

Towards Network-Aware Resource Provisioning in Kubernetes for Fog Computing applications

Abdul Ahad Ayaz

Summer term 2020

Abstract -

1 Introduction

- Starting with the IoT devices
- Management of IoT devices, transitioning from Cloud to Fog Computing
- some use-cases of IoT using fog computing
- Fog computing Infrastructure
- VMs vs Container-based solutions (VM Cloud infra vs Kubernetes)
- Kubernetes brief overview
- Kubernetes in-terms of Fog Computing (network consideration and issues)
- last paragraph about proposed solution for network related issues, and structure of seminar paper

2 Background

- Kubernetes Internal Architecture and Main Components
- Kubernetes works as an Orchestrator
- Kubernetes resource provisioning
- Concluding the section with pitfalls of default scheduler of Kubernetes

2.1 Kubernetes Main Components

- Write about the Architecture of Kubernetes with diagram
- Write about the building blocks of Kubernetes and their working

2.2 Kubernetes as Orchestrator

- Orchestrator main functions
- Comparison of available Orchestrator (Open-Stack vs Kubernetes)
- Workflow of Kubernetes as an Orchestrator (steps)

2.3 Kubernetes Resource Provisioning

- write about the default Kubernetes scheduler
- its main Components
- workflow of default scheduler

3 Kubernetes Network-based Resource Provisioning

- write about why we need network-based resource provisioning
- main factors consideration (e.g bandwidth and latency)

- workflow of network-based scheduler

this section.

4 Performance Evaluation

- Write about the considered use-case of Fog Computing for Evaluation

4.1 Experimentation Setup

- setup of Kubernetes base on the mentioned use-case of Fog Computing with diagram

4.2 Analysis of Kubernetes Default and Network-based Resource Provisioning

- write about the Performance difference between default Kubernetes scheduler and network based scheduler with supporting result tables and graphs

5 Comparison of Network-based Resource Provisioning Solutions

- Compare different solutions based on the following criteria:

5.1 Orchestrator

- write about the differences between Kubernetes(main-paper)[3] and other available cloud solutions such as Fogernetes[4] and [2].

5.2 Resource Provisioning Techniques

- difference between different resource scheduling techniques such as [5], [1] etc.

6 Conclusion

7 Further Research Topics

- after writing the seminar, if there is any improvement that can be done, will be added in

References

- [1] D. Haja, M. Szalay, B. Sonkoly, G. Pongracz, and L. Toka. "Sharpening Kubernetes for the Edge". In: <https://dl.acm.org/doi/10.1145/3342280.3342335>. SIGCOMM 2019 - Proceedings of the 2019 ACM SIGCOMM Conference Posters and Demos, Part of SIGCOMM 2019, 2019.
- [2] A. Reale, P. Kiss, M. Tóth, and Z. Horváth. *Designing a decentralized container based Fog computing framework for task distribution and management*. Tech. rep. <http://www.naun.org/main/UPress/cc/2019/a022012-044.pdf>. 2019.
- [3] J. Santos, T. Wauters, B. Volckaert, and F. De Turck. "Towards network-Aware resource provisioning in kubernetes for fog computing applications". In: <http://physics.nist.gov/Document/sp811.pdf>. IEEE Conference on Network Softwarization Unleashing the Power of Network Softwarization, NetSoft 2019, 2019.
- [4] C. Wöbker, A. Seitz, H. Mueller, and B. Bruegge. "Fogernetes: Deployment and management of fog computing applications". In: <https://ieeexplore.ieee.org/document/8406321>. IEEE/IFIP Network Operations and Management Symposium: Cognitive Management in a Cyber World, NOMS 2018, 2018.
- [5] L. F. Bittencourt, J. Diaz-Montes, R. Buyya, O. F. Rana, and M. Parashar. "Mobility-Aware Application Scheduling in Fog Computing". In: (2017). <https://ieeexplore.ieee.org/document/7912261>.