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MQTT – SparkPlug™ Specification

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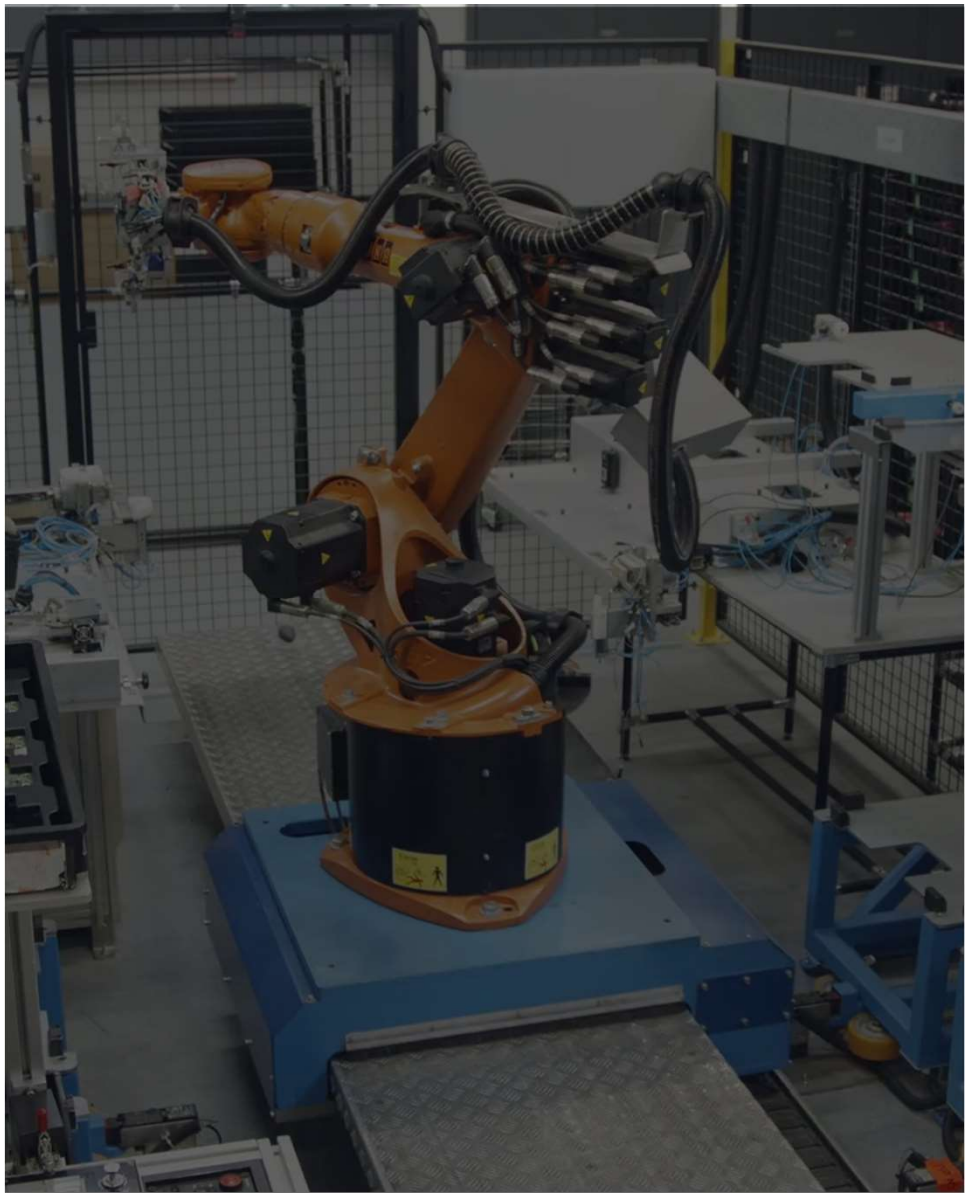
IIoT Transition Challenges

1. Integrating new modern device assets into existing production lines.

2. Changing data routing, data processing and measurement protocols during a digitalization process.

3. Updating Device asset configurations based on reported values.

4. Multiple SCADA Hosts in a factory lead to convoluted architecture making benefits of IIoT hard to realize.



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Missing Components of Vanilla MQTT

1. The topics and sub-topics could be really anything that one wishes it to be.
2. There is no prescribed structure to the message content payload.
3. Not fully aware of the state of the other systems., particularly relevant in an Industrial setting.

These drawbacks lead to lack of

INTEROPERABILITY

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SparkPlug B spec for MQTT

1. Extension of MQTT 3.1.1
2. Topic Hierarchy
3. Store & Forward
4. Edge of Network Device (EoN)
5. Compression

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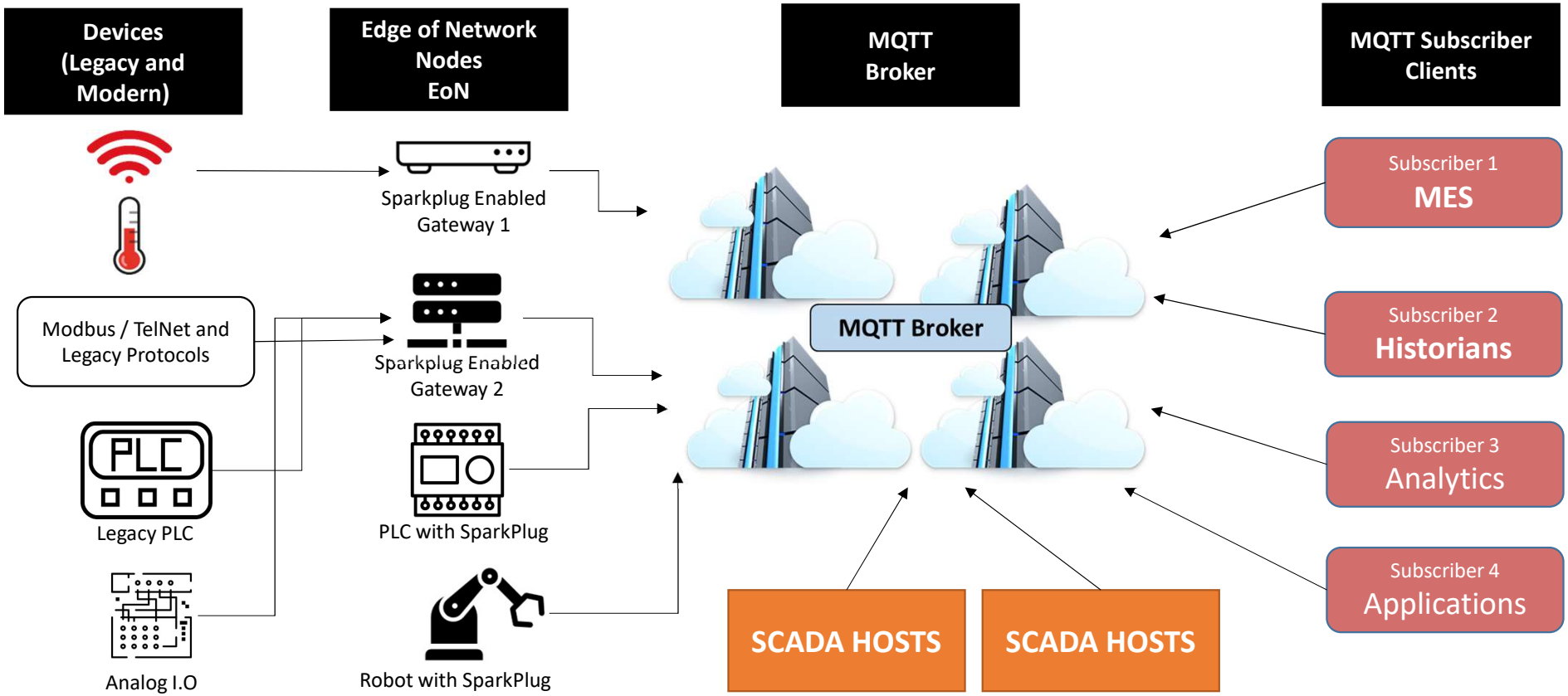
SparkPlug™ – Facilitating Interoperability



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Three Goals of Sparkplug for IIoT

1. Definition of Topic Names Spaces

Must Follow: namespace/group_id/message_type/edge_node_id/[device_id]

Name	Description	Example
Namespace	Root element that sets the Sparkplug version used	spAv1.0 OR spBv1.0
group_id	Logical grouping for MQTT edge nodes	Machine-group, productionline1
message_type	The message type	NBIRTH, NDEATH, NDATA, NCMD etc.
edge_node_id	One Edge node identifying EoN node	mqtt-edge-1
device_id	Device physically or logically attached to Edge Node. Must be unique	tempA0293, gaugeN9393

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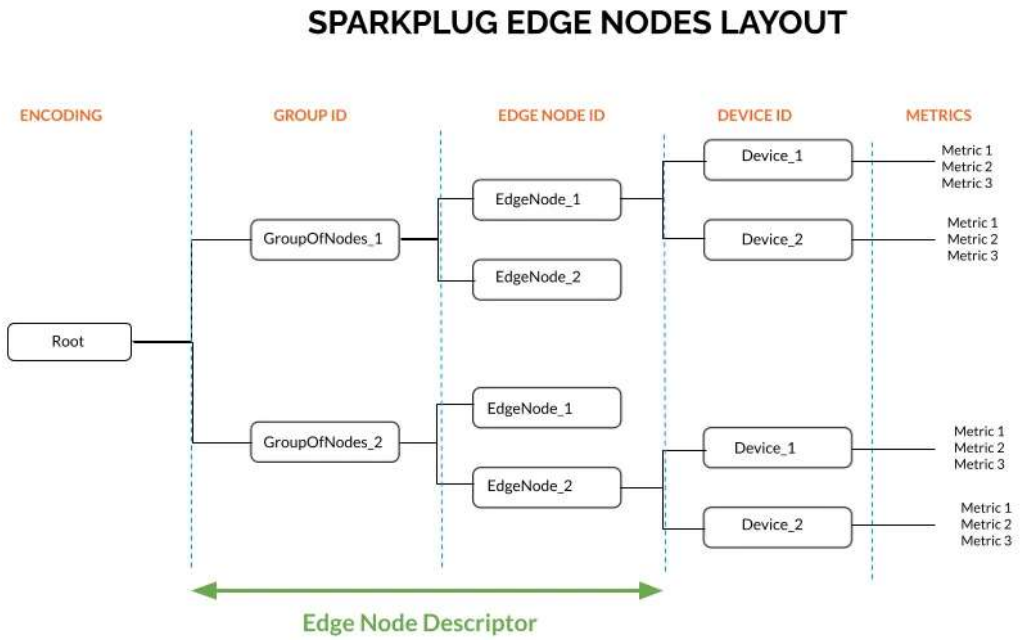

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Three Goals of Sparkplug for IIoT

1. Definition of Topic Names Spaces

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In a smart manufacturing facility, each production line might consist of numerous machines, each generating metrics like temperature, uptime, and error rates.

Using Sparkplug's topic namespace, messages from these machines are easily routed and categorized.

A topic such as spBv1.5/FactoryB/DDATA/Line2/Machine1 immediately provides context about the source and nature of the message, ensuring that monitoring tools, control systems, and operators can quickly process and act on the data.

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Three Goals of Sparkplug for IIoT

2. Specification of Payload Data Structure

Sparkplug B defines a standard, structured, data-rich but efficient payload format. The payload can be defined with different data types:

- Complex data types, like matrices
- Data sets
- Rich metrics including metadata, such as units
- Metric aliases
- Historical data
- File data

Here is an example of a simple SpB payload decoded into JSON:

```
{
    "timestamp": 1642312139,
    "metrics": [{
        "name": “SpindleSpeed",
        "alias": 1,
        "timestamp": 1542712163,
        "dataType": <unsignedINT>,
        "value": 3000
        }],
       "seq": 2
}
```

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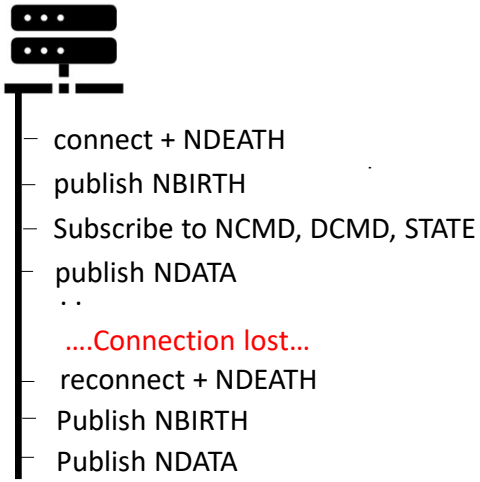
Three Goals of Sparkplug for IIoT

3. Definition of State Management

Concept of birth and death certificate messages to define and ensure the use of appropriate state monitoring mechanisms.



The EoN subscribes to the STATIC topic of a SCADA host, thus being informed about the state of the host/s.

Subscription to the NCMD topic, enables an EoN to be aware of all control information.

Subscription to the DCMD topic, enables the EoN to receive control information of all edge devices connected to the EoN

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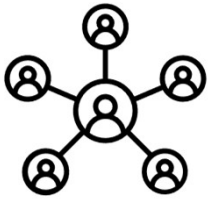

Single Source of Truth

Decoupled Data

Real-Time Availability

Inherited Security

State Awareness

Easy Maintainability

Refer to : https://sparkplug.eclipse.org/

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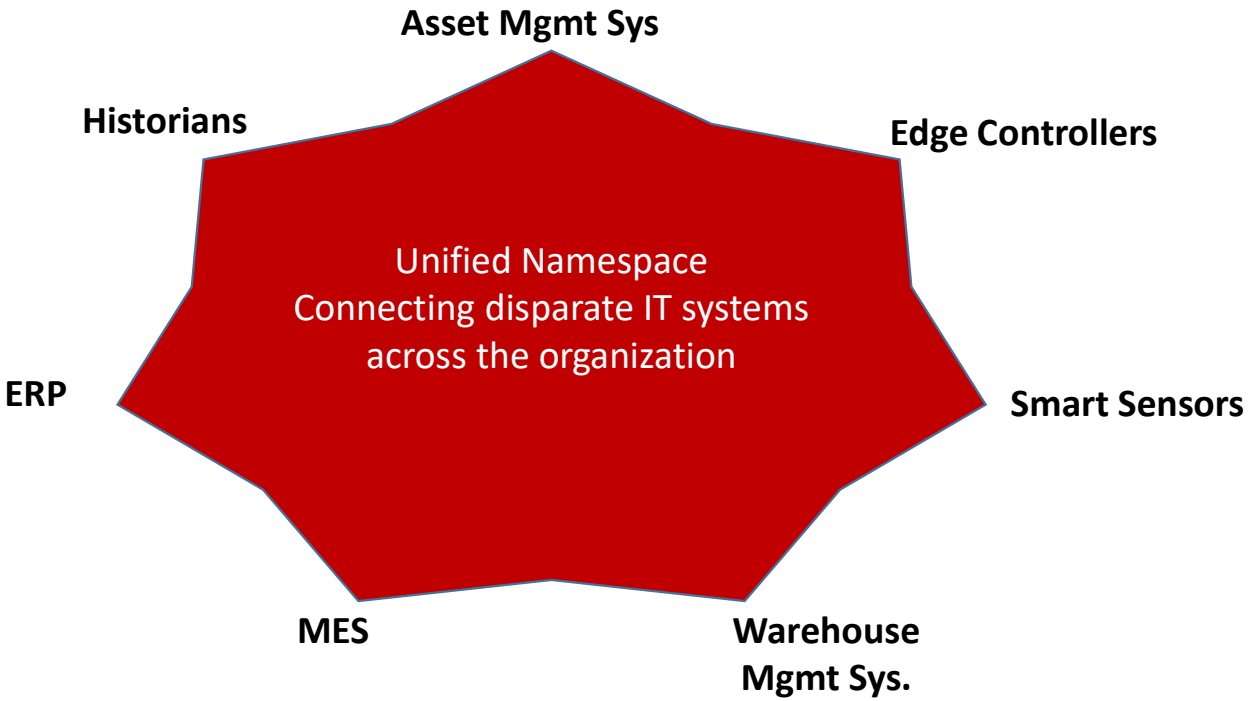
Industrial Strength MQTT Sparkplug B



With Sparkplug B, data from many domains can be shared across an organization and even across geographically dispersed factory/asset locations.