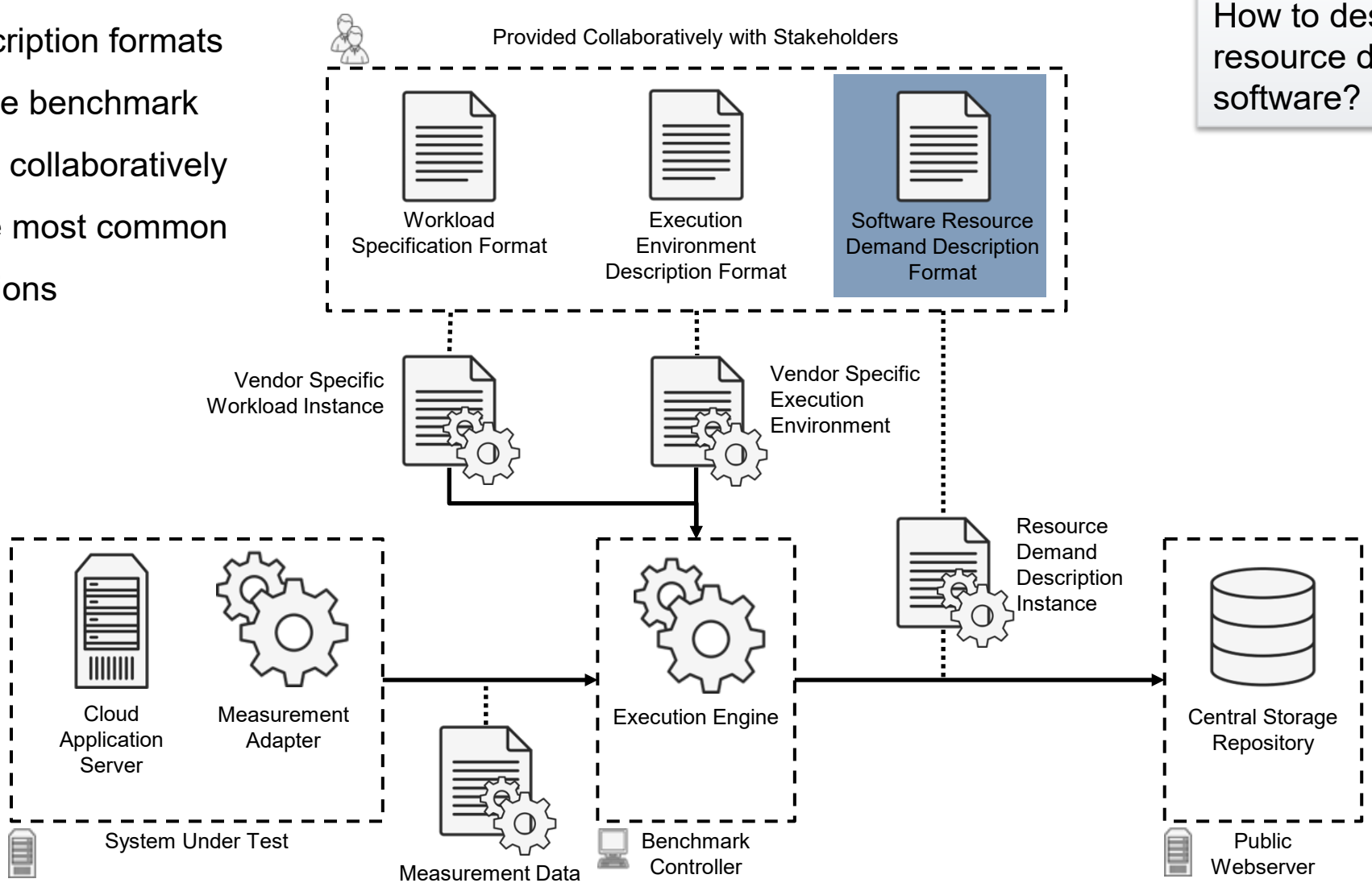
Benchmark Vision - Overview



Benchmark Vision

- Common description formats provided by the benchmark but developed collaboratively to address the most common cloud applications

How to describe the resource demand of software? 1



Benchmark Vision

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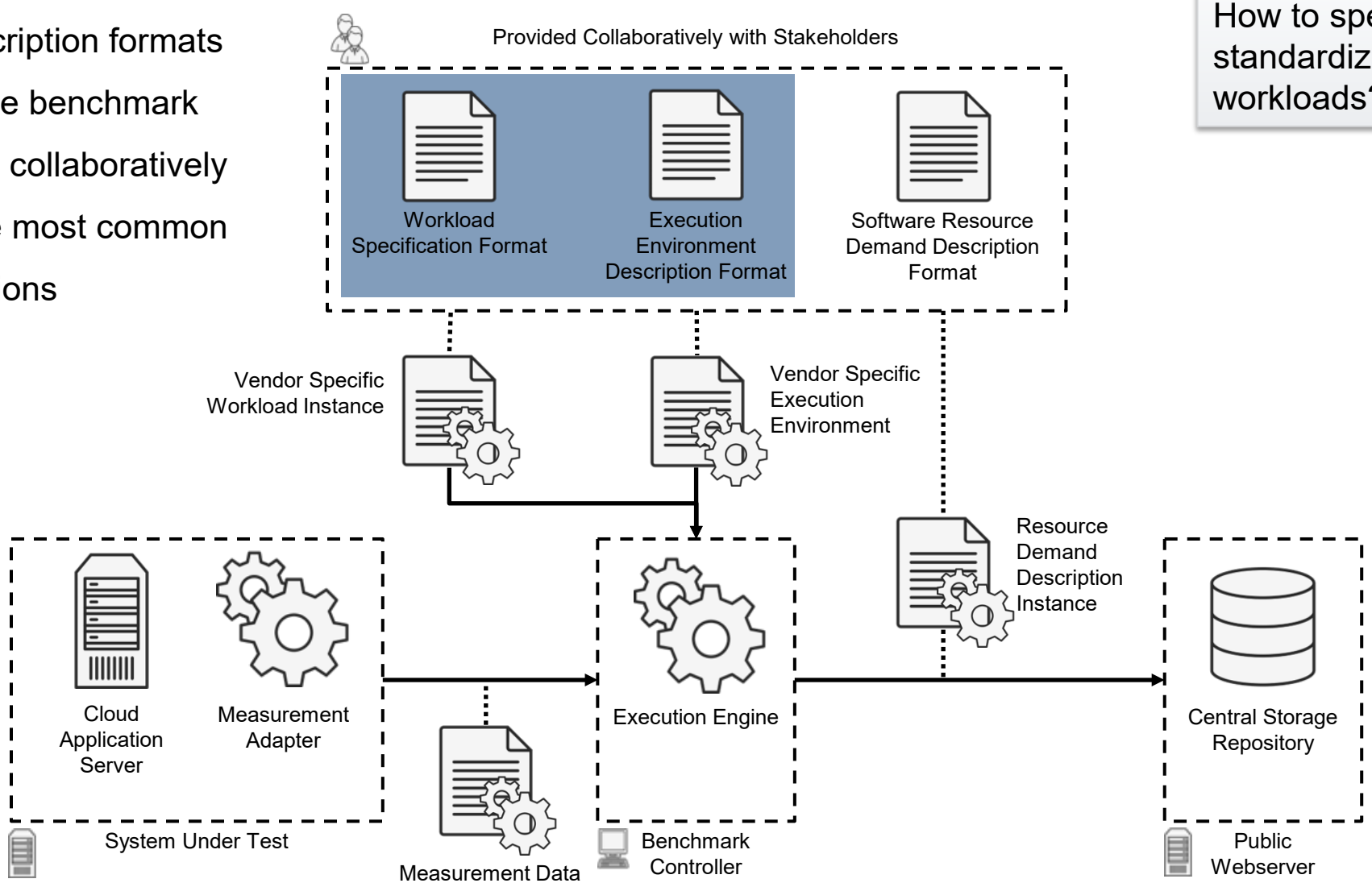
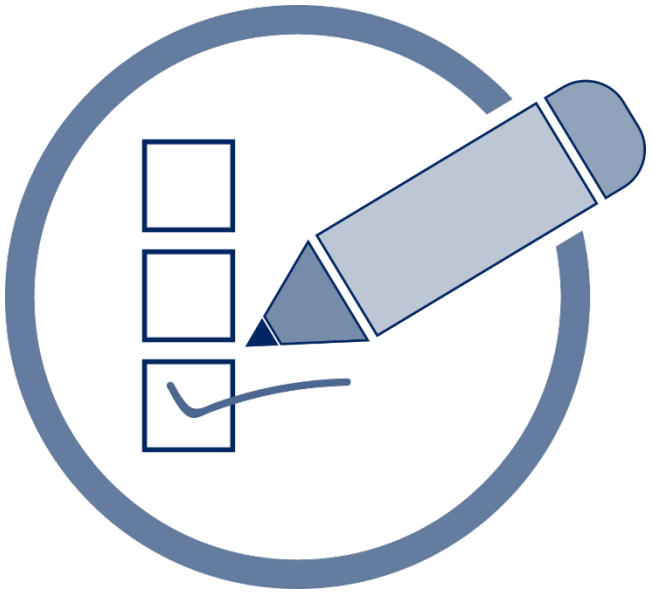
How to specify and standardize workloads? 2



Collaborate with Benchmark, Performance and Cloud Experts

How to specify and standardize workloads? 2

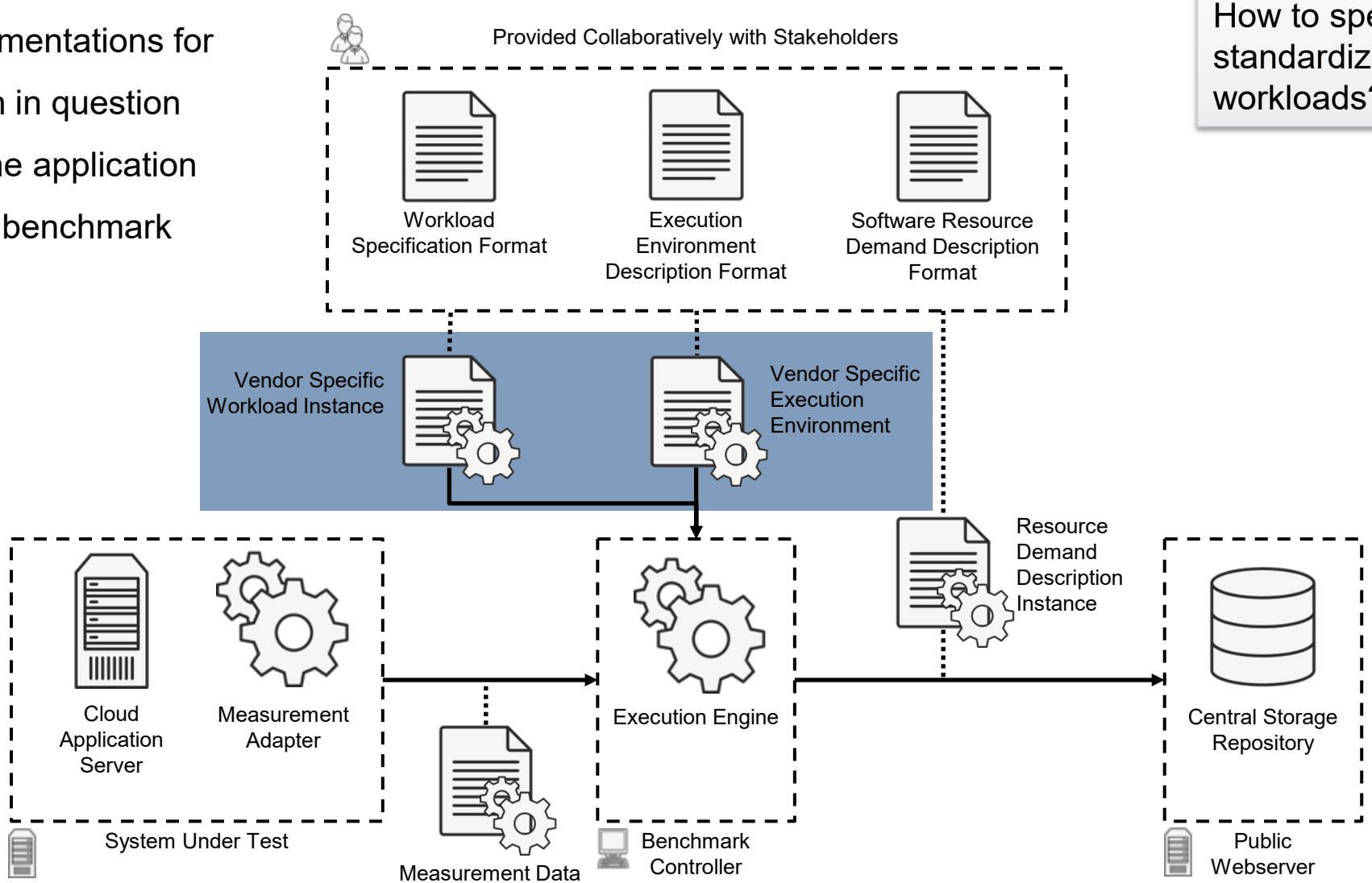


- Collaborate with experts in their field
- Survey which cloud applications are the ones most commonly used
  - Customer Relationship Management (CRM)
  - Enterprise Resource Management (ERP)
  - Supply Chain Management (SCM)
  - Others?
- Stakeholders agree on standard workload models
  - Must have a defined set of benchmarked functionality
  - Comparability

Benchmark Vision

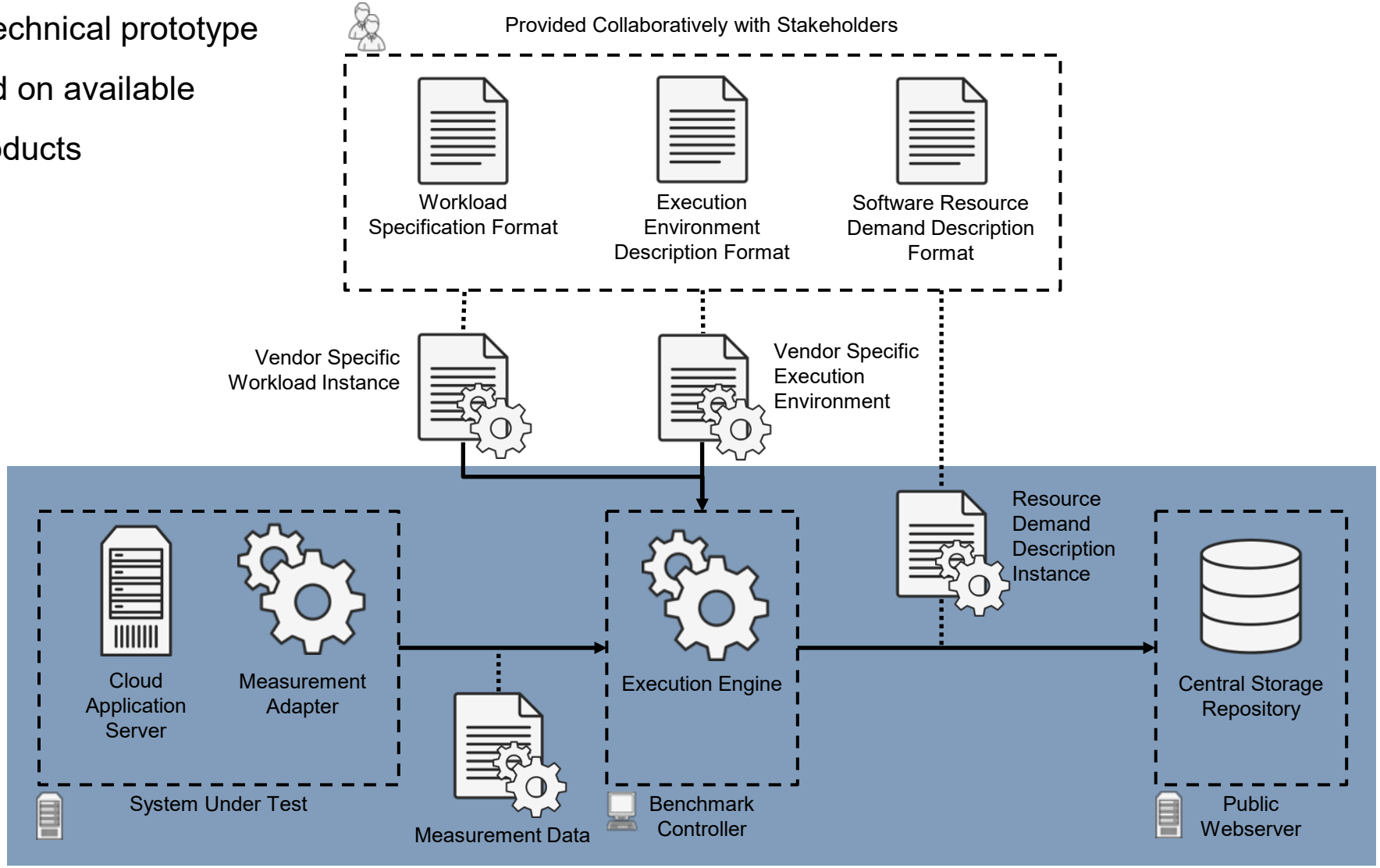
- Specific implementations for the application in question
- Provided by the application developers or benchmark executor

How to specify and standardize workloads? 2



Benchmark Vision

- Produce a technical prototype that is based on available software products



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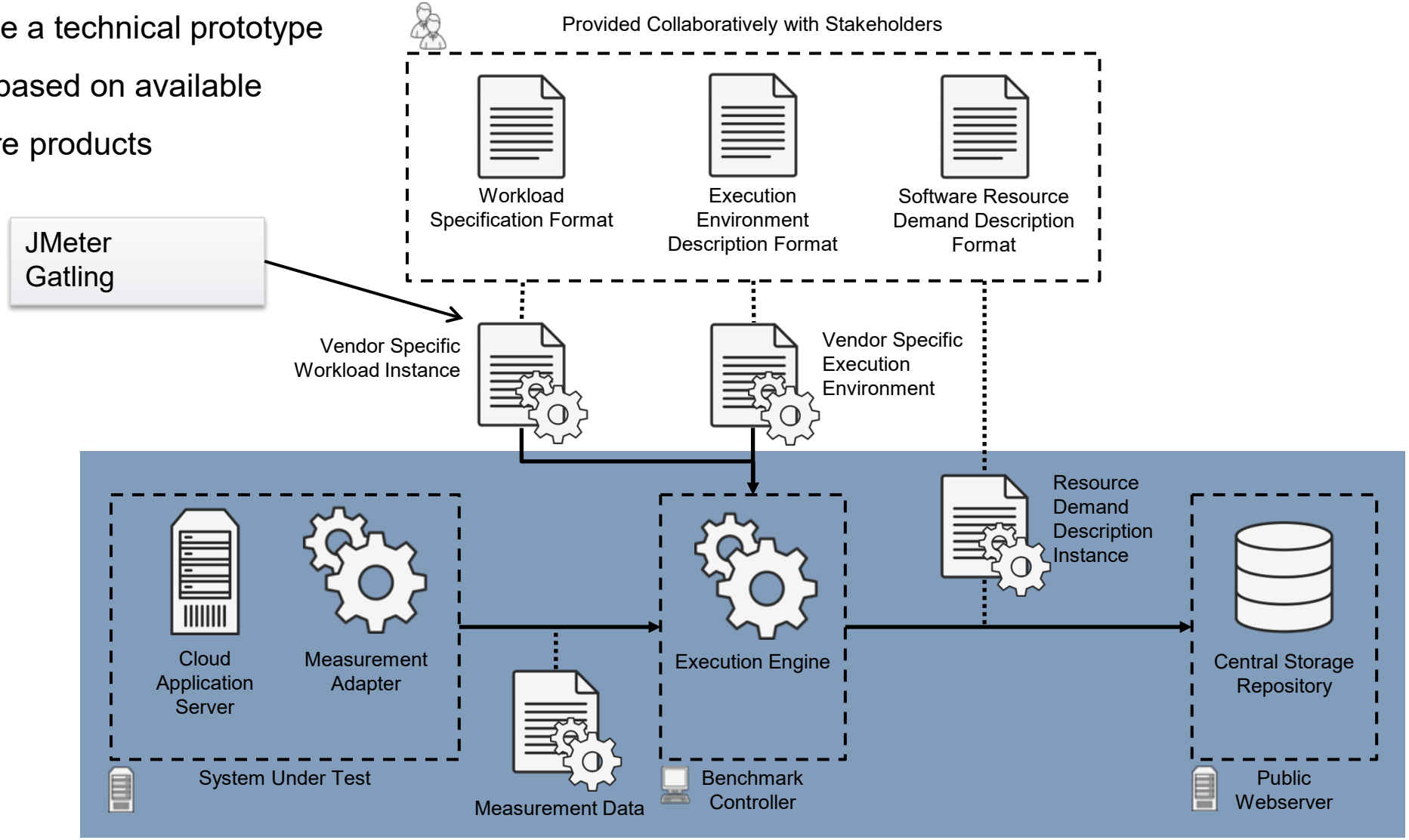

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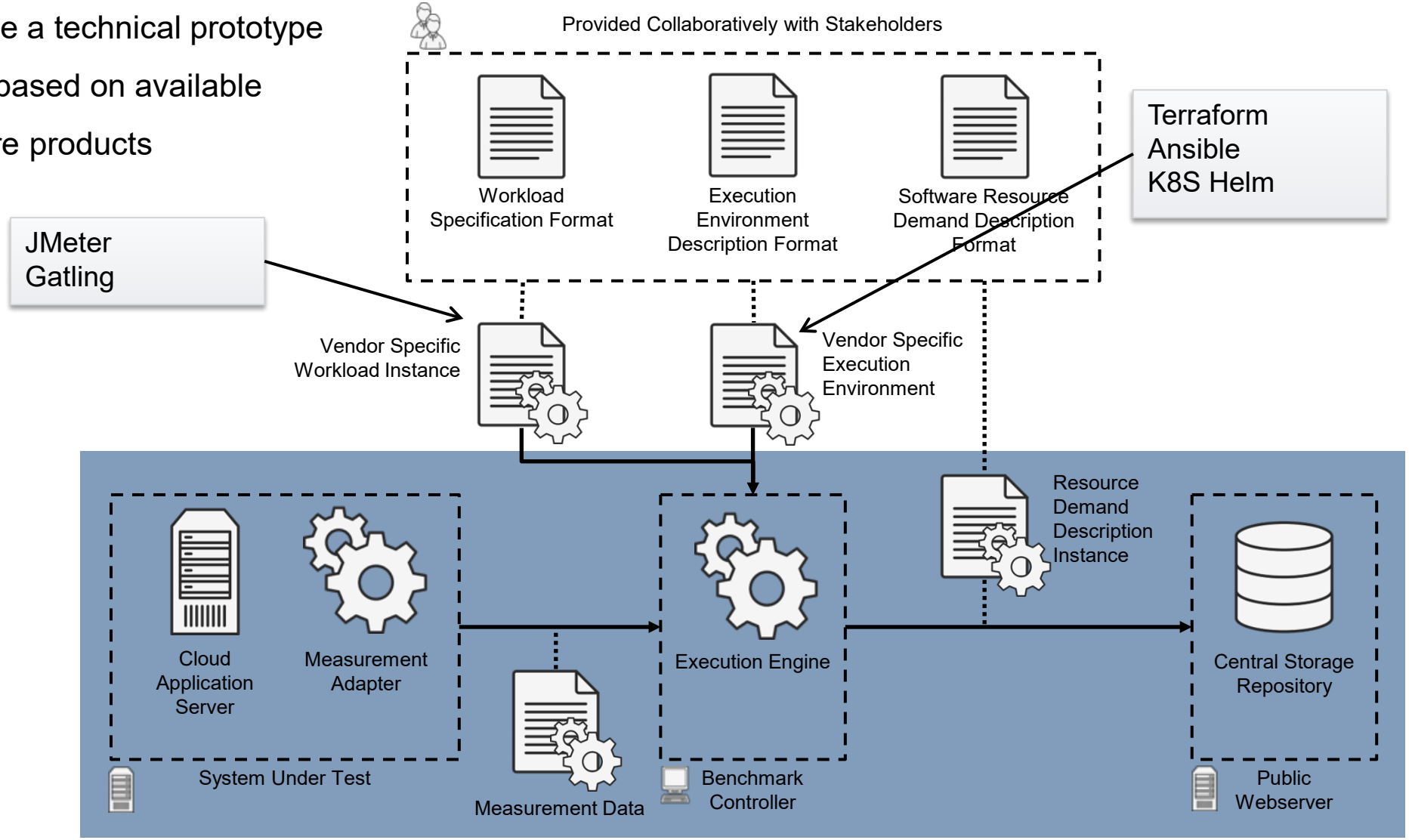

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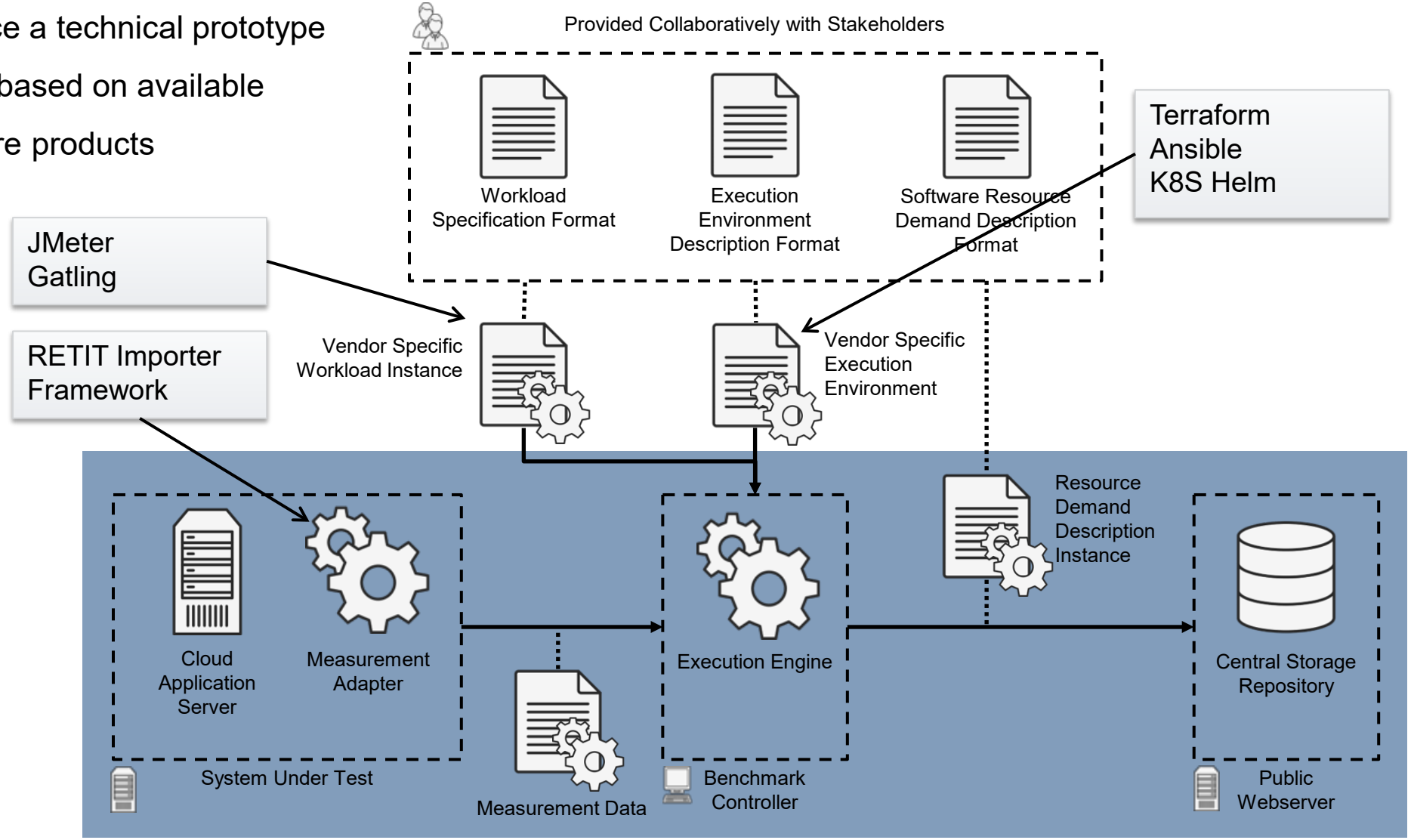

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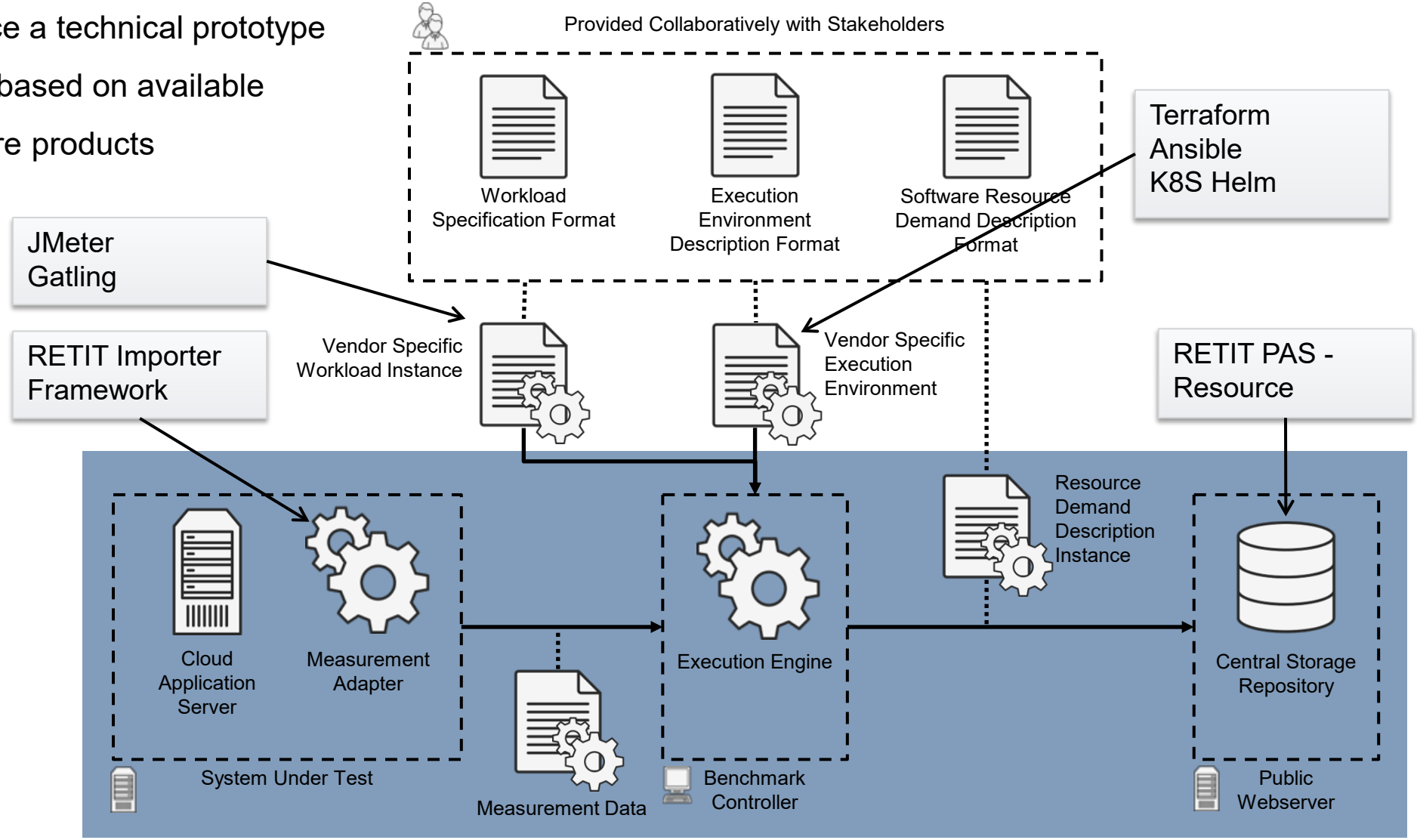

Raise Awareness

What are possible incentives to increase awareness and acceptance?

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- Get the benchmark endorsed by leading industry benchmark developers
- Share development and results continuously with the software engineering community
- Make results publicly available in an easy accesible repository
  - Allow operators to select and deploy the most resource-efficient variant of a specific software type
  - Increase mutual competitiveness to develop more resource-efficient software

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Thank You!

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