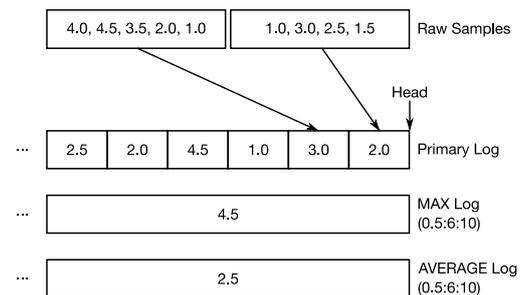


Master's Thesis

Optimally placing multi-resolution sensor logs and brokers in a cloud-fog topology

Internet of Things (IoT) systems are expected to generate a massive amount of data that needs to be distributed and stored. Given the large scale and geo-distributed nature of such systems, fog computing along with publish/subscribe messaging has been proposed as possible solutions for coping with data distribution at scale. [1], [2] Storing data is usually achieved with append-only logs. In the context of server and datacenter deployments, fixed-sized round-robin databases are an established tool to limit the growing size of those stores.

However, it is still unclear how practitioners can leverage the benefits of fog computing in this context, e.g. how to optimally place append only logs as well as their brokers in a pub/sub network. This question is complicated by the fact that several different resolutions can be placed independently.



■ Goals of the Thesis

This thesis will investigate how to achieve a joint placement of multi-resolution sensor logs and pub/sub brokers in a cloud and fog topology. To achieve this, an optimization model is to be developed that captures the constraints of the topology and requirements of the logs and brokers, including traffic and processing. The model should then be implemented in the gurobi optimizer framework. The thesis will analyze the performance in terms of traffic and delay of the optimal solution in comparison to simple heuristics, for instance the exclusive placement in the cloud. As a result, the thesis should, when finished, be able to highlight the achievable gain of using fog resources in addition to the cloud deployment widely in use today.

■ Keywords

Optimization, Gurobi, System Level Simulation

- [1] D. Happ, S. Bayhan, and V. Handziski, "JOI: Joint Placement of IoT Analytics Operators and Pub/Sub Message Brokers in Fog-centric IoT Platforms," *Future Generation Comp. Sys.*, 2020, under review.
- [2] D. Happ and S. Bayhan, "On the Impact of Clustering for IoT Analytics and Message Broker Placement across Cloud and Edge," in *15th ACM European Conference on Computer Systems (EuroSys 2020)*, *3rd ACM International Workshop on Edge Systems, Analytics and Networking (EdgeSys 2020)*, Irakleion, Greece: ACM, Apr. 2020.