



AEROSPACE INFORMATION REPORT

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Definition and Introduction of Digital Mesh/Digital Fabric Framework

RATIONALE

The Digital Mesh/Fabric solution is defined as a set of managed services to facilitate the identification, characterization, and composition of digital thread intersections. These digital thread intersections are defined using Digital Mesh/Fabric attributes and digital thread attributes. These mesh/fabric intersections are both determinate (known/pre-defined) and indeterminate (not known/discoverable).

The determinate Digital Mesh/Fabric is bounded by identifying allowable digital threads and associated data stores/data objects. An unbounded (indeterminate) Digital Mesh/Fabric is not known and is discoverable through query analysis and analysis of associated logical and physical data object utilization.

The Digital Mesh/Fabric concept builds upon the Digital Thread Framework (refer to AIR7161, which provides a detailed digital thread definition and architecture framework) by representing the interconnection of multiple digital threads across multiple data stores, logical organizing segments, and product life-cycle stages. Unlike a single digital thread, which follows a linear or sequential flow of data utilization through a product life cycle, the Digital Mesh/Fabric forms a complex mesh of n-dimensional interconnected digital threads, allowing for greater value creation, flexibility in data utilization, scalability, and integration.

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1. SCOPE

The proposed Digital Mesh/Fabric concept builds upon the Digital Thread Framework (refer to AIR7161) by representing the interconnection of multiple digital threads across multiple data stores, logical organizing segments, and product life-cycle stages. Unlike a single digital thread, which follows a linear or sequential flow of data utilization through a product life cycle, the Digital Mesh/Fabric forms a complex mesh of n-dimensional interconnected digital threads, allowing for greater value creation, flexibility in data utilization, scalability, and integration.

1.1 Purpose

The purpose of this document is to provide an overview definition and implementation guidance of the Digital Mesh/Fabric framework and its utilization across the product life cycle with the use of multiple digital threads.

1.2 Approach

This document provides an overview of definition of Digital Mesh/Fabric Framework standards by identifying and characterizing the intersection of multiple digital threads. The digital thread intersections are defined using Digital Mesh/Fabric attributes and digital thread attributes. These mesh/fabric intersections are both determinate and indeterminate. The intended users of this document are engineers, practitioners, academics, Original Equipment Manufacturers (OEMs), suppliers, operators, and Maintenance, Repair, and Overhaul (MRO) service providers who are various stakeholders in the aerospace and defense industry.

2. REFERENCES

2.1 Related Publications

The following publications are provided for information purposes only and are not a required part of this SAE Information Report.

2.1.1 SAE Publications

Available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 1-877-606-7323 (U.S. and Canada only) or 1-724-776-4970 (outside U.S. and Canada), www.sae.org.

AIR7161	Guidance for Digital Thread Data Standards Enablement, Monitoring, and Quantification with the Digital Thread Framework and Digital Thread Index
AIR7367	Considerations for Requirements, Specifications, and Framework of a Digital Thread in Aircraft Data Life Cycle Management

2.2 Abbreviations

DTDS	digital thread data standards
DTDB	digital thread data standard objects
DTS	digital thread segments

3. INTRODUCTION

The Digital Mesh/Fabric solution is defined as a set of managed services to facilitate the identification, characterization, and composition of digital thread intersections. These digital thread intersections are defined using Digital Mesh/Fabric attributes and digital thread attributes. The determinate Digital Mesh/Fabric is bounded by identifying allowable digital threads and associated data stores/data objects. An unbounded (indeterminate) Digital Mesh/Fabric is not known and is discoverable through query analysis and associated data utilization analysis.

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Overview of Digital Mesh/Fabric Framework

Figure 1 depicts a two-dimensional representation of Digital Mesh/Fabric Framework across a product life cycle:

- Interconnection of multiple digital threads
- Real-time data flow and cross-functional collaboration
- System aspects of meta data repository of data stores with authorization and access control mechanism
- Methodology of processing of natural language query
- Learning repository of Authoritative Source of Truth (ASOT) score dimensions

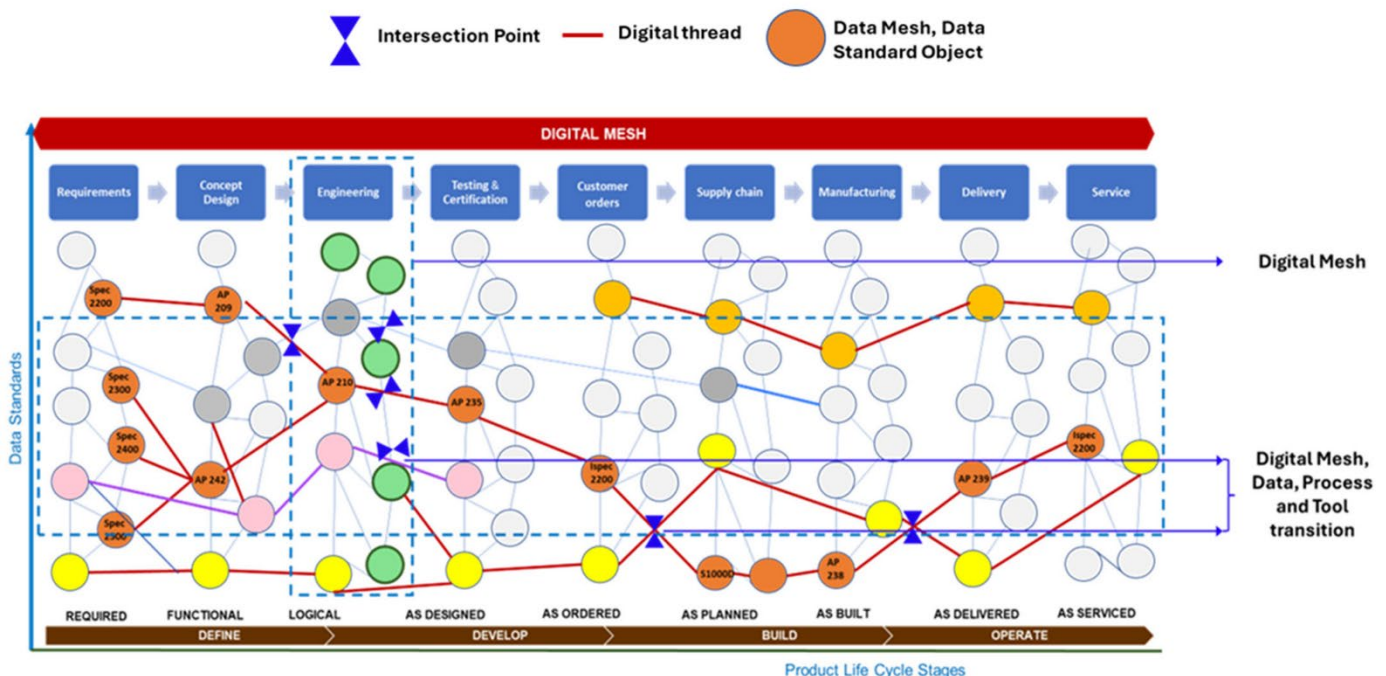


Figure 1 - Two-dimensional digital mesh/fabric framework representation across product life cycle

4. DEFINITION OF DIGITAL THREAD/MESH FRAMEWORK

There are many different ways and means of representing a Digital Mesh/Fabric Framework. One of the approaches this SAE Aerospace Information Report (AIR) outlines is the Digital Thread Framework *representation* on a n-dimensional graph model. An N dimensional Digital Mesh/Fabric Framework is represented as a composition of multiple digital thread objects and segments as shown in Figure 2.

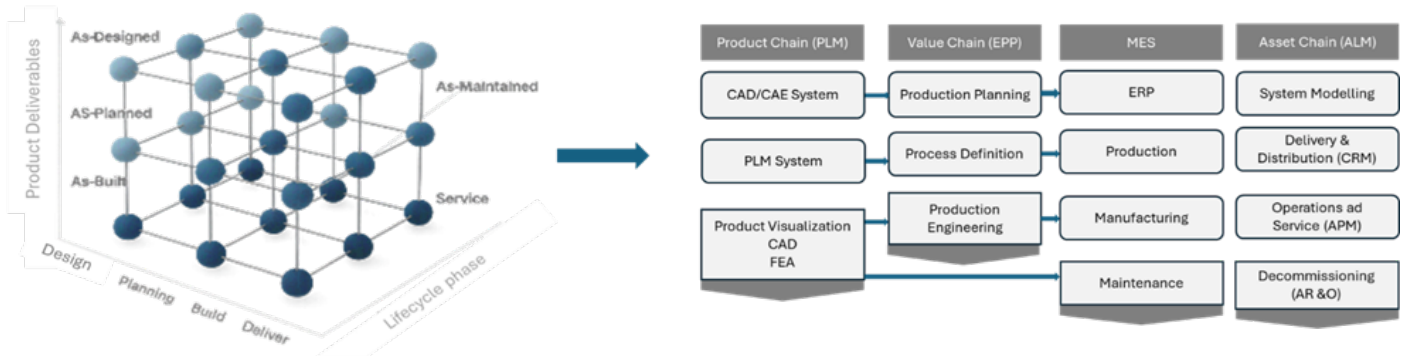


Figure 2 - N-dimensional DIGITAMESH/fabric ontology framework representation across product life cycle

Geometrically, the digital thread object is represented as a circle. The interconnecting segment between digital thread objects is represented by the line that connects the circles. Digital thread intersection objects are defined with an hourglass notation. Connectivity is accomplished by adhering to the digital thread interoperability standard associated with the respective digital thread object and segments. A typical organizational product digital mesh is represented with a schematic diagram as shown in Figure 3.

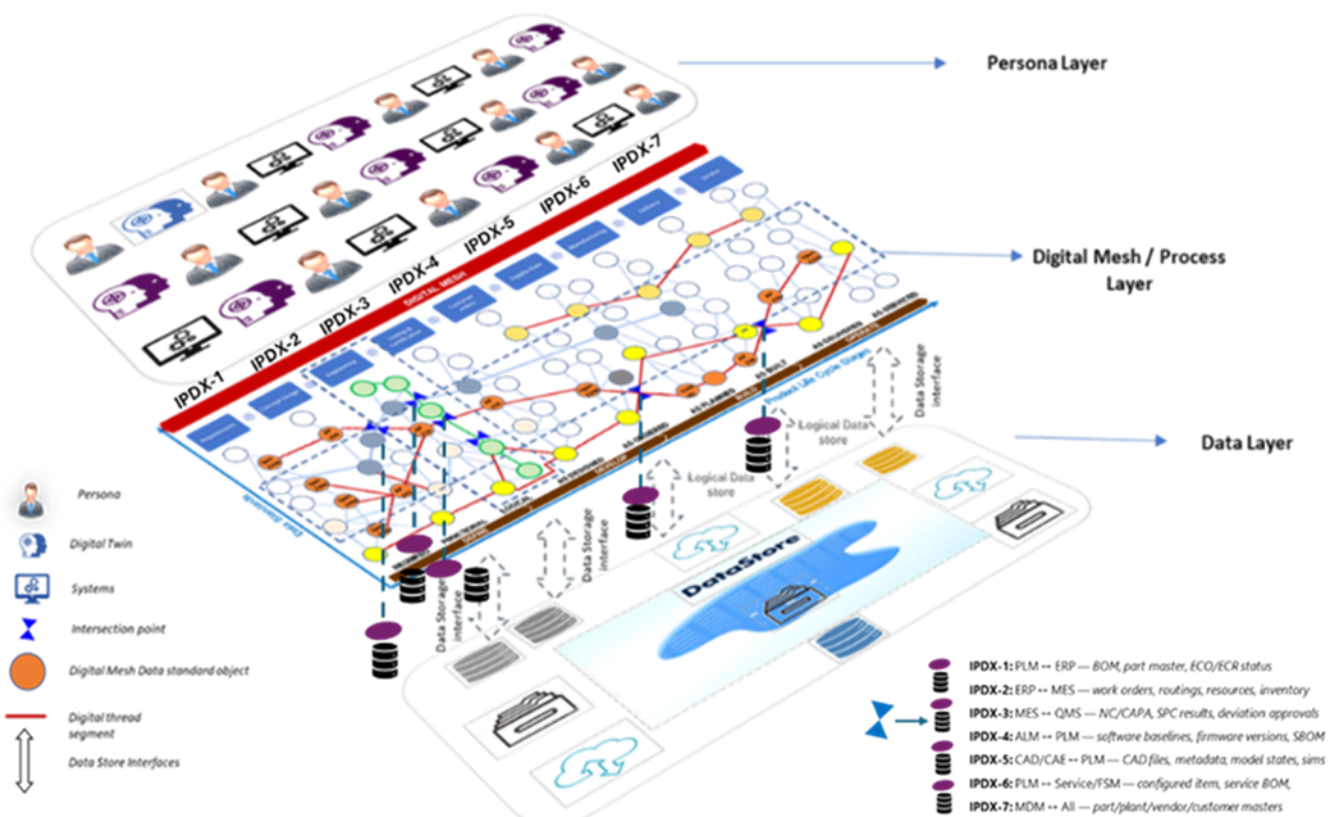


Figure 3 - Three-dimensional digital mesh/fabric framework representation across product life cycle