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OPC UA with Publish/Subscribe is now ready to apply for IOT on the process industry

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1   Introduction

Recent technological advances in areas of IoT and data analytics have been massive. As new possibilities are introduced, business requirements for technology are evolving and changing continuously. This has caused process industry companies to hesitate and delay their IoT investment decisions, even if the need for data-extensive applications like predictive maintenance, intelligent real-time analytics, decision-making support, machine learning (ML) and artificial intelligence (AI) is huge. New approaches for implementing industrial IoT solutions have thus been very much in demand.

It has been possible for a while to secure the existing investments when starting to extend data collection systems by taking into account a few fundamental factors: relying to standards when integrating different systems, ensuring supplier independence and noticing strong existence of Industry 4.0 and hence compatibility with related technologies, such as OPC UA. IoT solutions supporting PubSub and Time Sensitive Networking (TSN) are latest part of its reference architecture. Real-life process industries have various use cases that can be economically solved with OPC UA PubSub based IoT solutions.

2   OPC UA with PubSub

Industry 4.0 endorsed OPC UA is likely the best approach for ensuring extensible secure data transfer between plants, edge solutions, and cloud environment. OPC UA has standard data modeling for different purposes and equipment as well as common companion specifications for compatibility between different vendors. Furthermore, it utilizes familiar and established data communication standards. Together with IoT and Edge device remote management and control, OPC UA plays a key role in ensuring system security, integrity and business continuity. As the standard OPC UA, also PubSub works with multiple transport and message protocols. For OPC UA PubSub MQTT with JSON encoding as well as UDP with binary encoding will be available, and selection can expand in the future. Metadata associated with the message provides context which allows the subscribers to properly interpret the message and allow the publishers to report changes to their configurations.

Latest progress in OPC UA offers a compelling solution for connecting applications within the IoT. OPC UA has generic and neutral architecture with separated information model layer, communication models and protocol bindings. 2018 released PubSub enables further adoption of OPC UA at the deepest levels of the field where controllers, sensors, and embedded devices typically require optimized, low power and low-latency communications on local networks. New bindings to standards like TSN and protocols like AMQP and MQTT together with PubSub message model makes it very attractive for IoT systems which requires distributed locations, easy and fast extendability and connectivity and reliable manageability.

As PubSub is especially suitable for IoT and Cloud environments, it's essential that information security is at maximum level. PubSub security key mechanism uses web based standards as OAuth2 for federated identity mechanism. With OPC UA PubSub only applications authorized by the operators will be able to view or modify the data by the end-to-end security no matter how many intermediaries are required to deliver the data. That makes OPC UA with PubSub optimal choice for industrial IoT use cases.

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3   IoT PubSub Use Cases

Most important use cases for process industry differ depending on whether studying greenfield or brownfield applications. Similarly, restrictions and limitations vary whether we are implementing new solution from scratch or revamping existing processes or machinery. However the main principles for developing the technological solution are the same.

Easiest and most cost-effective way to implement or modernize distant process asset tracking is to transfer the data wirelessly directly to a cloud service via Industry 4.0 standard OPC UA communications. Instead of using unprotected legacy communication protocols across a Wide Area Network, OPC UA PubSub -based IoT with edge solutions offer modern communication techniques (such as MQTT) which are designed for secure, easily expendable and efficient network communications.

Benefits are crisp also on factory floor level, where controllers, sensors, and embedded devices typically require optimized, low power, and low-latency communications. For example measurements from field which have traditionally been collected daily by workers physically reading the value form meters can be securely and economically feasible way be connected to production information system for real time tracking and analytics purposes.

PubSub enables especially cloud-based use cases as virtually unlimited number of edge data sources, such as intelligent sensors, can supply data securely to internet-based data hubs and applications over public wide-area networks. That makes possible tele monitoring of decentralized assets like tanks and vessels economically with standard devices equipped with suitable sensors for the respective need, for example tracking of vessel fill up and basic analysis of its current content. That is important information for example supply chain optimization for many new circular economy use cases where raw material needs to be collected from small streams.
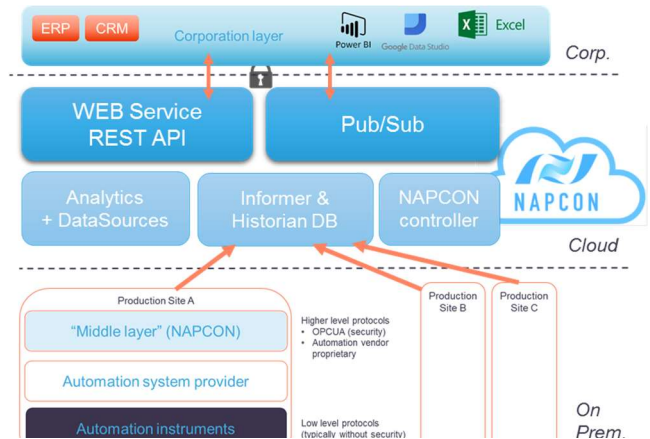
Figure 1. Illustrative picture how NAPCON {1} Understand –products can be used for process information collection from various production DCS and IoT sources to cloud corporation analytics utilizing common cloud platforms. All connectivity between sites and NAPCON Cloud is done via OPC UA.

Currently continually extending data analytics and predictive maintenance needs are increasingly breeding calculation capability demand and moving intelligence from cloud environments to the edge; i.e. near to the source of data and real-world functions. Cloud and Edge solutions boost platform independency but also set strict requirements for information security. To fulfill these needs IoT solutions must be easily extendible and easy to operate and maintain. Now OPC UA with PubSub support offers the most exiting standard set for solutions for these. Time to execute IoT for process industry is now!

References

[1]   napconsuite.com