Implementation and its performance evaluation on low processing delay communication by raw socket communication for IoT services

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Abstract: Recently, Society 5.0 has been discussed actively in Japan. In Society 5.0, mobile broadband communication infrastructure, i.e., Beyond 5G, is one of the attractive topics. When transport capacity can be expanded, communication processing should be reinforced to provide rich functionalities. In this paper, lightweight communication processing across raw socket interface is discussed. In particular, it is indicated as an essential study that the performance in this approach is better than in the conventional Internet through system prototyping. This paper gives the deployment direction in industrial IoT services, which requires low latency communication and lightweight processing.

Keywords: Beyond 5G, Society5.0, IoT Service, low latency

1. Introduction

5G and beyond 5G, which has deployed popularity in recent years, has made it possible to expand communication capacity and enhance communication processing, and has begun to provide a rich array of functions. However, it is in the field of infrastructure that 5G and beyond 5G are prevalent.

In the field of information processing there has not been much discussion of higher speeds.

Therefore, this paper proposes for high-speed communication functions that can run on top of broadband infrastructure.

As prior research on low processing latency communication, IoTA [1], a lightweight protocol implemented and developed by HI CORPORATION. Currently, IoTA is considered to run on UDP, but it is also possible by standard to run on a data link. It is believed that low-processing-delay communication can be achieved by having IoTA operate on the data link.

In this paper, we evaluate the performance of the Raw socket as a primary research.

Examples of the application of Raw sockets are [2] and [3].

2. Overview of raw socket communication

Figure 1 shows the position of the raw socket.

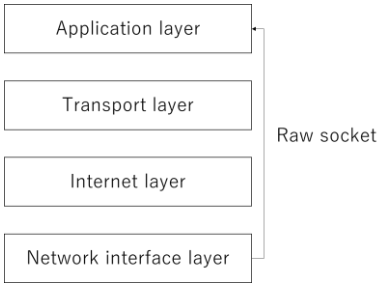


Figure 1 How raw sockets work

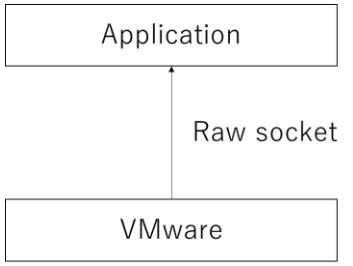
A raw socket is a socket that exchanges data directly without IP. The use of raw sockets also allows communication over data links.

3. System configuration for experiments

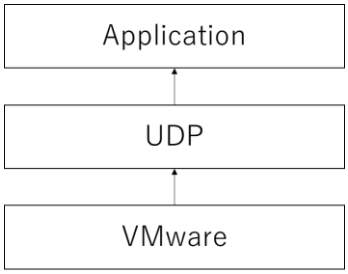
The physical configuration used in this experiment is shown in Figures 2 and 3.

The experiment will use two virtual machines, Machine1 (M1) and Machine2 (M2).

Messages sent from M1 are received by M2, and the time from the start of transmission to the end of reception is measured Figure 4. Also use a machine for time synchronization to synchronize time.



(a)When using raw socket



(b) When using raw socket

Figure2. Image of protocol stack with and without raw socket

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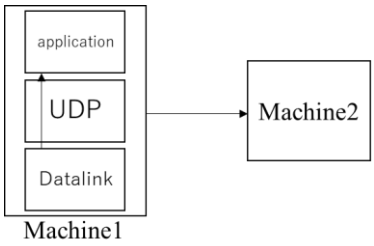

Figure 3 Direction of communication

The physical configurations shown in Figures 2 and 3 is configured within M1, while M2 is used as a machine to receive the messages sent.

The time when transmission is started is displayed at M1, and the receiving time is displayed at M2; the time taken for transmission is measured by subtracting the time displayed at M1 from the time displayed at M2.

In addition, this paper compares communication over lightweight raw sockets and UDP, which is used for real-time communication, such as video distribution and voice calls. In addition, M1 and M2 use VMware Workstation.

4. Experimental results

The results for this experimental environment are shown in Figure 5.

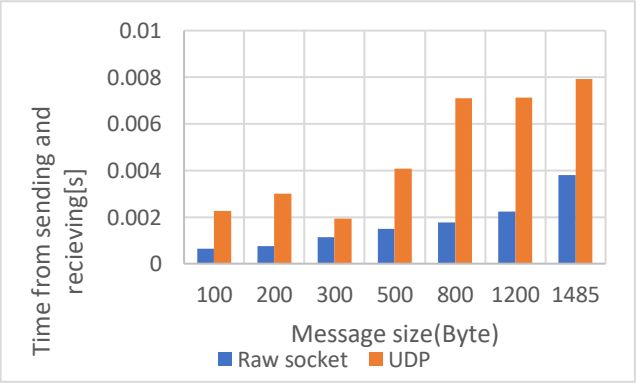

Figure 4 Comparison results between raw socket and UDP

We measure four message sizes: 100 bytes, 200 bytes, 300 bytes, 500 bytes, 800 bytes, 1200 bytes, and 1485 bytes.

The results of the experiment are shown in Figure 5. The results of this measurement are relative.

In this result, raw sockets dominated in all segments except 500 bytes. The results may have been affected by variations due to multiple measurements and the communication conditions at the time of the measurement. It is a simple operation that simply sends a message, but there are areas where the graph is not linear. This may be due to other operations taking place on the PC.

5. Conclusion

The results of this study demonstrate the possibility of high-speed communication through communication using a single raw socket.

In the future, it will be necessary to verify whether high-speed communication is possible by applying raw sockets to IoTA and other applications.

Reference

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