Scheduler for Kubernetes
an Open Source Cloud Platform

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Context

Data centers, composed of tens to hundreds of thousands of machines, packaged as virtual machines or services and sold under the label of cloud, are now changing the way the industry, academia and research computes.

The key to data center efficiency is the scheduler, i.e., the component responsible for choosing tasks and placing them on physical machines. The main challenge lies in colocation. To optimize costs, the scheduler collocates (executes) several tasks on a single machine. However, picking such tasks is difficult: if an important task demands more RAM/CPU, some other tasks must be killed or migrated; moreover, “noisy neighbors” may degrade everyone’s performance.

Goal

The goal is to develop relevant models, theory, and a prototype implementation of a data center scheduler. The problem has many aspects, including:

- **data gathering and analysis** to predict which tasks might be noisy or requesting significant CPU/memory;
- **colocation algorithms** employing machine learning or stochastic optimization to find optimal sets of neighbors;
- **finally, code development** to implement these ideas in kubernetes.io, an open source resource management.

Team and Collaborators

You will be working with two other Master students, under the PI’s close supervision.

Krzysztof Rzadca, the Principal Investigator, did his PhD on scheduling in supercomputers in Grenoble INP as a French government fellow; and his habilitation (HDR) in University of Warsaw on resource management in distributed systems. He was awarded grants from Foundation for Polish Science, National Science Center and Google.

Thanks to a Google Faculty Research Award, we collaborate with Google engineers who develop kubernetes; your ideas and your code may be thus included in one of the industry-standard cloud middleware.

We develop relevant theory in collaboration with other researchers, including Fanny Pascual (LIP6, University Pierre et Marie Curie - UPMC) and Denis Trystram (Grenoble INP and Institut Universitaire de France).

Further reading

- [http://www.mimuw.edu.pl/~krzadca/kassate](http://www.mimuw.edu.pl/~krzadca/kassate) project webpage
- [http://kubernetes.io](http://kubernetes.io) resource manager