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Summary

This week, the mid-presentation script was completely finished through many discussions. However, before making a script, a critical problem with the study architecture was found by Xavier. Thus, the detailed research topic was changed. According to this, the paper flow and the presentation flow was redesigned. Finally, the mid-presentation was done this Friday.

What IIEEE completed this week:

- Writing a draft of related work

    A.LoRaWAN

    IoT enables farmers to manage overall farms meticulously. There are many IoT network systems for agriculture. Among them, especially LoRaWAN is implemented in farming. [1] It is suitable for IoT which should be able to cover a wide range and get many sensing data. According to this advantage, many nations use the LoRaWAN network protocol in farms. LoRaWaN can cover 2-5km in urban, and 15km in rural. [1]

    In addition, battery usage is an important thing in IoT. As LoRaWAN uses an asynchronization system, it is advantageous for running a smart farm due to its good battery efficiency. [2]

    B. Docker

    Virtualization is widely used in IT services.[question] There are many virtualization technologies. Docker is one of them, which has many benefits compared with other virtualization methods. Among them, Docker containers and virtual machines are mainly compared.

    Rad et al, concluded that Docker provides some advantages, which are helpful for developers and administrators. It is an open platform that can be made use of building, distributing, and running applications in a portable, lightweight runtime, and packaging tool, known as Docker Engine.
    [https://www.notion.so/iamhge/An-Introduction-to-Docker-and-Analysis-of-its-Performance-8dd6022331d24b329ce9c9460f261230]

    Potdar et al, conducted performance evaluation on virtual machine and Docker container-based hosts in terms of CPU Performance, Memory throughput, Disk I/O, Load test, and operation speed measurement. It is observed that Docker containers perform better over VM in every test, as the presence of the Quick EMUlator (QEMU) layer in the virtual machine makes it less efficient than Docker containers.
    [https://www.notion.so/iamhge/Performance-Evaluation-of-Docker-Container-and-Virtual-Machi

[ne-c2be9ead6b9444a28a1a422c2c6c2b54]

C. Kubernetes

As containerized applications have gained much importance in recent years, much attention has been also drawn to tools for supervising containers. There are many orchestration tools which manage the life-cycle of containers and services. One of them, Kubernetes has become a de facto standard due to outstanding features and popularity. It provides functions for load balancing, auto-scaling, self-healing which help for maintainability, scalability and reliability. [Kubernetes, *Kubernetes*, https://kubernetes.io/, [Online; accessed 20-May-2022]]

Based on these references, the performance of containerized servers using Docker and Kubernetes for smart farm data visualization platform based on LoRaWAN was evaluated.

- Preparing mid-presentation and writing presentation script completely

Things to do by next week

- Modifying the paper with some feedback
  - According to changing the detailed topic, some parts will change.
  - It will be contained the traditional load balancing system and distributed system with Kubernetes.
- Selecting the development stack
  - There are many parts to develop for service.
    - Front-end
    - Back-end

Problems or challenges:

- The Detail of topic was modified
  - Xavier gave some feedback about our structure of the system. after discussing that, The project topic was changed.
    - A Comparison of Distributed Systems before and after using Kubernetes for Smart Farm Visualization Platform based on LoRaWAN.

References

[1] D. Davcev, K. Mitreski, S. Trajkovic, V. Nikolovski and N. Koteli, "IoT agriculture system based on LoRaWAN," *2018*
14th IEEE International Workshop on Factory Communication Systems (WFCS), 2018, pp. 1-4.

[2] LoRa Alliance, What is LoRaWAN® Specification, https://lora-alliance.org/about-lorawan/, [Online; accessed 24-May-2022]

[3] A. Vahdat, M. Al-Fares, N. Farrington, R. N. Mysore, G. Porter and S. Radhakrishnan, "Scale-Out Networking in the Data Center," *in IEEE Micro*, vol. 30, no. 4, pp. 29-41, July-Aug. 2010.

[4] Kubernetes, Kubernetes, https://kubernetes.io/, [Online; accessed 20-May-2022]

[5] Rad, Babak Bashari, Harrison John Bhatti, and Mohammad Ahmadi, "An introduction to docker and analysis of its performance," *Int. Journal of Comp. Science and Network Security (IJCSNS),* 2017.