УДК 004.78

THE DEVELOPMENT OF IOT APPLICATION ON EDGE COMPUTING PLATFORM

Dayoub A. (ITMO university)
Research supervisor - associate professor, candidate of technical sciences, Vladimir G.A.
(ITMO university)

Introduction

Mobile edge computing (MEC) is considered as an effective method to solve the limited resources problems in IoT. In MEC environments, servers with certain computing capabilities are deployed on the edge of the network, which are closer to the IoT devices and can provide computing services for the IoT devices.

Meanwhile, IoT devices can offload the computation tasks to the MEC servers to achieve better performance. When the IoT devices execute some computing tasks with a large amount of calculation and strict delay limitations, they can choose to offload the computing tasks to the MEC servers.

Although traditional cloud computing does have its advantages such as abundant computing resources, high scalability, and cost-effective, it also brings many challenges. For instance, it may suffer a single point of failure and incurs long latency between the user and the centralized cloud. On the other hand, most IoT applications require decentralized systems to serve them, and should be developed with location awareness, reliability, and low latency. For time sensitive IoT services, the latency should be no larger than 1 ms and the reliability should be not lower than 99.99% [1].

Main part

IoT edge computing is a method of processing data generated by internet of things (IoT) devices at or near the source of the data, rather than sending all the data to a centralized data processing location. This allows for faster analysis and response to the collected data, as well as reducing the amount of data that needs to be transmitted.

IoT edge architecture: A traditional IoT architecture includes a perception layer, network layer and cloud platform layer [2]. The perception layer is mainly responsible for the collection of field data and the control of the system. The network layer is mainly responsible for the transmission of perception data and control instructions. The platform layer mainly completes equipment management, connection management, application enablement, business analysis and other functions.

The application of edge computing in IoT scenarios is an effective complement to traditional IoT systems. Compared with the traditional IoT architecture, IoT edge architecture adds edge layer between perception layer and platform layer as shown in figure 1.

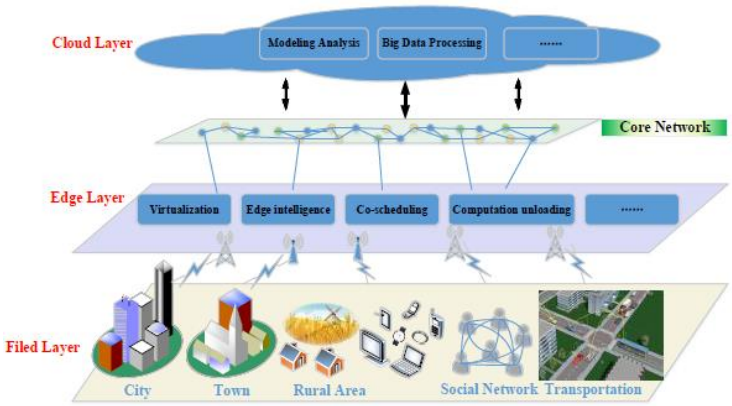

Figure 1: IoT Edge Architecture.

Edge layer is the function sink of cloud platform, which can realize real-time analysis and processing of data. It also can realize the real-time control and decision-making of system. This is bound to reduce the use of invalid data to network bandwidth, reduce system delay, and save the energy consumption caused by data transmission. At the same time, the IoT system in the edge side is a closed-loop system, which greatly improves the robustness and the reliability of the system [3].

The development of IoT application on Edge computing platform

Our system has three main parts, which are the IoT sensors, the Edge computing platform and the cloud as shown in figure 2.

The source of IoT data is Node-RED which is a visual tool for building workflows for IoT scenarios. It allows chaining or wiring IoT devices.

The edge computing platform is AdvantEDGE which is a mobile edge emulator platform. It has many features and services which can help us measure many parameters like latency, bandwidth and error rate.

The cloud is Yandex cloud, it will be our reference point for the measurement to compare it to with the edge.

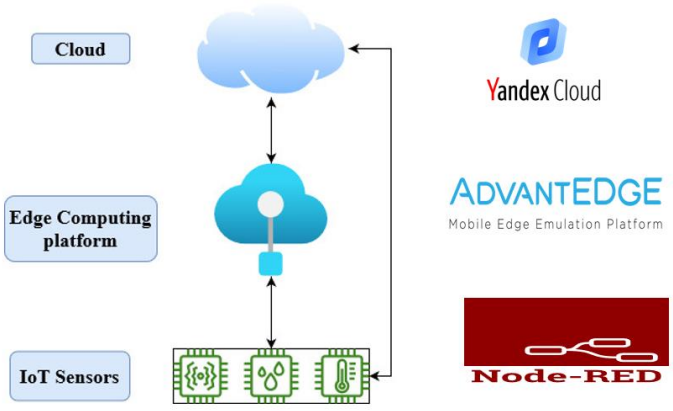

Figure 2: The schema of the IoT edge application.

The process is to deploy the IoT application on the edge computing platform, the IoT application simply will receive the data from IoT devices and then apply processing on this data.

Here to determine the performance we should measure many parameters like latency bandwidth and error rate. And thanks to AdvantEDGE we can measure all these parameters.
After that we will compare this to the case when the IoT applications run on cloud and see the difference between the two cases.
It's possible also to try different IoT protocols like: MQTT, CoAP and AMQP. And measure the performance when using different protocols.

Conclusion

From this research we expect to have a simulated model of an IoT application developed on an edge computing platform, and we will measure the performance parameter like latency bandwidth and error rate and compare it with the traditional case without the edge. This model will open the doors to other studies on the idea of developing the IoT applications with the help of MEC, because the MEC is one of the main enabler technology for IoT.

References

1. M. Mahbub, Md. S. Apu Gazi, S. al Arabi Provat, and Md. S. Islam, "Multi-Access Edge Computing-Aware Internet of Things: MEC-IoT," in 2020 Emerging Technology in Computing, Communication and Electronics (ETCCE), Dec. 2020, pp. 1–6.
2. M. A. Jabraeil Jamali et al., "IoT architecture," Towards the Internet of Things: Architectures, Security, and Applications, pp. 9–31, 2020.
3. J. Pan and J. McElhannon, "Future Edge Cloud and Edge Computing for Internet of Things Applications," IEEE Internet Things J, vol. 5, no. 1, pp. 439–449, Feb. 2018.