Open
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Lab eG

An Open Source implementation of OPC UA Publish/Subscribe over TSN and a related demonstrator to be exhibited at Embedded World 2018 in Nuremberg, Germany

Letter of Intent (V5, January 15, 2018)

This Letter of Intent is signed between

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hereafter OPC UA Pub/Sub project participant and the

Open Source Automation Development Lab (OSADL) eG, 69120 Heidelberg, Germany

hereafter OSADL.

Introduction

In order to overcome the various shortcomings of the currently available Ethernet-based industrial communication methods, it was proposed to further develop and standardize the existing OPC UA protocol and to equip it with new features requested by industry. Such features include broadcasting messages simultaneously to many listeners (Publish) and the ability to install callback mechanisms to trigger automatic message submission when a state changes (Subscribe) to avoid polling. However, for the time being there is no implementation available that includes these features and can be used by industry – either since the features simply are not available or, if available, the implementation uses a strong-copyleft Open Source license which makes it impossible to be combined with a proprietary application and to be conveyed to customers. In addition, real-time capabilities may be needed when used in industry, but they are lacking as well. It, therefore, is the aim of this Letter of Intent to launch a community project to develop an Open Source OPC UA library equipped with Publish and Subscribe features and real-time capabilities. An Open Source license shall be used that allows to deploy the library in industrial products.

OPC UA Publish/Subscribe over TSN

The OPC Unified Architecture (OPC UA) includes a TCP-based client/server protocol. OPC UA was originally released by the OPC Foundation between 2006 and 2009 and has since been standardized in the IEC 62541series. OPC UA has seen wide adoption in industry for information modeling and communication without hard real-time requirements.

In addition to the existing OPC UA protocol, the OPC Foundation is working on an extension to OPC UA, the upcoming Part 14 of the specification. Part 14 adds the Publish/Subscribe paradigm where messages are broadcast to a group of receivers. Message distribution is implemented via a dedicated broker (e.g. based on the AMQP protocol) or via IP-multicast and a custom UDP-based protocol. (Note that the existing OPC UA protocol already includes a subscription model that allows a server to push notifications of data changes and events. But this requires stateful connections and individual messages sent to all receiving clients.) Part 14 is currently available as a draft document to members of the OPC Foundation.

There is now ongoing interest to equip the OPC UA Publish/Subscribe extension with real-time capabilities. To this end, it was envisaged to base it on TSN, a level-2 protocol, that shall be configured in such a way that it will not interfere with the traditional traffic via the level-3 protocols UDP and TCP. First tests with an Intel I210 network adapter that were carried out by OSADL have shown that this is, in fact, feasible.

Current status and aim

The community project described herein aims to develop an OPC UA Publish/Subscribe over TSN implementation, create a related demonstrator and exhibit it at Embedded World 2018 in Nuremberg, Germany, that will take place from February 27 to March 1, 2018. The work shall be based on the OPC UA implementation of the open62541 project (https://open62541.org/) that can be copied and distributed under the Mozilla Public License 2.0 (MPL-2.0). It is expected that the presentation of the demonstrator at the Embedded World will create sufficient momentum to append another three-month project period to stabilize the work towards a public release and to port the software to add more TSN hardware platforms that will be available by then according to related announcements. The targeted feature set is as follows:

- Brokerless OPC UA Publish/Subscribe via IP-multicast and the binary message encoding format (see the draft for part 14 of the OPC UA specification).
- Integration of the publisher in a regular OPC UA server with additional real-time interrupting. Subscribers are standalone.
- Demonstrator and measurement tests for real-time operations of OPC UA Publish/Subscribe via TSN. This is done for two selected hardware platforms until Embedded World 2018 with the possibility to add more supported platforms thereafter.
- Configuration of the Publisher will be made during startup, as (re-)configuration during runtime is still undergoing changes in the standardization for both TSN and OPC UA Publish/Subscribe.

Project management, software development and testing

The overall organization and the management of the project is provided by Kalycito Infotech Private Limited based in Coimbatore, India. The software shall be developed by Fraunhofer Institute IOSB in Karlsruhe, Germany. Fraunhofer IOSB is a founding member and leading contributor to the open62541 initiative. Support and integration for TSN hardware platforms is provided by Kalycito. Testing and project management support is provided by the Open Source Automation Development Lab (OSADL) eG in Heidelberg, Germany. OSADL will also provide booth space at the Embedded World 2018 to exhibit the demonstrator that will be created in the course of the project and provide related press and marketing material.

Budget

Based on an estimated overall project cost of 240.000 euros, the following distribution of costs would be conceivable:

a) A total of 160.000 euros will be acquired and provided by Kalycito.

b) A total of 80.000 euros will be provided by a subgroup of eight OSADL members who will contribute 10.000 euros per member and who will sign this Letter of Intent for this purpose. However, any other composition of the contribution is also conceivable as long as the validity threshold of the Letter of Intent is reached.

Share of results and benefits

a) The OPC UA Pub/Sub project participants together will be provided an exclusive two-day workshop on TSN integration with OPC UA to be conducted jointly by Kalycito, Fraunhofer and OSADL at a single location in Europe. At this date, the software developed so far will be made available to the participants of the OPC UA Pub/Sub project.

b) If the OPC UA Pub/Sub project participant has own TSN hardware and is able to connect it to the OPC UA Pub/Sub implementation, the hardware will be added as additional demonstrator to the show case area of the OSADL booth at the Embedded World 2018 and included into press and marketing material.

c) If the OPC UA Pub/Sub project participant has own TSN hardware, but does not succeed to connect it to the OPC UA Pub/Sub implementation in time, support is offered to do so, but only after Embedded World 2018 when the internal APIs have stabilized. This will require a separate support contract. This also applies for custom components such as configuration tools and any activities that require one-to-one development or support for a particular project participant.

d) Any TSN hardware that is provided in this project will be added to the OSADL QA Farm and tested on request. The test results may be kept confidential or made publicly available according to the given instructions.

e) The generic part of the OPC UA Pub/Sub implementation, *i.e.* components for open62541 stack such as client-server module, OPC UA Pub/Sub reference design, performance benchmarks from integration of OPC UA Pub/Sub with two TSN silicon platforms will be made publicly available at the end of the project under an Open Source license. This is subject to availability of suitable TSN

features on chosen silicon platforms.

f) The OPC UA Pub/Sub project participants will have to acquire the TSN IP and drivers directly from their silicon vendor when they wish to integrate the OPC UA Pub/Sub implementation with their choice of TSN silicon platform.

Confidentiality and IP Issues

Any contribution or communication must be kept confidential with the only exception that the software and accompanying material will be released under the Mozilla Public License 2.0 (MPL-2.0). Example software and test programs will be released under the Creative Commons Zero v1.0 Universal (CC0-1.0) that does not impose any license obligations.

Schedule

If the funding threshold is reached, the project will be launched in January 2018 and last at least until end February 2018 or longer, if the budget allows.

Agreed intent

By signing this Letter of Intent, the OPC UA Pub/Sub project participant agrees to accepting the above mentioned conditions in the final consortium agreement; withdrawal from the final agreement without any penalty shall be limited to the following conditions

a) At least 50% of the estimated total budget of 240.000 euros, i.e. 120.000 euros, is not committed by January 31, 2018.

b) The estimated OSADL contribution of at least 50% of 80.000 euros, i.e. 40.000 euros, is not committed by January 31, 2018.

In any other case, a penalty for breach of contract in the amount of 20% of the accepted contribution to the budget shall be applicable.

The OPC UA Pub/Sub project participant confirms, by signing this Letter of Intent, their interest in participating in the project and joining the related consortium.

OSADL membership

The OPC UA Pub/Sub project participant agrees to join OSADL as Regular or Associate Member at Bronze, Silver or Gold level.

Place of jurisdiction

This Letter of Intent will be governed by the laws of Germany, except for its conflicts of laws principles. The place of jurisdiction for all disputes arising from or in connection with this Letter of Intent shall be Mannheim, Germany.

Signatures

OSADL member

Location:

Date:

Signatures:

Open Source Automation Development Lab (OSADL) eG

Location:

Date:

Signatures:

General Manager or Member of the Board of Directors