

OPC DAY
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Large Scale Data Delivery to Cloud with OPC UA PubSub

Jan Borch

Principle IoT Solution Architect @ AWS

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Industrial IoT Use Cases

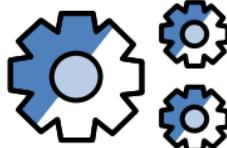


Predictive Quality

Asset Condition Monitoring

Predictive Maintenance

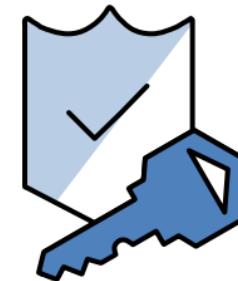
Industrial customers face unique challenges



Data Access
& Ingestion

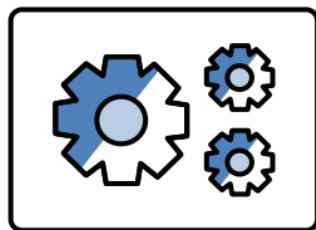


Scale



Security

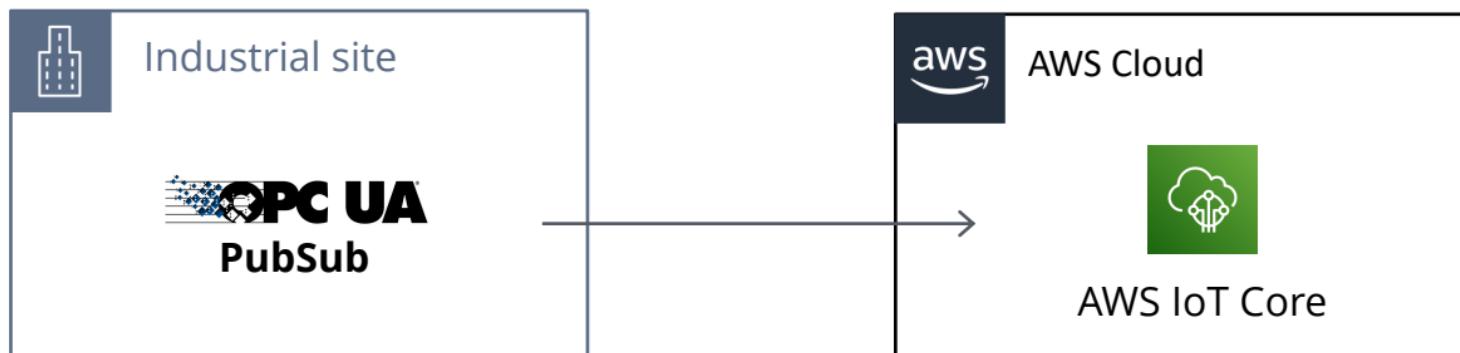
Back-of-the-envelope calculation to understand scale



**Data Access
& Ingestion**

- 5000 datapoints from one facility
- 1KB avg message size
- Send 1 per second
- → 5MB/s or 12.9TB/month

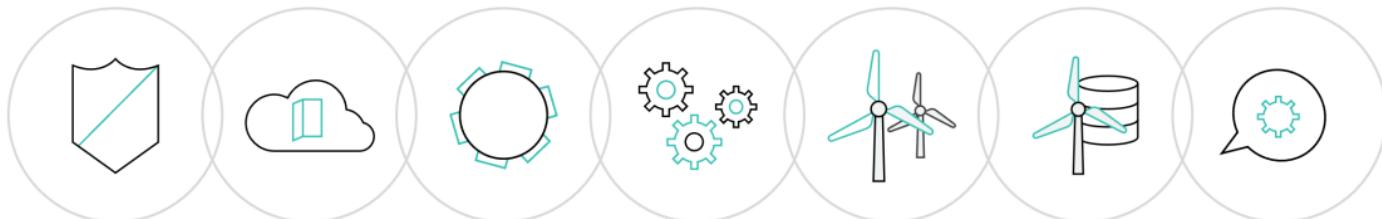
OPC UA PubSub for Cloud Connectivity powered by AWS IoT





AWS IoT Core

Connectivity and control services



Identity service

Manage authorization of devices and provision unique identities at scale

Device gateway

Fully manage connectivity optimized for IoT workloads

Message broker

Reliable and fast communication across your IoT fleet

Rules engine

Ingest large amounts of IoT data at a low cost, pre-process it, and make it available to 20+ services for analytics, reporting, and visualization

Device shadow

Understand and control the status of your device at any time

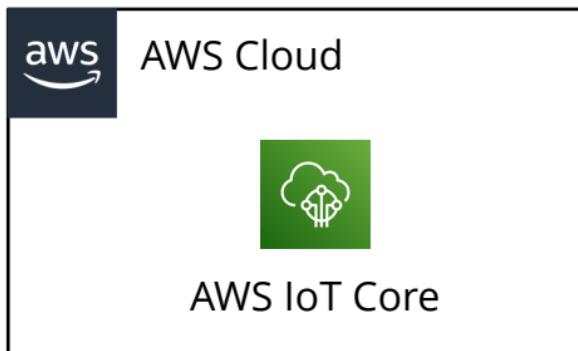
Registry

Define and catalog device for easy use by AWS services

Device advisor

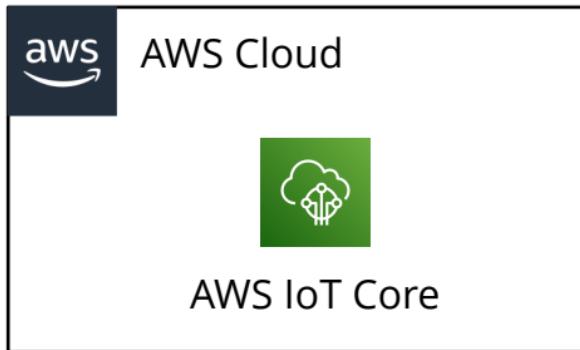
Fully managed test capability for IoT devices

AWS IoT Identity Service



- TLS 1.2/1.3
- X.509 based authentication
- Bring your own root or client certificates
- Fine grained access control down to MQTT topic level
- Just in time provisioning

AWS IoT Device Gateway



- MQTT 3.11 and 5.0
- Customizable MQTT topic space
- Retained messages
- Qos 1 and Qos 2
- Binary payload support
- Scales automatically with usage
- Custom endpoints
- VPC Endpoints

OPC UA PubSub Publisher - PubSubConnection

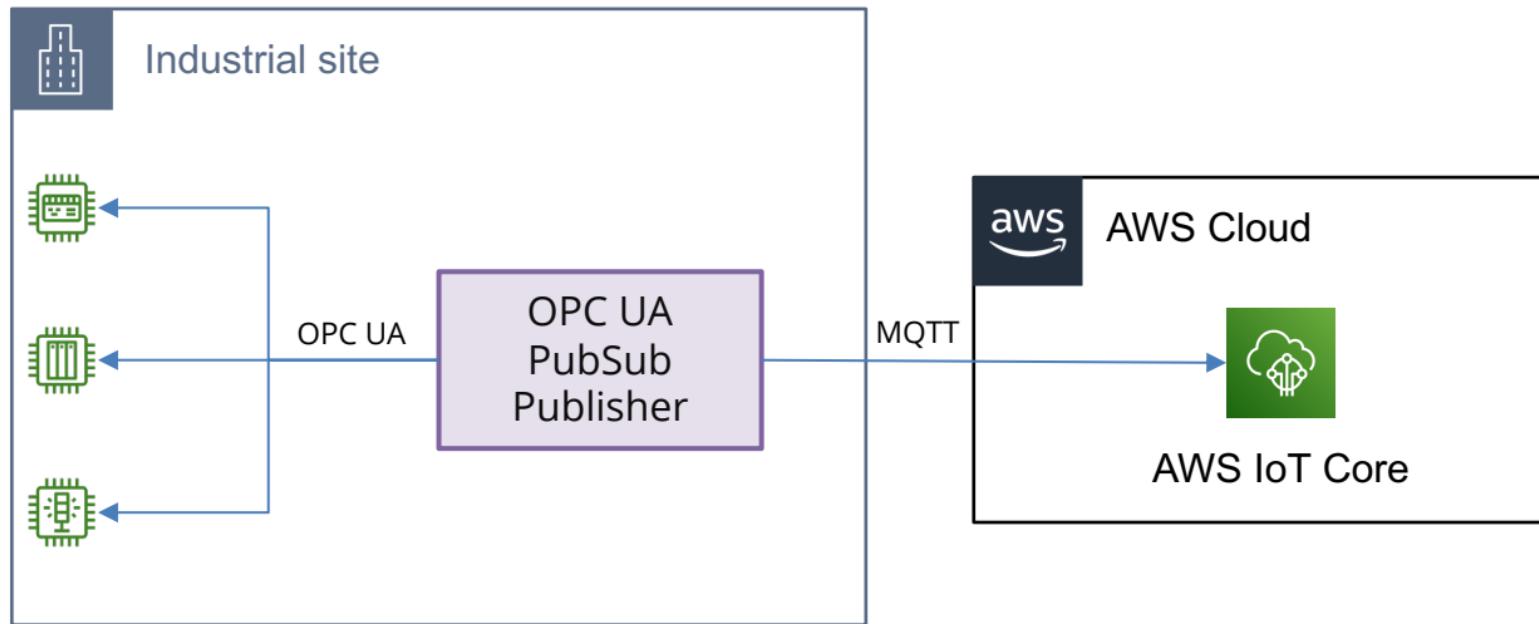
PubSubConnection

WriterGroup

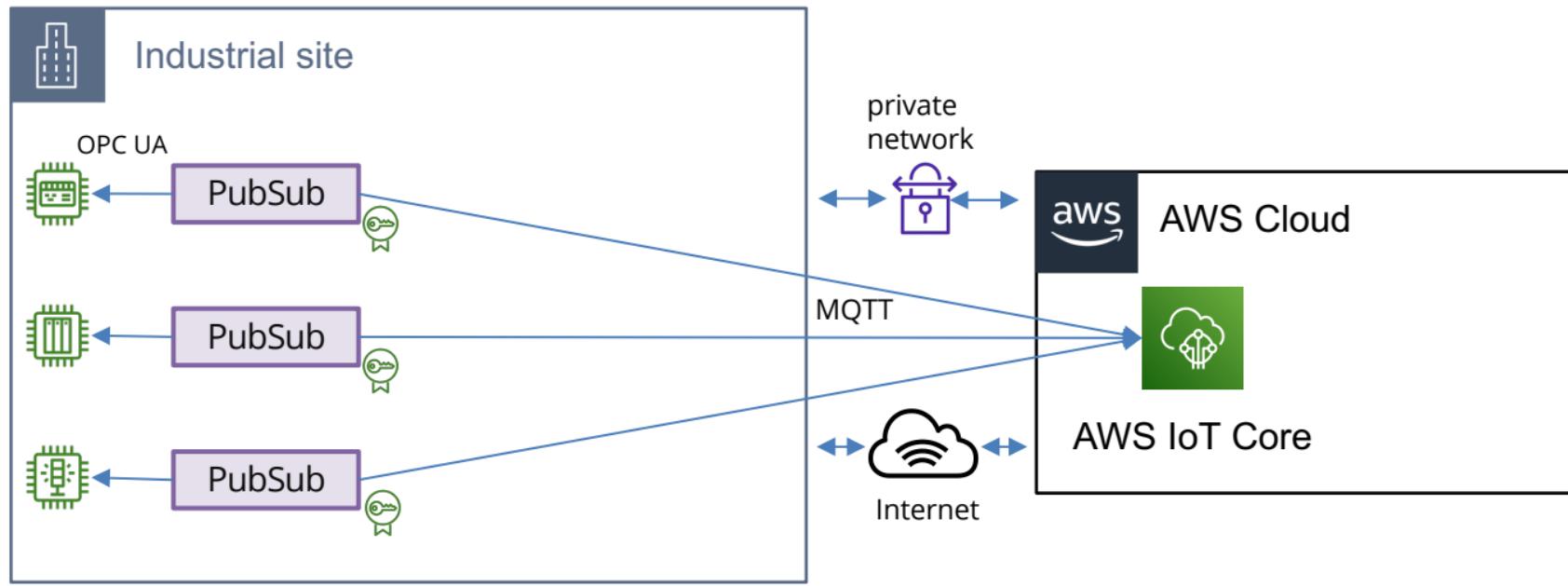
DataSetWriter

- PublisherId
- AWS IoT endpoint
- Device certificate/key
- TLS settings
- Transport: MQTT
- Encoding: UADP/JSON

Single Publisher



Distributed publisher



Zero Trust

The image shows two side-by-side screenshots of web pages related to Zero Trust.

NIST CSRC Screenshot: The top navigation bar includes "Search CSRC" and "CSRC MENU". The main content area features the NIST logo and the text "Information Technology Laboratory COMPUTER SECURITY RESOURCE CENTER". Below this, there's a "PUBLICATIONS" section listing "SP 800-207" and "Zero Trust Architecture". A "Date Published: August 2020" note and a "Planning Note (12/11/2020)" link are also present. Social media icons for Facebook and Twitter are at the bottom.

AWS Cloud Security Screenshot: The top navigation bar includes "Contact Us", "Support", "English", "My Account", and a "Sign In to the Console" button. Below this is a secondary navigation bar with links for "re:Invent", "Products", "Solutions", "Pricing", "Documentation", "Learn", "Partner Network", "AWS Marketplace", "Customer Enable", and a search icon. The main content area features the AWS logo and the title "AWS Cloud Security". Below the title is a menu with "Overview", "Security Services", "Compliance Offerings", "Data Protection", "Learning", "Resources", and "Partners". The central part of the page has a large blue header with the title "Zero Trust on AWS" and the subtitle "Advancing your security model with a Zero Trust approach". At the bottom of this section is a call-to-action button labeled "Free AWS Training | Advance your career with AWS Cloud Practitioner Essentials—a free, six-hour, foundational course »".

OPC UA PubSub Publisher - WriterGroup

PubSubConnection

- PublisherId
- AWS IoT endpoint
- Device certificate/key
- TLS settings
- Transport: MQTT
- Encoding: UADP/JSON

WriterGroup

- WriteGroupId
- PublishingInterval
- NetworkMessageSize

DataSetWriter

OPC UA PubSub Publisher control bandwidth

6.2.5.2 PublishingInterval

The *PublishingInterval* with the *DataType Duration* defines the interval in milliseconds for publishing *NetworkMessages* and the embedded *DataSetMessages* created by the related *DataSetWriters*.

6.2.5.5 MaxNetworkMessageSize

The *MaxNetworkMessageSize* with *DataType UInt32* indicates the maximum size in bytes for *NetworkMessages* created by the *WriterGroup*

- **Publisher control message throughput and consumed bandwidth**
- **AWS IoT can also throttle bandwidth used per connection on cloud side**

Size reduction sample



- Measurement00 (Double)
- Measurement01 (Double)
- ...
- Measurement98 (Double)
- Measurement99 (Double)

PubSub

1. Json payload : 8632 B
2. UADP : 2180 B (-75%)
3. PublishingInterval -> 2s

On DataSet level:

1. KeyFrameCount: 5

OPC UA PubSub Publisher - DataSetWriter

PubSubConnection

- PublisherId
- AWS IoT endpoint
- Device certificate/key
- TLS settings
- Transport: MQTT
- Encoding: UADP/JSON

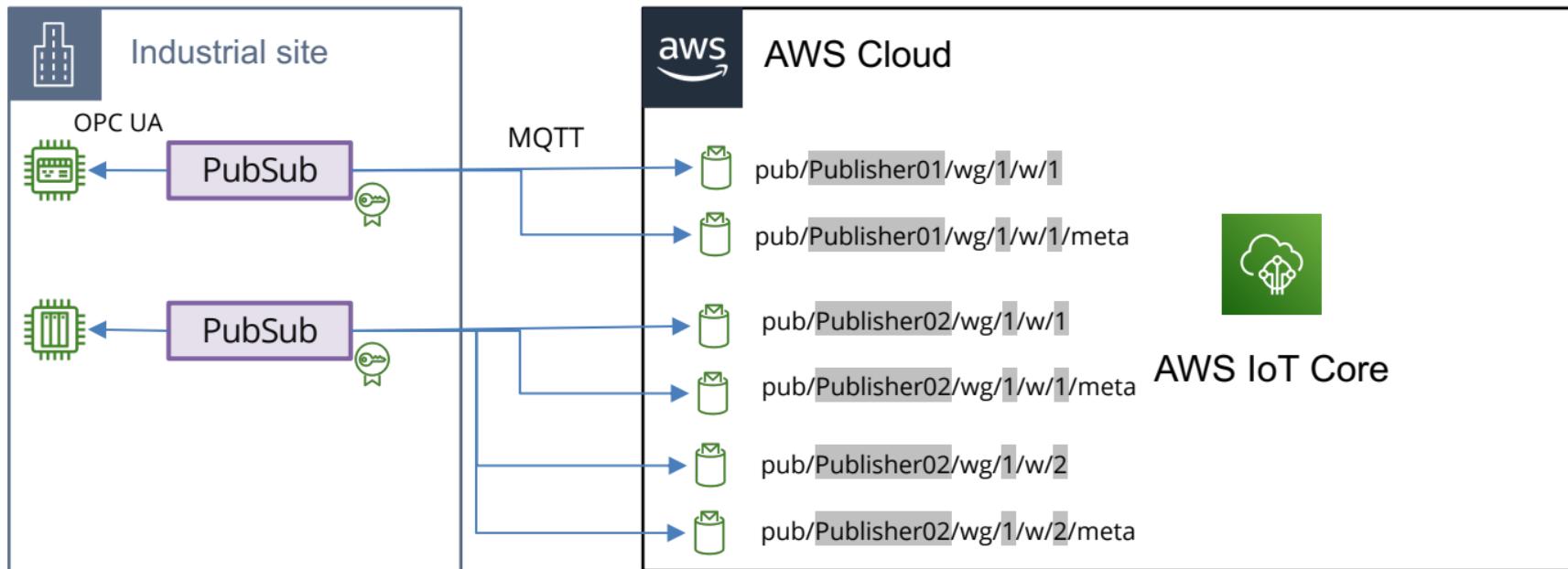
WriterGroup

- WriteGroupId
- PublishingInterval
- NetworkMessageSize

DataSetWriter

- WriterId
- MQTT topic for messages
- MQTT topic for meta data
- QoS
- OPC UA NodeIds
- OPC UA Events
- KeyFrameCount

MQTT topic space



MQTT retained messages

AWS IoT > Manage > Retained messages

Retained messages (2) [Info](#)

Messages published with the RETAIN flag set are listed here. Only the most recent message that was published to a topic with the RETAIN flag set is kept. Refresh the list to see the most recent messages. Viewing the contents of a message is billed at the standard messaging rate.

Search topic name

Topic name

[publisher/String:SamplePublisher@909c4ad2251a/1/1/meta](#)

Payload size

5.60 KB

[publisher/String:SamplePublisher@909c4ad2251a/1/2/meta](#)

0.17 KB

AWS IoT > Retained messages > [publisher/String:SamplePublisher@909c4ad2251a/1/1/meta](#) [Info](#)

[publisher/String:SamplePublisher@909c4ad2251a/1/1/meta](#) [Info](#)

Last updated: November 27, 2022, 11:19:54 (UTC+0100)

[C](#)

[Publish](#)

[Delete](#)

Retained message details

Topic
[publisher/String:SamplePublisher@909c4ad2251a/1/1/meta](#)

QoS
1 - At least once

Payload size
15.05 KB

Time saved
November 27, 2022, 11:19:48 (UTC+0100)

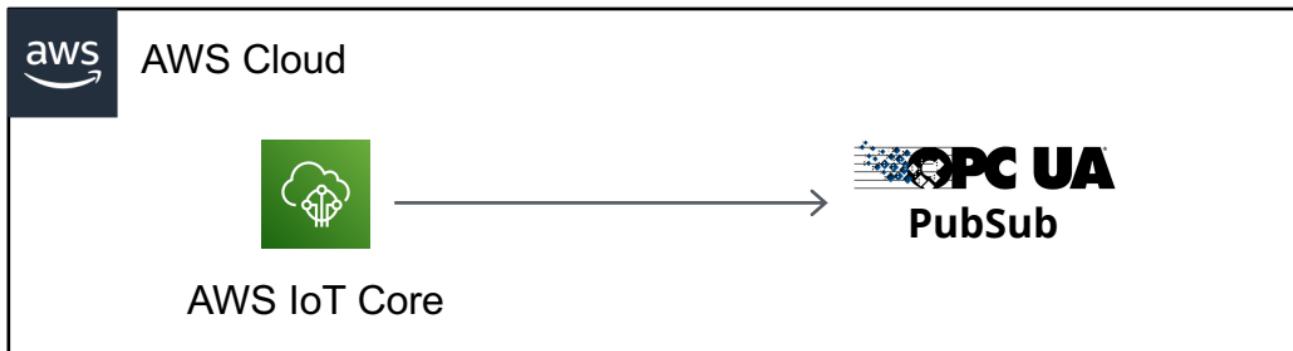
Message payload

```
{  
    "MessageId": "92515de1-825d-4e07-9440-a3f505bee3ad",  
    "MessageType": "ua-metadata",  
    "PublisherId": "SamplePublisher@909c4ad2251a",  
    "DataSetWriterId": 1,  
    "MetaDatas": [  
        {  
            "Name": "Sample OPCUA Variable Dataset",  
            "Fields": [  
                {  
                    "Name": "Measurement000",  
                    "Description": "",  
                    "BuiltInType": 11,  
                    "DataType": {  
                        "Id": 11  
                    },  
                    "Value": null  
                }  
            ]  
        }  
    ]  
}
```



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Cloud Side OPC PubSub Subscriber



OPC UA PubSub Subscriber - DataSetWriter

PubSubConnection

- SubscriberId
- AWS IoT endpoint
- TLS settings
- Device certificate/key
- Transport: MQTT
- Encoding: UADP/JSON

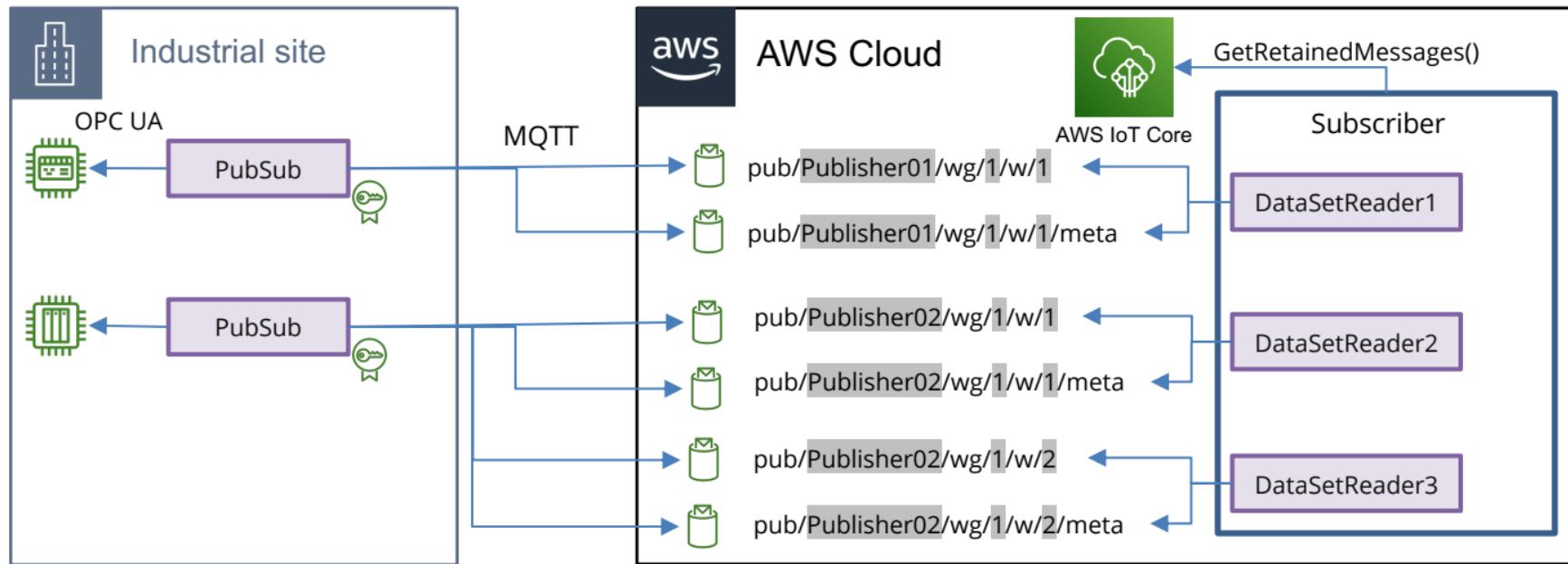
ReaderGroup

- ReaderGroupId

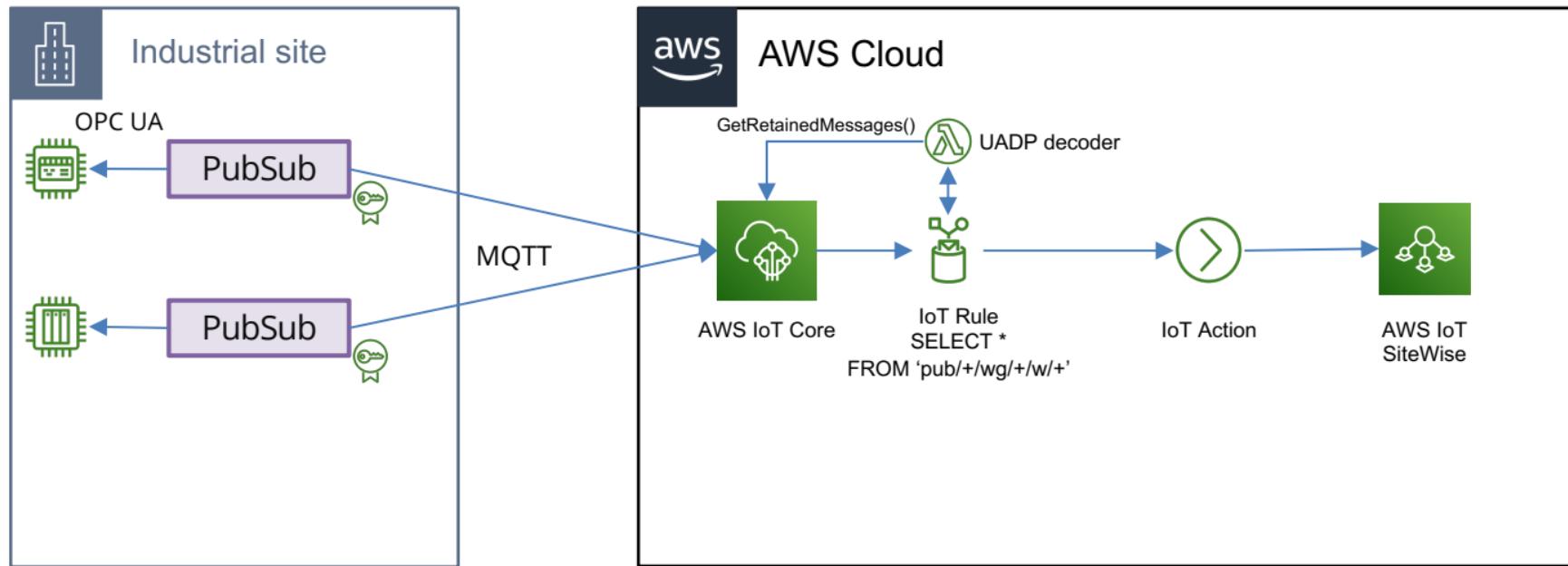
DataSetReader

- ReaderId
- MQTT topic for messages
- MQTT topic for meta data
- QoS

OPC PubSub Subscriber Publisher discovery



Scale the Subscriber? AWS IoT Rule Engine



AWS IoT SiteWise

AWS IoT SiteWise

Edge
Gateways

Build
Models
Assets
Data streams

Monitor
Getting started
Portals

Settings
Logging options
Encryption
Storage

What's new 4

Data streams (2/10) Info

Alia... ▾ Q Measurement000 X All d... ▾

Data stream alias Asset property name

<input checked="" type="checkbox"/> Measurement000	Measurement000
<input checked="" type="checkbox"/> Measurement001	Measurement001

2 data streams selected

AWS IoT SiteWise creates a line chart to visualize data from the first 10 data streams that you select.

Aggregation function Time range Time interval

Maximum Last 1 hour 1 minute

400

200

0

-200

-400

Nov 27
11:00 11:05 11:10 11:15 11:20 11:25 11:30 11:35 11:40 11:45 11:50 11:55

Time (UTC)



Thank You!

Q&A