# Controller Area Network Protocol For Vehicle System

1st Sheikh Muhammad Adib Bin Sh Abu Bakar
*Hochshule Hamm-Lippstadt*
*B.Eng. Electronic Engineering*
Lippstadt, Germany
sheikh-muhammad-adib.bin-sh-abu-bakar@stud.hshl.de

2nd Zafirul Izzat Bin Mohamad Zaidi
*Hochshule Hamm-Lippstadt*
*B.Eng. Electronic Engineering*
Lippstadt, Germany
zafirul-izzat-bin.mohamad-zaidi@stud.hshl.de

3rd Muhammad Farid Izwan Bin Mohamad Shabri
*Hochshule Hamm-Lippstadt*
*B.Eng. Electronic Engineering*
Lippstadt, Germany
muhammad-farid-izwan.bin-mohamad-shabri@stud.hshl.de

***Abstract*—**
***Index Terms*—real time system, resource, protocol**

## I. Introduction

The rising power and cost effectiveness of electronic devices has affected all aspects of human endeavour during the last several decades. This also not exceptional to industrial control systems which are always improvise progressively. Control of industrial and process facilities was first done mechanically in the early 20th century, either manually with analogue devices or through the use of hydraulic controllers. Mechanical control systems were superseded by electronic control loops that used transducers, relays, and hard-wired control circuits as discrete electronics became more prevalent now a days. These systems were enormous and took up a lot of area, frequently necessitating many kilometres of wire, starting from one point to another point, as example the connection from the field itself to the control circuits. The functionality of many analogue control loops may be reproduced by a single digital controller thanks to the introduction of integrated circuits and microprocessors.

We know that at the beginning phase, a digital computer was for the first time being applied as a digital controller. As time goes by, Digital controllers gradually replaced analogue control, however connection with the field was still done using analogue signals. The transition to digital systems necessitated the development of new communication protocols for the field as well as between controllers. Fieldbus protocols are the most frequent name for these communication protocols. Recently, digital control systems began to include networking at all levels of industrial control, as well as the interconnection of commercial and industrial equipment utilizing Ethernet standards. This has resulted in a networking environment that, on the surface, looks to be comparable to traditional networks but has fundamentally different requirements.

An industrial communication network is the foundation of any automation system design since it provides a strong method of data interchange, data controllability, and the flexibility to link numerous devices. Over the last decade, the deployment of proprietary digital communication networks in industries has resulted in improved end-to-end digital signal correctness and integrity. With the help of real-time communication among machines and control centers, industrial communication networks power smart manufacturing scenarios. They guarantee that supply chain abnormalities may be evaluated and avoided by monitoring procedures and operations. Predictive maintenance is an excellent illustration of how the Industrial Internet of Things may improve efficiency and cost optimization through connection and data analytics. For example, any machine with sensors may collect vital information about its state and interactions with other equipment and operators. The network transmits this data to processing centers, where it is compared to historical and statistical data to find trends, recurrences, and exceptions. They can also build links between certain inputs and any breakdowns or inefficiencies. Intelligent gateways provide smooth interaction between several communication protocols that are structured in separate subnetworks.

This paper serves as an introduction to industrial communication networks. Industrial networking concerns itself with the implementation of communications protocols between field equipment, digital controllers, various software suites and also to external systems. To assist the reader, the communication network that is widely used specially in industrial field will be explain generally so that the reader can have humongous imagination and deep understanding regarding this topic. The chosen communication network which is CAN will be thoroughly discussed and contrast with those other networks. Many aspects of the operation and philosophy of industrial

Identify applicable funding agency here. If none, delete this.

networks has evolved over a significant period of time and as such a history of the field is provided. The operation of modern control networks is examined and some popular protocols are described

## II. Type of communication

### A. wireless network

#### 1) bluetooth:

#### 2) near field communication:

#### 3) wifi:

### B. wired network

#### 1) ethernet:

#### 2) I2C:

#### 3) UART:

## III. Problem

Wired communication protocol always being used in many application because of its reliability in term of the connection and it efficiency especially in transferring long sequence of data.

Today, there is many protocol that support weird communication such as UART, SPI and I2C as written in the previous subtopic. each protocol have their on advantage to solve many problem in a curtain application domain. For instance, SPI support many salve to be controlled by one master that almost impossible to be implemented using UART. This kind of protocol use atleast 4 wire to connect between one master and one slave. By using this protocol, increasing number of slave means that the used number of wire for the communication also will be increased. This is a huge problem for a system that use a lot of distinct sensors and actuators smartphone, computer and machine in production line. Here is where the I2C play a big role because with the I2C, only two wire are need for the communication between a master and their slaves regardless of the number of the salve.

Another problem that arrive when using I2C in a more rugged application is their reliability and efficiency. Imagine a main controller for a car system that is located at the front of ther car want to communicate withe the brake lamp at the back of the car, where the length of the used wire could be 5 meter.. Since the I2C protocol only support for low voltage application, with that long, it is possible that output from the controller will not be well received by the brake lamp system. If the output is well receive it cloud be very slow becouse with that long, we only allowed to use very low frequency to make the communication works. But to make it work is not only the purpose. In case on emergency brake, it is important for the car behind to that this car a breaking through the brake lamp. If the signal is to slow this can cause a catastrophic event.

To solve this problem which is to reduce the number of used wire, reliable and efficient communication protocol for rugged application, Controller Area Network protocol or CAN protocol should be used.

We will explain more bout this protocol in the next subtopic followed by the application to make user more understand and able to implement this kind of protocol.

## IV. CAN Communication Protocol

### A. The CAN Standard

2. The CAN Standard 3. Standard CAN 3.1 The Bit Fields of Standard CAN 4. A CAN Message 4.1 Arbitration 4.2 Message Types 4.3 A Valid Frame 4.4 Error Checking and Fault Confinement 5. The CAN Bus 5.1 CAN Transceiver Features 5.2 CAN Transceiver Selection Guide

## V. Application of CAN Protocol

### A. Scenario

### B. Application Model

### C. Implementation

#### 1) Hardware:

#### 2) Software:

## VI. State Of The Art

## VII. Discussion

## VIII. Conclusion

## Acknowledgment

We, Sheikh Muhammad Adib and .. and ... thanks..

## References

[1] G. C. Buttazzo, "Hard real-time computing systems: Predictable scheduling algorithms and applications". New York: Springer, 2011.

[2] L. Sha, R. Rajkumar and J. P. Lehoczky, "Priority inheritance protocols: an approach to real-time synchronization," in IEEE Transactions on Computers, vol. 39, no. 9, pp. 1175-1185, Sept. 1990, doi: 10.1109/12.57058.

[3] L. M. dos Santos, G. Gracioli, T. Kloda and M. Caccamo, "On the Design and Implementation of Real-Time Resource Access Protocols," 2020 X Brazilian Symposium on Computing Systems Engineering (SBESC), 2020, pp. 1-8, doi: 10.1109/SBESC51047.2020.9277858.

[4] Rajkumar, Raj and Juvva, Kanaka and Molano, Anastasio and Oikawa, Shuichi "Resource Kernels: A Resource-centric Approach to Real-Time and Multimedia Systems" 1997 Proceedings of SPIE - The International Society for Optical Engineering. 3310. 10.1117/12.298417.

[5] Nakajima, Tatsuo and Tokuda, Hideyuki, "Real-Time Synchronization in Real-Time Mach", 1994