Digital Twin Hub Application System

System Description

Abstract
This document provides system description for the **Digital Twin Hub Application System**.

Contents

1 Overview

This document describes the Digital Twin Hub Application System, which exists to make it possible to easily connect to a physical twin and create a digital twin. This system can connect to a physical twin running on a older or more primitive protocol and extend the functionalities of the physical twin via a modern rest api. This makes it possible to have more systems communicate with the digital twin via a modern interface, and this can save battery and load on the physical twin, as consumers talk to the digital twin and only the digital twin talks to the physical twin.

The digital twin could also be configured to only talk to the physical twin on certain intervals, thus saving more battery. Having a digital twin also provides higher availability, as consumers communicate to a digital twin that can have good network connection, while a physical twin might move around or have weaker network hardware and thus have worse availability.

The rest of this document is organized as follows. In Section 1.1, we describe the intended usage of the system. In Section 1.2, we describe fundamental properties provided by the system. In Section 1.3, we describe delimitations of capabilities of the system. In Section 2, we describe the abstract service operations produced by the system. In Section 3, we describe the security capabilities of the system.

1.1 How This System Is Meant to Be Used

Given the knowledge of what protocol and connection information to a physical twin, a system operator can create a new digital twin instance via the digital twin hub. When a digital twin system is created the system operator can decide what endpoints should be created to reflect the functionality of the physical twin. The rest endpoints that is created by the digital twin instance will be registered as services in the service registry, and other application systems can consume them.

When it is no longer desired to have the digital twin system it can be removed and deleted by the system operator. This will unregister all relevant services and the sysstem from the service registry, furthermore all information about the digital twin system will be removed.

1.2 System functionalities and properties

1.2.1 Functional properties of the system

Digital Twin Hub solves the following needs to fulfill the requirements of a digital twin.

- Connects to the physical twin via a defined protocol.
- Extends the functionalities of the physical twin thru a rest api.
- Register all created endpoints as services.
- Stores retrieved sensor data in a database, giving higher availability of data in case of poor network access thru the physical twin.

1.2.2 Data stored by the system

In order to achieve the mentioned functionalities, Digital Twin Hub saves the following data in a mongo data base.

```
{
    "digitalTwinId": "UUID",
    "digitalTwinModel": {
        "physicalTwinConnection": {
            "connectionModel": {
                "address": "string",
                "port": 0
            },
                "connectionType": "string"
        },
        "controlCommands": [
            {
                "serviceDefinition": "string",
                "serviceUri": "string"
            }
        ],
        "sensedProperties": [
            {
                "intervalTime": 0,
                "sensorEndpointMode": "string",
                "serviceDefinition": "string",
                "serviceUri": "string"
            }
        ]
    },
    "systemDefinition": {
        "address": "string",
        "port": 0,
        "systemName": "string",
        "authenticationInfo": "string"
    }
}
```

Listing 1: Whats saved about a DigitalTwin.

```
{
    "digitalTwinId": "UUID",
    "serviceDefinition": "string",
    "sensedData": Object
}
```

Listing 2: The saved SonsorData.

1.3 Important Delimitations

No delimitations.

2 Services produced

2.1 service create-digital-twin

The purpose of this service is to make it possible to create a new digital twin system.

2.2 service remove-digital-twin

The purpose of this service is to make it possible to remove an existing digital twin system.

3 Security

The security of Eclipse Arrowhead - and therefore the security of Digital Twin Hub - is relying on X.509 certificate trust chains. The Arrowhead trust chain consists of three level:

- Master certificate: `arrowhead.eu`
- Cloud certificate: `my-cloud.my-company.arrowhead.eu`
- Client certificate: `my-client.my-cloud.my-company.arrowhead.eu`

For Arrowhead certificate profile see `https://github.com/eclipse-arrowhead/documentation`

4 References

5 Revision History

5.1 Amendments

No.	Date	Version	Subject of Amendments	Author
1	YYYY-MM-DD	4.6.1		Xxx Yyy

5.2 Quality Assurance

No.	Date	Version	Approved by
1	YYYY-MM-DD	4.6.1	