Chair of Agrimechatronics
TUM School of Life Sciences
https://www.lse.ls.tum.de/en/amx/home/

Thesis

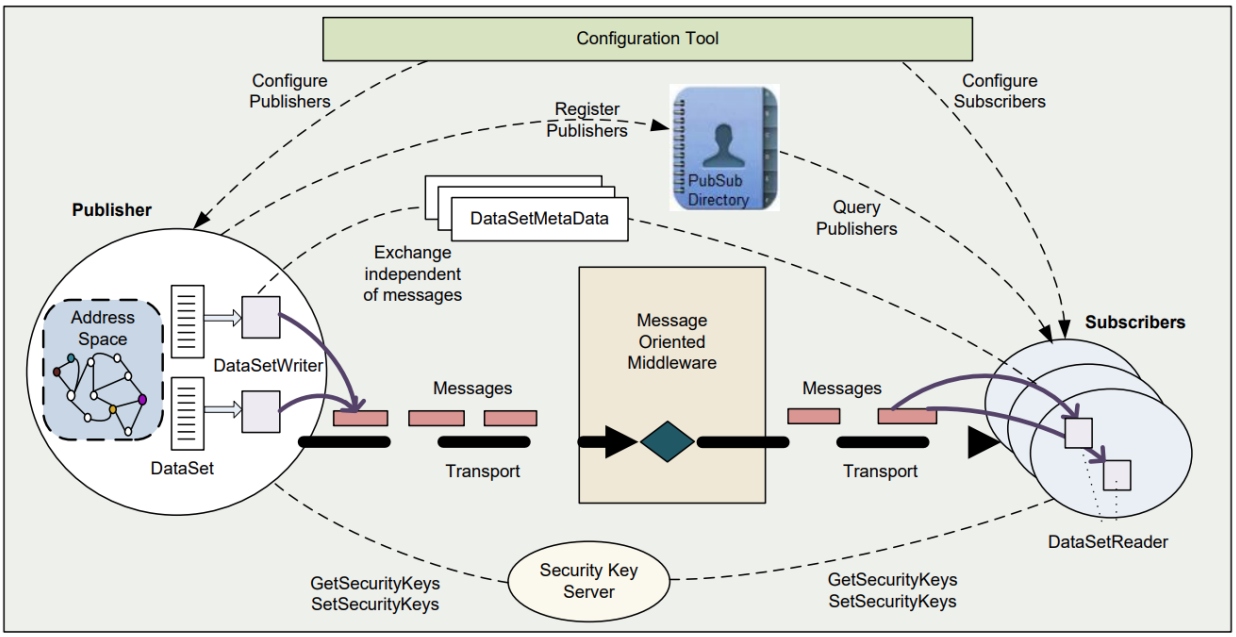
Analysis of Message Oriented Middleware for enabling OPC UA PubSub

Introduction

- OPC UA is a networking protocol used widely in industrial automation (https://opcfoundation.org/about/opc-technologies/opc-ua/).
- DDS is a lower level protocol which occupies a similar function. DDS is notably used in the popular ROS 2 Robot Operating System (https://www.dds-foundation.org/what-is-dds-3/).

The OPC UA framework enables the standardised exchange of information between different systems. E.g. when a new panel is installed in a solar park, it is able to integrate itself into the network with minimal to zero configuration. One method of sharing information from such assets is called "PubSub" publish-subscribe.

The figure below is taken from the OPC UA specification; it defines how a Message Oriented Middleware (MOO) can be used to transform the normally 1-to-1 messaging into many-to-many messaging (PubSub). The goal of the work is for the student to create a proof-of-concept implementation of this "OPC UA-over-DDS" framework and investigate the methods for integrating new MOOs into an OPC UA architecture.



Background

The chair of Agrimechatronics is performing research into the area of machine-to-machine networking in agricultural machines. The current standard is the widely used ISOBUS built on top of a 250 Kbit/s CAN bus network.

The 250 Kbit/s CAN used in such machines is slow for modern applications which often have complex automation functionalities. As such a new Ethernet-based framework is being developed (https://www.aef-online.org/about-us/activities/high-speed-isobus.html) to create a faster network for the future.

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Wider Purpose of the Work

The student's thesis will therefore be used to push forward the international standardisation efforts of the next generation of inter-vehicle communications technology for agricultural and transport vehicles.

Prerequisites

- Good knowledge of IP networks
- Strong coding skills (any language, preferably C++)
- Structured and independent way of working
- Good written and spoken English

Your tasks

- Research and analyze the best way to use DDS for PubSub
- Research and analyze how new MOOs can be integrated into the OPC UA architecture
- Extend the open62541 implementation of the OPC UA standard to support PubSub over DDS
- Measure and evaluate its performance

If you have any further questions, please send an email to the contact person.

Start: immediate or in the next semester

- If you have any further questions or wish to apply, please send your application by email to samuel.brodie@tum.de including your current **transcript of records**

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