



The Data Fabric Advantage: Decoupling Data for Scale, Agility and AI

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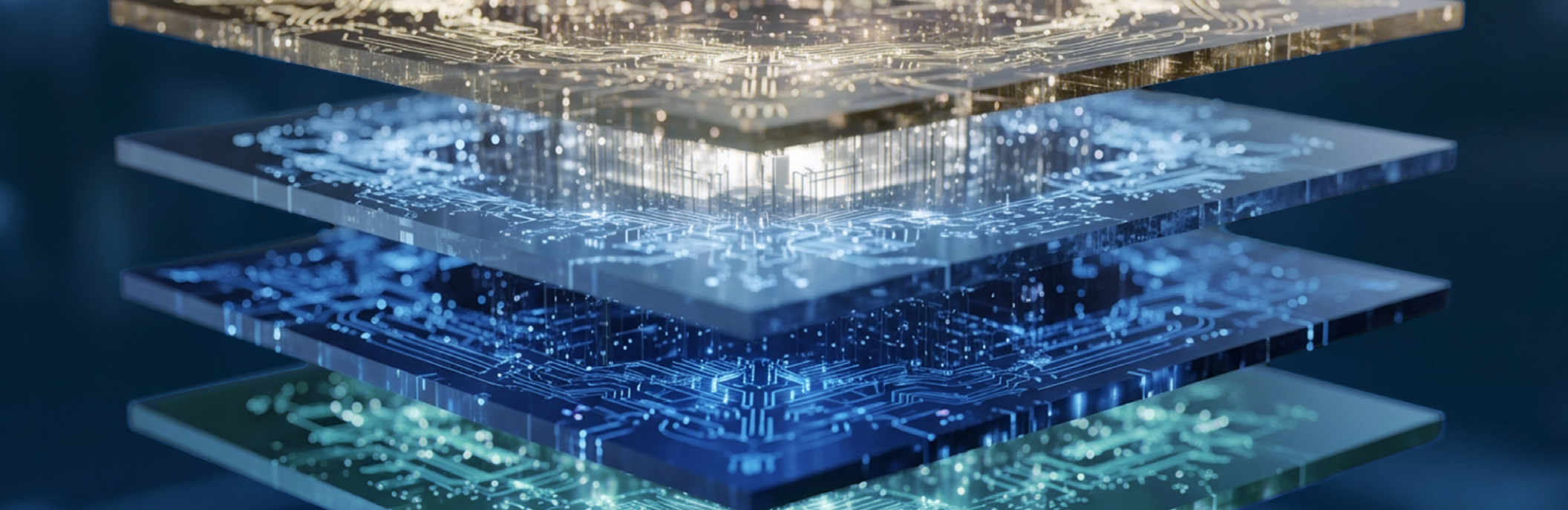
Tightly Coupled Data Architectures Impede Innovation

As industrial organizations scale digital initiatives, the limitations of tightly coupled data architectures are becoming increasingly apparent. While the idea of decoupling systems so that they don't directly depend on one another isn't new, this concept is becoming one of the most important shifts in how industrial systems are designed and how data is circulated throughout the enterprise. With intensifying focus on AI, advanced analytics, digital twin technology and other data-driven digitalization initiatives, a decoupling data fabric-based approach has never been more necessary, as the weaknesses and limitations of point-to-point connectors and platforms that are essentially point-to-point connectivity systems in disguise are hamstringing enterprise digitalization initiatives.

How Data Coupling Became a Problem

Industrial data architectures were not initially designed with flexibility in mind. They were designed around control systems, where reliability and performance were the primary focuses. Data followed fixed paths: a PLC fed a SCADA system. SCADA fed a historian. The historian might support reporting or dashboards. Each step was coupled to the next and each new use case required building a new integration or connection from scratch.

The coupled approach worked when the number of use cases was limited; however, it became increasingly unsustainable as the same data was expected to support predictive maintenance, energy optimization, reliability programs, AI modeling, ESG reporting, digital twin enablement and enterprise planning, often all at once. In this environment, each downstream system is reinterpreting the data it receives with varying degrees of context, resulting in discrepancies that can be costly and problematic once action is taken based on that inconsistent data. In addition, data governance, cybersecurity and manual updates all had to be managed for each individual connector. As enterprises use point-to-point connectors to link numerous data sources to a multitude of different data-consuming enterprise applications, the resulting "spaghetti architecture" becomes unsustainable at scale, resulting in risk instead of value. It also creates additional points of failure.



Shifting the Paradigm: From Systems to Data

Decoupling is shifting the paradigm for industrial data management. Think of data as being accessible independent of any one application instead of being handed off from one system to the next.

In this “decoupled” approach, the role of a system is not to own data, but to produce it, consume it--or both. To make that model possible, industrial organizations are increasingly relying on an IT-ready, OT native data fabric. Rather than serving as another application in the chain, an OT data fabric creates a layer between data producers and data consumers, connecting to upstream data-generating systems like control systems, historians, LIMS and MES, and exposing their data in a unified, contextualized way to downstream data consumers like ERP systems,

predictive and prescriptive maintenance applications, AI-enabled applications and digital twins.

A truly OT-native data fabric such as AspenTech Inmation™ OT Data Fabric enables bi-directional and horizontal data flow. It doesn't just move data “up” towards analytics, cloud platforms or enterprise applications. It can also move data “down” into operational systems in a controlled and structured way, backfilling data, triggering events and feeding results from higher-level applications back into upstream environments. It can also be used to move data horizontally between upstream data sources like process historians to bridge or backfill data, ensuring continuity of data availability even if one system goes offline or is undergoing an upgrade or migration.

What an OT Data Fabric Actually Does

An OT data fabric is designed to centrally manage data and interactions between systems.

It specializes in ingesting data from the full spectrum of data sources regardless of technical modernity, protocol and data type. It contextualizes this real-time or historical data into an asset hierarchy like an ISA-95 data model, enriches it with metadata and resolves inconsistencies in structure, naming and context so that the same, consistent representation of that data can be queried or leveraged by any application.

In essence, the data fabric's representation of the data becomes the point of interaction. Data consumers don't need to directly integrate with each underlying system and data producers don't need to account for every downstream use case. The data fabric absorbs that complexity and manages it centrally—and optimally. This fundamentally changes the architecture by moving integration away from the edges of individual applications and establishing it as a shared capability within a single OT-native platform. As a result, data becomes broadly usable across applications, reducing complexity, eliminating redundant integration efforts and enabling more consistent use of operational data throughout the enterprise.

Why Decoupling Matters

The value of decoupling extends well beyond architecture, delivering the flexibility, agility and resilience industrial organizations need to thrive in an AI-driven landscape. These advantages manifest in several important ways:

Reduced cost and effort. Once producers and consumers are decoupled, the cost and effort of leveraging data is dramatically reduced across the enterprise.

Accelerated time to value. New use cases no longer require custom integrations with every data source. If the data is already available in the system, building a new dashboard or analytics model is more configuring than engineering, which can shorten timelines from months to weeks or even days.



Reduced risk. In tightly coupled systems, even small changes like a historian upgrade can have cascading effects on everything connected to it. With a decoupled architecture, those changes are insulated. The platform absorbs the impact and consumers continue to operate as before.

Scalability. In a traditional setup, a data source may only support a small number of downstream use cases before the performance of the data source is impacted. In a decoupled model, the same data can feed a multitude of applications simultaneously with minimal impact on the source systems, which is especially critical in industrial environments where uptime and system performance cannot be compromised. A decoupled architecture also makes it easier to scale data across sites and use cases while minimizing integration efforts.

Consistency. Instead of each team independently accessing operations data and interpreting it, context can be defined once, centrally and consistently (i.e. what an object represents, how a value is calculated,

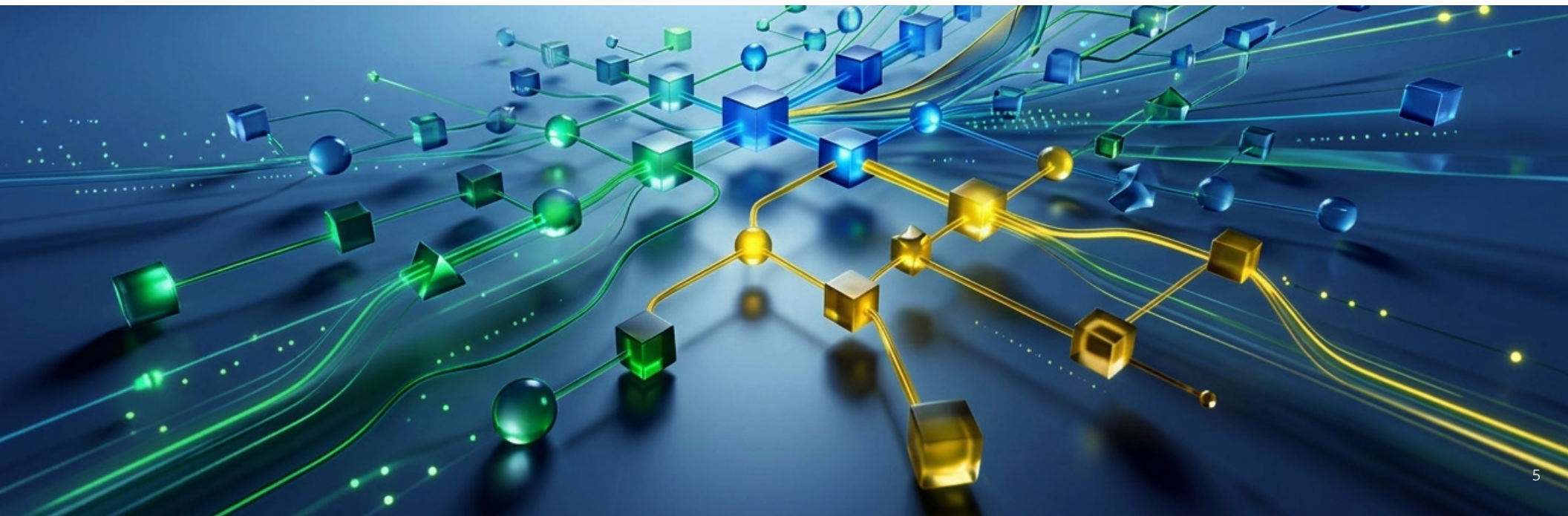
how data should be used, etc.). Everyone in the organization works from a single source of truth.

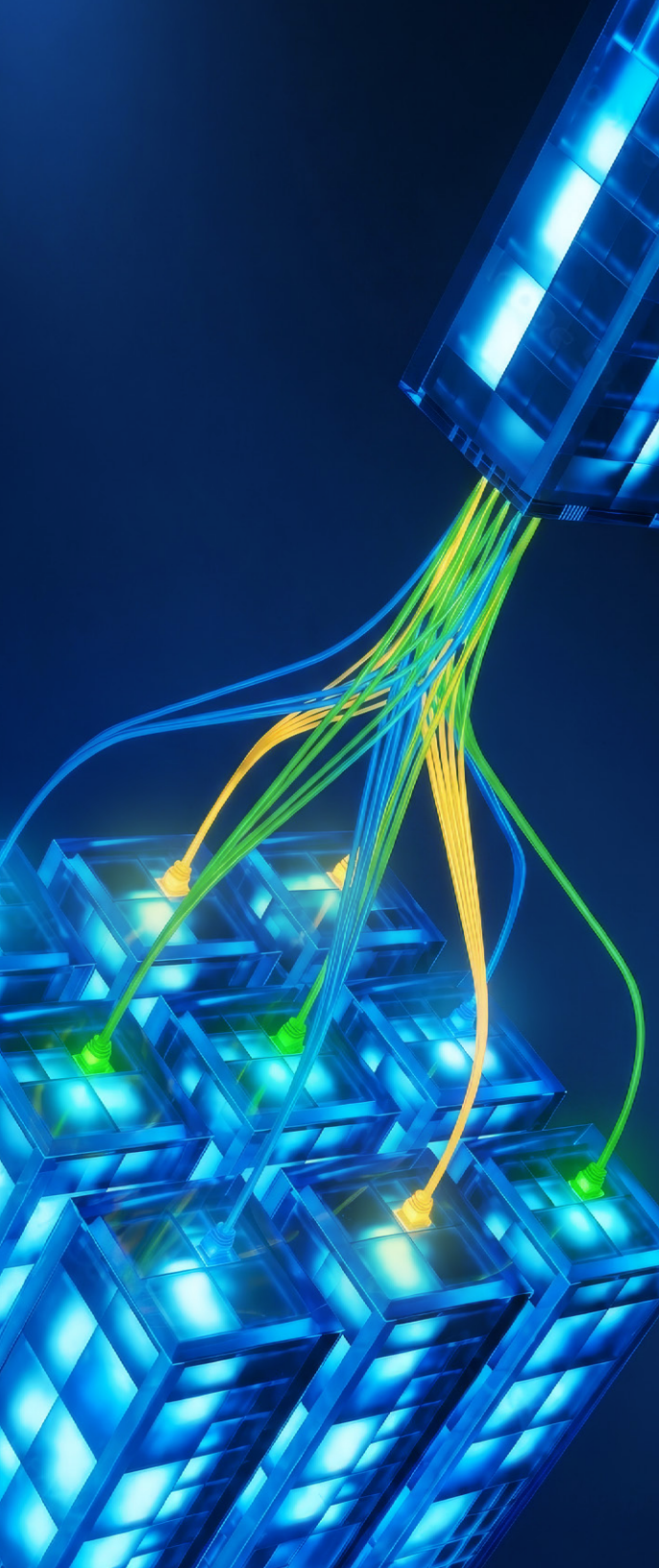
Seeing Common Use Cases Differently

When you look at common industrial initiatives through a decoupled lens, the benefits are apparent.

Advanced analytics presents a great example. In a coupled environment, data scientists spend most of their time focused on acquiring and cleaning data from different systems. With an OT data fabric such as AspenTech Inmation OT Data Fabric in place, that work has largely been done upfront and the focus shifts to building models and generating insights.

Similarly, from an enterprise perspective, multisite optimization is another common use case addressed with a decoupling OT data fabric. Each site may have different historians, different naming conventions and





different structures. A decoupled platform normalizes that landscape, making cross-site analysis feasible without custom integration needed at every location.

Even cloud adoption and hydration become simpler. Directly exposing OT systems to the cloud introduces security and architectural complexity, system performance risks and cloud ingestion costs incurred from streaming vast quantities of data into the cloud. To address this, OT data fabrics like AspenTech Inmation OT Data Fabric act as a controlled publisher, deciding which data moves outward, in what form and under what governance.

A Strategic Advantage in a Rapidly Evolving Technological Landscape

One of the most pressing advantages of a decoupled data architecture is not just how it supports today's use cases, but how it changes the way new ones are created.

In traditional environments, even when a new use case is identified and well understood, an incredible amount of effort must be spent acquiring, integrating and preparing data by connecting systems, reconciling discrepancies and building numerous point-to-point data pipelines. These integration burdens limit how quickly new ideas can be developed and how many ultimately make it into production. With an OT data fabric in place, the data is already available, contextualized and accessible in a consistent way. As a result, building new use cases becomes less about engineering data pipelines and more about applying analytics, logic, or visualization to data that is ready to use, lowering the barrier to innovation and expanding the range of viable opportunities.

Over time, the benefits of a decoupled data architecture scale. Organizations are no longer limited to a handful of high-value initiatives simply because integration is costly and time-consuming. They can instead afford to explore, iterate and scale a much broader range of ideas. The ceiling of what is possible is raised because the barriers that used to limit it have been removed.

This becomes even more important in the context of how quickly the technology landscape is evolving, particularly around AI.



New technological capabilities are emerging at an unprecedented rate. Models improve, industry-standard applications evolve and new categories of applications rise to prominence overnight. In a tightly coupled environment, taking advantage of new innovations means starting over, building new integrations, reshaping data and navigating constraints imposed by existing systems or vendor ecosystems.

A decoupled, vendor-agnostic data fabric avoids this because the data exists independently of the systems that generated it and the data is accessible in a consistent way. New technologies can be implemented without reworking the foundation underneath. Whether it's a new AI model, a different analytics stack, or an emerging application category, data access is no longer the limiting factor.

That flexibility enables organizations to keep pace with change instead of reacting to it or letting it pass by. Rather than being locked into a set of predefined integrations or a single vendor's ecosystem, they can adopt

new capabilities as they emerge and plug them into an existing data foundation.

Conclusion

As AI and digitalization are transforming industrial operations, the real upside of decoupling isn't just efficiency, it's the freedom to evolve. It ensures that as the landscape evolves, your ability to build, adapt and innovate evolves with it. After all, as enterprises race to leverage these emerging technologies to generate value and build advantages in the market, do they really want the technical capabilities of their decades old data historians to define the ceiling of what is possible, or should they adopt a new approach that is purpose-built and optimized to address the data demands of the modern age? In a world defined by constant technological change, a decoupled data infrastructure isn't just what moves industrial enterprises forward—it's what keeps them future ready.



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