

A K8-Based Mechanism for Remote Monitoring and Control of IoT Devices

Sina Shabani

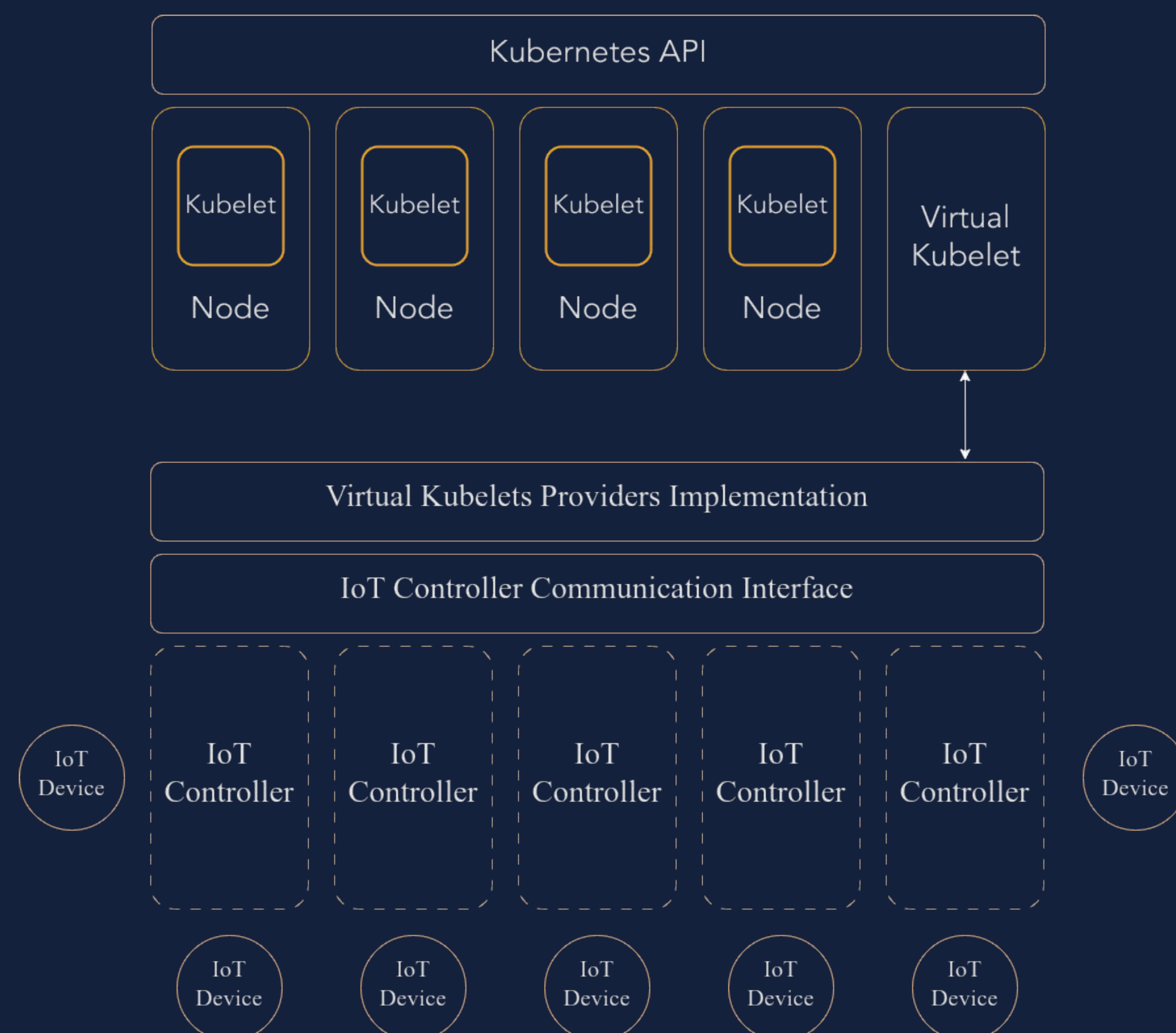
Department of Computer Engineering, Iran University of Science and Technology



Abstract

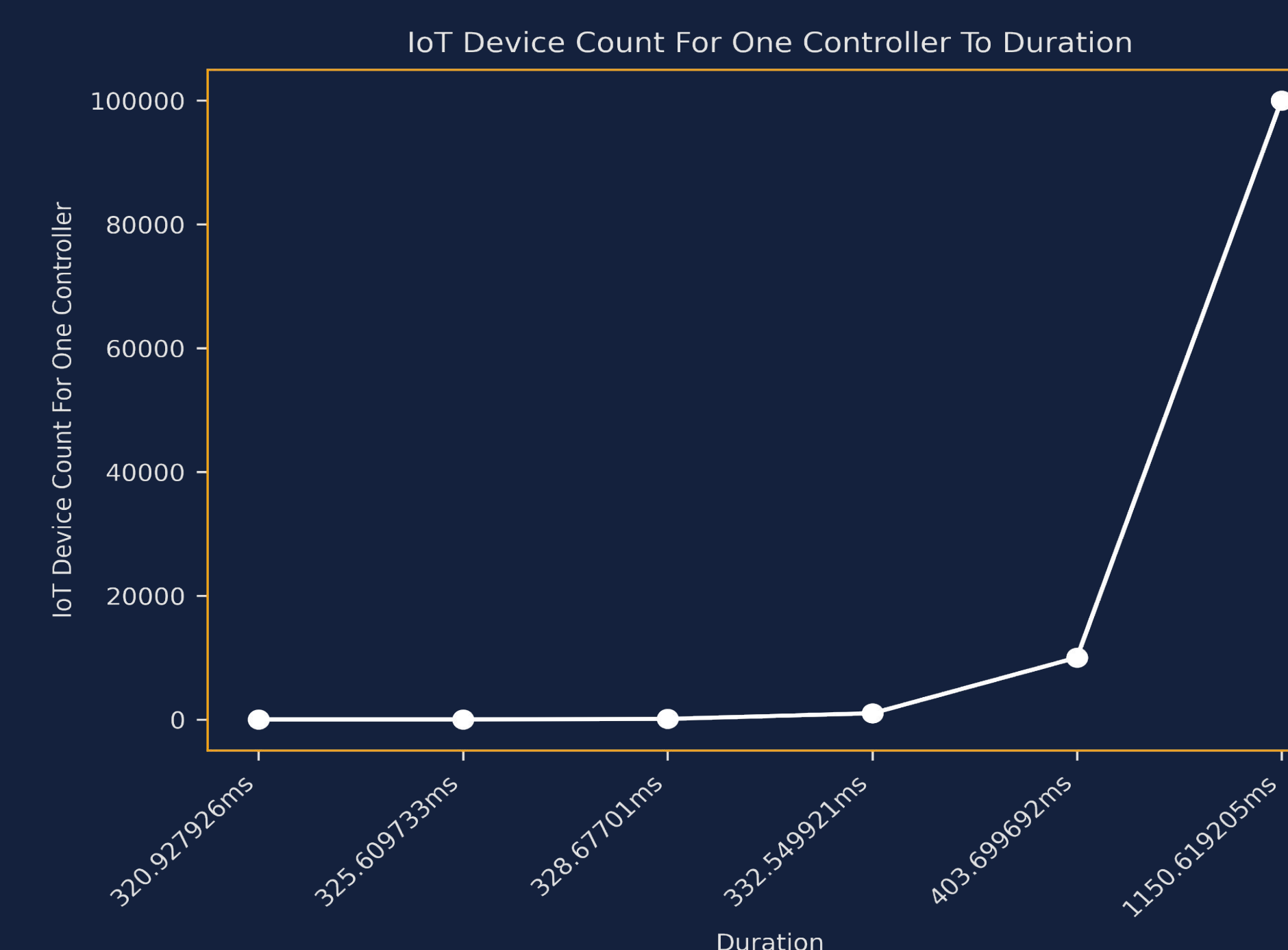
In today's world, the management, control and supervision of IoT devices face a significant challenge. The lack of a unified solution hinders effective control and monitoring of a diverse range of IoT devices. This results in fragmented control mechanisms and complex management processes. The project "A K8-Based Mechanism for Remote Monitoring and Control of IoT Devices" proposes an innovative approach to address this challenge. By leveraging the capabilities of Kubernetes as the core infrastructure, the project aims to provide a comprehensive solution for centralized control and monitoring of IoT devices. This solution streamlines the management process and enhances efficiency by offering a unified platform for device control and monitoring. With its robust architecture, the project facilitates seamless integration, scalability, and intelligent decision-making based on real-time device data. By implementing this solution, organizations can effectively manage and monitor their IoT device ecosystem while optimizing operations and ensuring optimal performance

Architecture

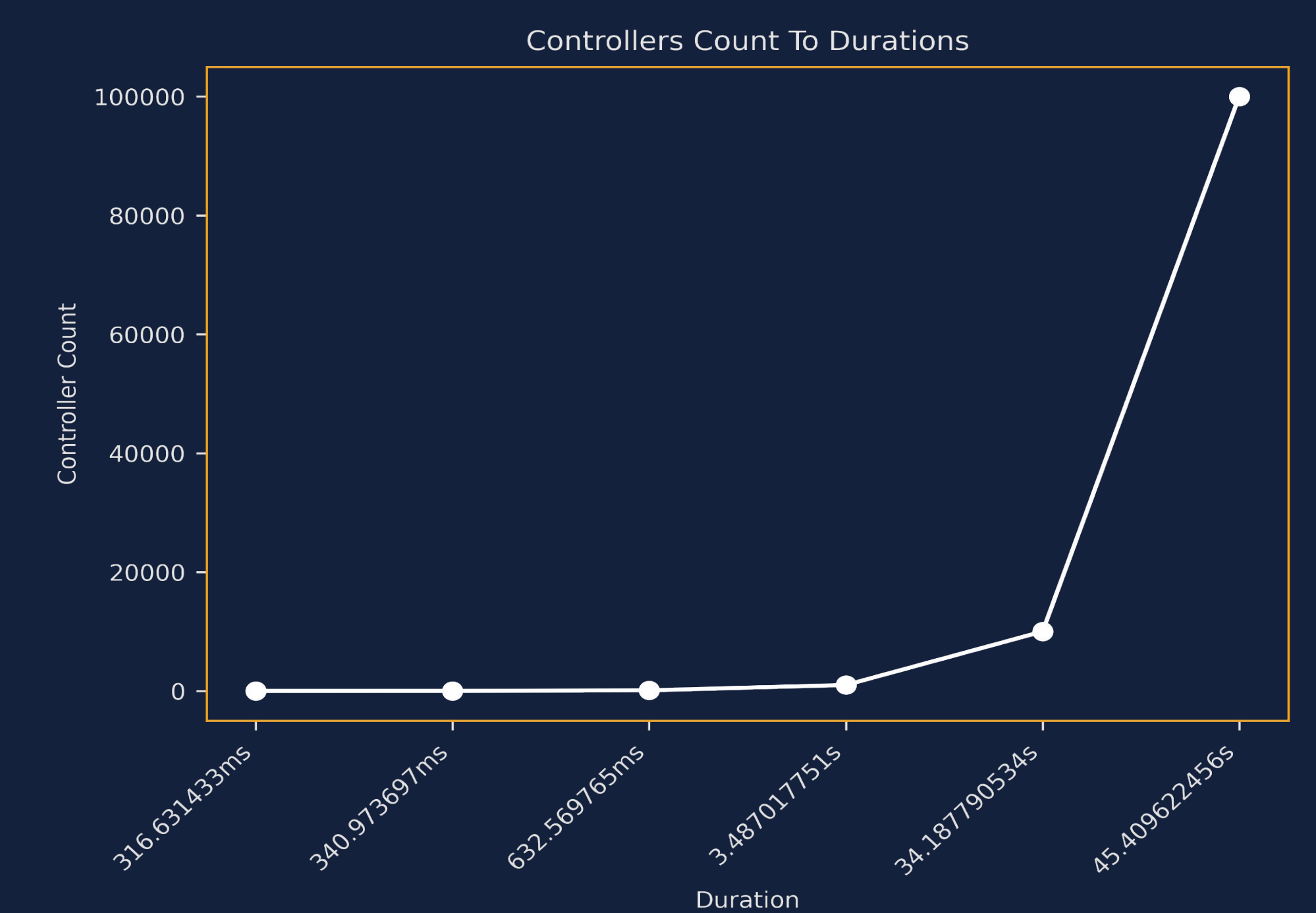


Results

- Benchmarks are generated with custom software
- Benchmark software is written in Golang as for the rest of the project
- A shell script then takes this software and generates desired results
- The results are then fed to a python script that draws the charts using matplotlib
- The entire project ran on a single Raspberry Pi 4 Model B Rev 1.4 with 4 cores and 8GiBs of DDR3 memory.



- ❑ Single provider
- ❑ Single controller was able to control 100K IoT Devices with reasonable time.
- ❑ Took 1.15 seconds to fetch the state of 100K devices from a single controller
- ❑ A highly scalable and performant way of controlling IoT Devices.



- ❑ Single provider
- ❑ It takes Significantly more time to fetch IoT Device states.
- ❑ Still reasonable.
- ❑ 10x HTTP traffic
- ❑ Easily scalable through adding more provider

Methodology

- ❑ Virtual kubelet's provider implementation to connect to kubernetes
- ❑ A fan-out design to fetch device states
- ❑ Provider and communication interface exchange data with callbacks

Conclusion

Kubernetes is an open-source but enterprise-grade platform which has an extremely good support from its massive community. It is battle-tested and performant. The suggested methodology can monitor thousands of IoT Devices from this platform in a scalable and fault-tolerant way. It is also very simple to use.