ROS 2.0 AND OPC UA: A STATUS UPDATE

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Agenda

- Recap
- Status
- Outlook
Recap
Driving force of technological developments

⇒ Digital Intelligence
⇒ Connectivity
Recap

OPC Unified Architecture

- Base Services and data models for
  - Data Access
  - Methods
  - Events
- Platform independent communication stack
- High performance
- Integrated security
- Possibility for the specification of further information models

Proprietary specifications

Specifications for information models of other organizations

OPC UA Base Services

Transport
Webservice / OPC UA Binary

OPC UA Data Model Modelling Rules

Source: based on ascolab GmbH
Recap

ROS based on OPC UA for seamless integration

- Platform and manufacturer independent communication within ROS networks using OPC UA Pub/Sub and TSN
- Provision of OPC UA endpoints of ROS networks for superimposed systems (e.g. MES) and parallel systems (M2M)
Recap
Case Study

- WAGO PFC200 Linux Fieldbus Coupler
- OPC UA Server implemented using open62541
Recap

Approach

Userland Code

ROS client library API

Abstract DDS API

Abstract API

RTI Connext

PrismTech OpenSplice

Twin Oaks Software CoreDX

OPC UA ...

Source: ros2.org
Recap

Making ROS relevant for Industrie 4.0

- OPC UA is a key technology in the context of Industrie 4.0
- ROS 2.0 enables the integration of the OPC UA communication technology
- ROS 2.0 based on OPC UA enables using OPC UA field devices and seamless integration of robots into production networks
- Completion of the OPC UA Pub/Sub specification pending (currently prototyping phase)
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Status
ROS 2.0 and OPC UA

RCL provides the ROS2.0 functionality
RCL calls the similar methods from the RMW-Interface
RMW-methods get inherited by the Middleware Implementations
RCL calls the similar methods from the RMW-Interface
RMW-methods get inherited by the Middleware Implementations

DDS IMPL (OPENSPLICE)
-InitDDS()
DDS ENVIRONMENT

OPCUA ISW IMPL
-InitOPCUA()
OPCUA ENVIRONMENT

ROS_TYPE_SUPPORT (Conversation of ROS-Messages into rmw-specific Datatypes)

RMW (ROS Middleware-Interface)
-Rmw_Init()
-Rmw_Create_Node()

MAIN USER Land Code
-rclcpp::init(argc, argv)
rclcpp::node::Node::make_shared("Name of Node")

Create ROS2-Node
Bsp. Talker
Status feedback + Callbacks
Status

Workflow architecture

Middleware RMW
CMAKELIST „log in“ the Middleware Implementation

RMW-Interface for ROS2
- rmw_init()
- rmw_create_node()

<<Typesupport>>
Typesupport (not fully implemented yet)
typesupport_handle()

<<RMW-ROS-Interface>>
RMW-Implementation
- DDS_init()
- OPCUA_init()

Middleware Environment

ROSLIGHT USER land code
- rclcpp::init(argc, argv)
- rclcpp::node::Node::make_shared("Name of Node")

RCL ROS CLIENT LIBRARY (C/CPP/Python)
- rclcpp_init()
- rclcpp_create_node()
- rclcpp_create_publisher()
- ..............................................................

RCL ROS Client Lib

ROS user land code

ROSLIGHT RCLROS Client Library
RCL ROS CLIENT LIBRARY (C/CPP/Python)
**Status**

**Workflow architecture**

- ROS user land code
- RCL ROS Client Lib
- Typesupport
- Middleware Environment

```
ROS user land code

rclcpp::init(argc, arv)

rclcpp::node::Node::make_shared("Name of Node")

rcl_init()

rcl_node_init()

rmw_init()

rmw_create_node()

OPCUA_init() + Libs einladen

OPCUA connect fct()

```

- Initialize
- Initialize of Middleware Interface
- Create Middleware Node
- Return node_handle
- RCL_RET_OK/RCL_RET_ERROR
- RCL_RET_OK/RCL_RET_ERROR
- RMW_RET_OK or RMW_RET_ERROR
Agenda

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Outlook

OPC UA Roadmap

- OPC UA Publish/Subscriber Communication Model
- Release of Companion Specification planned for end of this year
- First prototypical implementations already available

Source: OPC Day Europe 2016
Outlook

OPC UA Pub/Sub

Source: OPC Day Europe 2016
Outlook

Pub/Sub with UDP Multicast

Source: OPC Day Europe 2016
Outlook

Public funded project – SeRoNet

- OPC UA as main communication layer in service robotic networks
- OPC UA based Services
Your Contact at ISW

Wir steuern Zukunft
Innovativ. Interdisziplinär. Wissenschaftlich.

Thank you very much!
Any questions?

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