PADERBORN UNIVERSITY

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CCS

Bachelor / Master's Thesis

Vehicular Micro Cloud Prototype Implementation

Vehicles typically rely upon clouds for live maps downloading, infotainment services etc. With increasing penetration rate of the connected vehicles, and their increasing service demands, typical cloud architectures do not scale well. This is mainly because the communication with cloud servers often suffers from high end-to-end delays. Inspired from Mobile Edge Computing, we introduced *vehicular micro cloud* architecture [1] to overcome these issues. In simple words, vehicular micro cloud is a cluster of cars acting as a virtual edge server which offers processing, storage and communication services to other cars or pedestrians nearby. It can also cache popular data for downloading and aggregate data to be uploaded to the data center. Having these virtual edge servers very close to the users helps in reducing the delays.
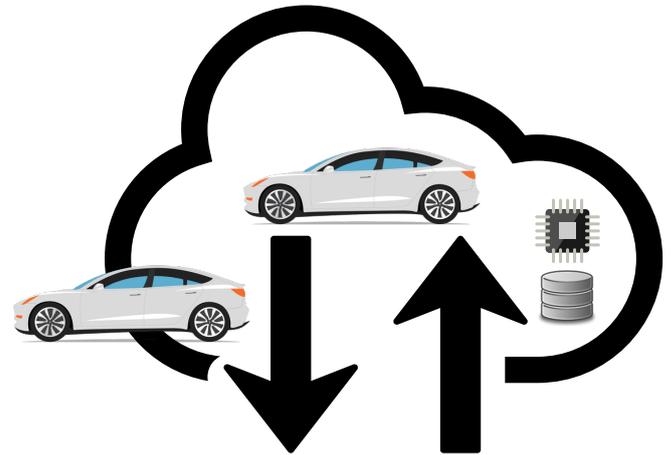
As of now, feasibility of this architecture and the benefits from it have been studied only via simulations.

■ Goals of the thesis

In this thesis, we aim to implement the first vehicular micro cloud prototype offering communication services such as uploading of data from cars to the data center. The prototype is expected to be running along with SUMO for realistic traffic mobility. The first step of the thesis is to understand the vehicular micro cloud architecture. Then, the strategies to form the micro cloud, the services supported by them should be implemented, e.g. as described in [2], [3]. Some visual components to display the micro cloud status at run-time should also be implemented. The implementations should be validated and evaluated in different scenarios with different traffic densities and data transfers.

■ Keywords

Vehicular cloud, virtual edge server

[1] T. Higuchi, J. Joy, F. Dressler, M. Gerla, and O. Altintas, "On the Feasibility of Vehicular Micro Clouds," in *9th IEEE Vehicular Networking Conference (VNC 2017)*, Torino, Italy: IEEE, Nov. 2017, pp. 179–182.

[2] F. Hagenauer, C. Sommer, T. Higuchi, O. Altintas, and F. Dressler, "Vehicular Micro Clouds as Virtual Edge Servers for Efficient Data Collection," in *23rd ACM International Conference on Mobile Computing and Networking (MobiCom 2017), 2nd ACM International Workshop on Smart, Autonomous, and Connected Vehicular Systems and Services (CarSys 2017)*, Snowbird, UT: ACM, Oct. 2017, pp. 31–35. DOI: 10.1145/3131944.3133937.

[3] G. S. Pannu, T. Higuchi, O. Altintas, and F. Dressler, "Efficient Uplink from Vehicular Micro Cloud Solutions to Data Centers," in *19th IEEE International Symposium on a World of Wireless, Mobile and Multimedia Networks (WoWMoM 2018)*, to appear, Chania, Greece: IEEE, Jun. 2018.

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