Connecting Assets, Systems, and Organizations

From Submodel Templates to a Central Hub

The development of Submodel templates (SMT) has been one of the core achievements of Industrial Digital Twin Association e.V. (IDTA) and its member companies. Over the past years, the SMT Framework has evolved into a central element for realizing interoperability within the Asset Administration Shell (AAS) ecosystem. Each SMT provides a standardized, machine-readable structure for describing specific aspects of an asset, allowing companies to exchange consistent and meaningful digital information across systems, domains, and organizations.

Every SMT adds another building block to the AAS, enabling standardized data exchange across industries. The development of every SMT is taken up by a working group and this year IDTA has already reached the milestone of its 100th SMT. An open development process, supported by the IDTA GitHub repository, ensures transparency and community participation throughout the lifecycle of each template.Here are few highlights of achievements from the SMT working groups:

- Concept for the Digital Battery Passport, structured in seven SMTs plus a practical guideline, created in close collaboration between IDTA, Catena-X, and the Battery Pass Consortium.
- Joint SMTs developed in collaboration with NAMUR, OPC Foundation, and EUROMAP, addressing challenges from various fields while harmonizing cross-industry standards.
- Submodels realizing key use cases such as the Digital Product Passport (DPP), Asset Onboarding, Collaborative Engineering, and Automated Master Data Creation.

All IDTA published and ongoing Submodels can be explored on the IDTA Website and IDTA's GitHub repository: https://industrialdigitaltwin.org/en/content-hub/submodels

Create Interoperable Standards that Connect Industries

Several joint initiatives have contributed to the progress of the SMT development. The collaboration between EUROMAP and IDTA established joint working groups to harmonize Submodel structures across the machinery and automation sectors. Catena-X and the Battery Pass Consortium have advanced the Digital Battery Passport Submodel, which is a vital step toward greater transparency, sustainability, and compliance with EU regulations for energy storage. In collaboration with NAMUR, Submodels for the process industry have been developed, including those for PCE Request – P&ID Information, Process Data, Safety Instrumented Functions (SIF), and SIS Components. The partnership with OPC Foundation led to the creation of a Submodel for the OPC UA Server Datasheet, enabling a consistent digital representation and comparison of OPC UA systems.

By 2026, the goal is to ensure that every AAS implementation can rely on a consistent and well-documented set of SMTs, facilitating cross-domain use cases and accelerating industrial digital transformation. With ongoing community-driven developments and growing international alignment, SMTs continue to strengthen the AAS as a universal framework for seamless data exchange and interoperability across value chains.

Building on the strong foundation laid by SMTs, IDTA is also focusing on the further development of the AAS with the goal to keep improving the specifications, align them with ongoing standardization activities, and support practical implementation across different industries. The roadmap for the AAS for 2026 highlights the planned steps in this direction and invites the community to contribute to shaping them.

Planned Enhancements and Standardization Goals

The AAS specifications are divided into five parts: Metamodel, API, Data Specifications, Security, and AASX Package File Format. After the successful Release V3.1 in 2025, IDTA continues to update these parts, with focus on feedback from users and working groups.

The next major release, 26-01, will center on the Digital Product Passport (DPP) and alignment with the JTC 24 standard. A whitepaper, currently under the working title "How to implement a DPP system using AAS aligned with JTC 24", is in progress. It will include guidelines for implementers, describe the reference architecture, and highlight key points such as metamodel alignment, API harmonization, and backward compatibility with existing AAS tools.

For the following releases, there are a few potential topics under discussion. These include eventing, data signatures (related to Part 4: Security), versioning, and a new Part 3B for the measurement of units. These are still being explored in different Task Forces and will depend on community feedback and industry requirements. Collaboration with initiatives such as Factory-X and Manufacturing-X will also help identify priorities and align the work.

The roadmap continues to strengthen both technical and semantic interoperability of the AAS, ensuring compatibility with standards like IEC 63278 and related international efforts. IDTA's open and transparent working approach – through GitHub, AsciiDoc-based documentation, and active Task Forces – allows all stakeholders to follow the progress and contribute directly.

By 2026, the aim is to offer a stable and continuously improving AAS framework that supports reliable, interoperable digital twin implementations across different domains. With ongoing collaboration and community engagement, the AAS will remain a key element for connecting assets, systems, and organizations in the industrial digital ecosystem.

Operationalizing the AAS: The Asset Data eXchange Hub

As the standardization work progresses, it becomes evident that the community's needs go beyond what any single company can provide. Each organization using the AAS creates and manages its own asset data and seeks to share it in a standardized way. However, without a neutral space for efficient data exchange, true interoperability remains limited. While the AAS enables standardized data structures, companies still have to establish individual connections to each data provider, which is time-consuming and inefficient.

To address this gap, the Asset Data eXchange Hub (ADX Hub) was conceived as a central service designed to connect data providers and data consumers within an ecosystem based on the AAS. It enables seamless exchange of standardized, asset-centric data across the manufacturing landscape, ensuring that asset metadata and digital twins are interoperable and aligned with recognized industry standards. Built on the internationally accepted specifications AAS and ID Link, the platform provides a future-proof foundation for creating data spaces that are reliable, scalable, and vendor-neutral.

The platform operates according to three core principles. Decentralization ensures that data remains with the provider, and all exchanges occur directly and transparently between participants. Simplicity is achieved through a one-time registration process that allows effortless access to standardized data. Security is maintained through robust identity management and authentication mechanisms based on standard protocols. By combining these principles, the ADX Hub enables industrial data sharing that is efficient, trustworthy, and scalable.

The ADX Hub offers a comprehensive suite of ecosystem services for standardized, secure, and interoperable asset data exchange. Key services include: an Identity Provider for secure digital identity management (supporting X.509 certificate-based authentication and integration with Microsoft Entra ID); a Discovery Service for locating business partners, data providers, and asset endpoints; a Validation Service for verifying AAS files and APIs against IDTA specifications; and a Submodel Template Repository (SMT Repo) that ensures consistent implementation of standardized submodels across organizations. Together, these services support digital transformation by simplifying data onboarding, strengthening data governance, and enhancing interoperability across industrial ecosystems.

Initial information on the ADX Hub is now available to explore its capabilities and begin integrating standardized asset data exchange into operations: https://adx-hub.admin-shell-io.com

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