

Extended information of Semantic Definition Format (SDF) for Digital Twin

draft-lee-asdf-digital-twin-04

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Status of “SDF for Digital twin”

- draft-lee-asdf-digital-twin-00 (IETF 118, Prague, November 2023)
 - Introducing SDF extensions for digital twin
- draft-lee-asdf-digital-twin-01 (ASDF , online, April 2024)
 - Adding the examples of a boat’s location description
- draft-lee-asdf-digital-twin-02 (ASDF interim, online, November 2024)
 - Adding sdfLocation to SDF model (Figure 1)
- draft-lee-asdf-digital-twin-03 (ASDF interim, online, November 2024)
 - Adding requirements for digital twin
- [draft-lee-asdf-digital-twin-04](#) (IETF 121, Dublin, November 2024)
 - Adding the basic architecture of digital twin with SDF objects

Introduction

- What is SDF for digital twin?
 - A framework that defines sdfThings, including affordance and non-affordance objects,
 - and their interactions in a digital twin environment.
 - Location is the first item to be added.
- Purpose of the revisions
 - Address Gaps: Extend SDF capabilities, especially in terms of location data representation.
 - Enhance Usability: Provide clearer examples and more detailed guidance.
 - Improve Integration: Facilitate better interoperability with external ontologies and frameworks.

Main changes in this version

- **Basic architecture** of digital twin in Figure 3
 - is based on ISO 23247-2, the reference architecture of digital twin framework for manufacturing,
 - and consists of two layers, the physical layer and the digital twin layer
- **Common qualities** in Table 1
 - is from clause 4.6 of draft-ietf-asdf-sdf-18

Basic architecture of digital twin (1/2)

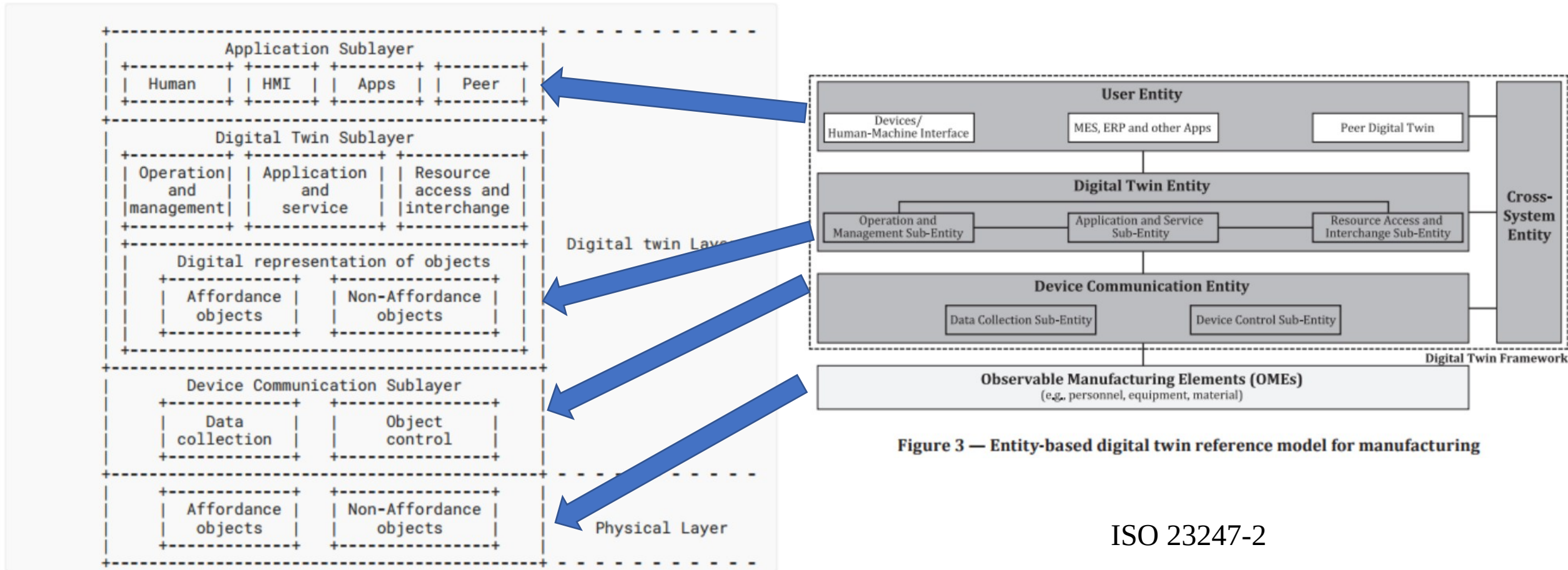


Figure 3 — Entity-based digital twin reference model for manufacturing

ISO 23247-2

Figure 3: Basic Architecture of digital twin

Basic architecture of digital twin (2/2)

- Physical layer
 - includes the SDF objects, such as
 - **affordance objects**, e.g. sensor devices
 - **non-affordance objects**, e.g. documents
- Digital twin layer
 - **Device communication sublayer** for data collection and object control
 - **Digital Twin Sublayer** for digital representation and synchronization
 - The three functions, including operation and management, application and service, and resource access and interchange, are from ISO 23247-2.
 - **Application Sublayer** for user interfaces and data access

Conclusion

- Requirements of SDF model for digital twin (version 03)
- The reference architecture for digital twin (version 04)
- More information to represent an object as a digital twin
 - History data of objects, relationship between objects, etc.
- The protocol and data format, if needed

Thank you!

Q&A

Proposed structure of "non-affordance" information (example)

```
{
  "sdfObject": {
    "HatDetector": {
      "sdfNonAffordanceInfo": {
        "location": {
          "wgs84": {
            "lat": 60.1676,
            "lon": 24.9514
          },
          "postal": {
            "city": "Helsinki",
            "post-code": "00130",
            "country": "Finland"
          },
          "w3w": "nutrients.snows.voting"
        },

```

```
        "owner": {
          "organization": "TKY"
        },
      "sdfProperty": {
        "hatIsOn": {
          "type": "boolean",
          "writable": false
        }
      }
    }
  }
}
```

Suggestion for draft(s)

- Informative: “Using SDF to describe Digital Twins”
 - Containing the the digital-twin specific text from the current DT draft
 - Example(s) and guidance on how to use SDF for modeling
 - (also mapping to ISO 23247-3?)
- Normative: “Including non-affordance information in SDF”
 - Defining new “sdfNonAffordance” block (with a better name)
- Normative: “Location (and other?) non-affordance information for SDF”
 - Defining and Registering qualities and sub-structure for the sdfNonAffordance block
 - Start with “location”; add also other similar info?
 - (could also be part of the the draft #2 above)