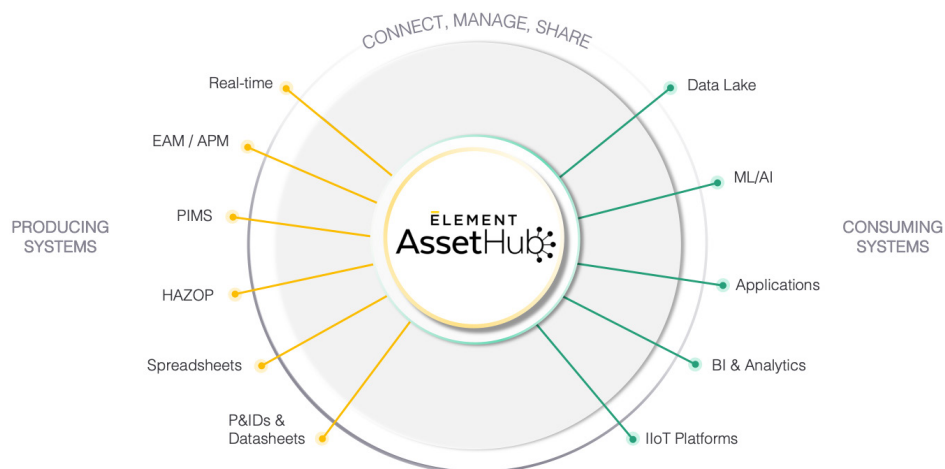


Element AssetHub

Create a 360° View of Every Asset

Data is the fuel driving innovation in today's enterprises. Yet asset-intensive industries face a fundamental challenge converting their asset data into analytics. Asset data is stored in silos across many production sites and systems, out of reach for most data consumers. Simply consolidating asset data in a data lake doesn't solve the problem because without context you can't find all the operational signals in the data. Modeling asset data to build that context is challenging because of the complex structure and semantics of asset data, especially sensor data.



Element AssetHub™ eliminates the data challenges holding back analytics with an all-in-one solution that integrates, harmonizes, and contextualizes your asset data. AssetHub is a multi-faceted solution to **connect** disparate asset data sources, **manage** data modeling through Asset Twins (the dynamic digital representations of physical assets), and **share** common data models and asset data for easy consumption across the enterprise.

AssetHub is delivered on a modern cloud-native architecture to overcome the integration, data modeling, and persistence challenges inherent in utilizing asset data for advanced industrial analytics.

AssetHub unlocks your asset data, providing a 360° view of every asset, enabling advanced analytical and AI applications.

Connect Diverse & Distributed Asset Data

AssetHub's architecture supports hybrid data connectivity to data sources of any type, whether on-premise or cloud-based. Off-the-shelf Data Agents connect to time-series, transactional and master data systems with high speed and stable data migration of large and complex data sources.

Data Agents. Connect to process historians like the OSIsoft PI System, Aspen InfoPlus.21, SQL databases, flat files, P&ID's, SAP PM, IBM Maximo and more. Use Element Extensions to build agents to connect to custom applications.

KEY BENEFITS

10x faster time to insight: Build Asset Twin models in days for any use case

Improve productivity >25%: Free engineers and data scientists from data wrangling

Increase ROI by enabling multiple use cases: Organize asset data once to support use cases across the enterprise

Use data with confidence: Monitor integrity of Asset Twins and data values, ensuring up to date, reliable data

Modern software enables modern use cases: Cloud native architecture to connect asset data across the enterprise

KEY FEATURES

Connectivity to existing operational systems via APIs and Agents

Attributes are consistently tracked across like equipment

Intuitive interface to transform data and map data to Asset Twins

Assurance on data model and underlying data to build trust in analytics

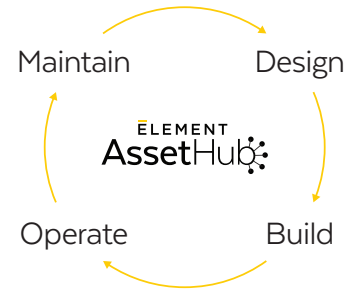
Flexible data model enables multiple views of the Asset Twin

Connectivity APIs. Use intuitive APIs that provide extensibility to interface with relational data sources or RESTful endpoints. APIs provide data processing to queue, batch, retry, and dedupe. They support millions of data points per minute.

Data Import Portal. AssetHub’s Data Import Portal has a single interface to manage every connection allowing you to define data extraction schedules and align data sources by cleaning time zone mismatches and other required system-wide changes.

Manage Asset Data with Asset Twins

Asset Twins are the data models that digitally represent a physical asset and all the attributes associated with the asset. Asset Twins are fundamental to harmonizing and contextualizing asset data. Like the physical assets they represent, managing Asset Twins require a design, build, operate and maintain workflow process which AssetHub supports through its rich features.



Design Asset Twins

Asset Templates. Ability to import external templates, including PI Asset Framework, and create new templates from scratch.

Asset Attributes. Define parameters for each template (measurements, continuous values, manufacturer, limit information, status, install date), relationships between attributes, data type, export format and default interpolation method.

Asset Template Library. 200+ templates relevant to process, batch, and discrete industries that are filterable and easily modified.

Build Asset Twins

Data Pipelines. Associate asset data to Asset Templates through a set of data transformations purpose-built to contextualize time-series data with other enterprise data sets like SAP PM and IBM Maximo. Modeled data is published to the Element Graph, creating flexible data hierarchies. Supports computational techniques like SQL complete.

The screenshot shows a data pipeline workflow with steps like 'Parse ISA-95 Naming', 'Parse Equipment', 'Reduce Data Set', 'Merge Histories', and 'Map Attributes'. Below the workflow is a data table with columns: metrl..., name, engu..., Proc..., ISA..., Equi..., Nam..., Attri..., Equi..., Atri..., data..., Tag..., TEM... The table contains several rows of data, including entries for 'deep005...' with various units and equipment types.

metrl...	name	engu...	Proc...	ISA ...	Equi...	Nam...	Attri...	Equi...	Atri...	data...	Tag ...	TEM...
deep005...	43F10033...	m3/min	43	F1	1033	PV	FLOW	C				Centrifuga...
deep005...	43F18348...	m3/min	43	F1	8348	PV	FLOW	C				Centrifuga...
deep005...	43J4951...	KW	43	J1	4951	PV		C	POWER			Centrifuga...
deep005...	43PD1697...	psi	43	PD1	6979	PV		C	DIFF PRE...			Centrifuga...
deep005...	43P16032...	psi	43	P1	5032	PV		C	DISC PRE...			Centrifuga...
deep005...	43P16918...	psi	43	P1	6918	PV		C	PRESSUR...			Centrifuga...
deep005...	44E1206...	V	44	E1	2306	PV		C	VOLTAGE			Centrifuga...
deep005...	44F1629...	m3/min	44	F1	1629	PV	FLOW	C				Centrifuga...



Map Assets. Automatically populate attribute information for Asset Twins from asset data. Map unique information like geospatial and augmented reality.

Enterprise Calculations. Encode Asset Templates with variable operating envelopes, excursion limits, or anomalies. You can also define attribute driven KPIs, and physical relationships between attributes (e.g. $\text{Power} = \text{Current} * \text{Voltage}$).

Operate Asset Twins

Hierarchical Views. Construct an unlimited number of simple or complex hierarchical views of your assets for any data consumer, obviating the need for one master asset structure.

Master Data. Clean up mapped master data to keep data consistent across systems and metadata uniform. Enable different data consumers to have different names for the same assets and attributes with aliases or synonyms.

Perpetual Data. Keep Asset Twins up to date by persisting live connections to source systems, scheduling incremental mapping updates, re-publishing asset pipelines, and updating any views or exports of your asset data based on the changes recorded in your operational systems.

Maintain Asset Twins

Model Integrity. Track the percentage of data mapped versus the attributes available from the Asset Template.

Data Integrity. Highlight normal data issues like null values, flat-lined/stale values, or noisy values in your time-series.

Governance Controls. Rich set of pre-defined and custom RBAC roles for data sharing within and between organizational units.

Share Asset Data Enterprise-wide

Asset Twins provide the flexibility so you can construct any schema of your data you need to power any application and data consumer inside or outside your organization.

Publish Models. Export hierarchical views to products like PI Asset Framework, Honeywell Asset Sentinel, SAP PM Asset Registry, and GE Predix; or data standards like MIMOSA and Energetics. API-driven syncs keep products harmonized and consistent.

Data Tables. Export data to analytical applications with a simple interface. Export data in a SQL-ready format or in a raw parquet format for consumption in a data lake.

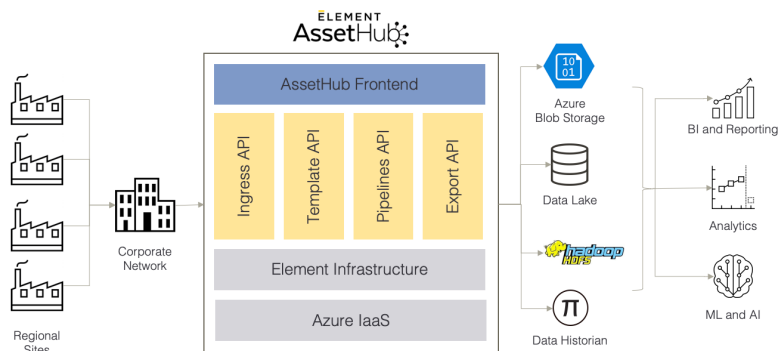
Data Export Portal. Easily manage each of the exports to enable applications and analytical use-cases. Easily collaborate, search, describe, and delete unused dataset through the portal.

Supported by an Industrial-scale Foundation

Architectural Design

AssetHub is a cloud native SaaS application designed to enable digital transformation and Big Data analytical activities for asset-intensive industries. We've purpose-built our

solution to support the analytical needs of today, with the capabilities to evolve to the needs of tomorrow.



Big Compute. AssetHub utilizes an Apache Spark-based computational layer to horizontally scale the system and support large workloads for activities like analyzing data quality issues, or transforming data for exports. Additionally, AssetHub’s HDFS Storage layer provides access to the Hadoop ecosystem, opening access to 99% of analytical tools, meaning no proprietary analytical tool requirements or no additional training for new analytical systems.

Element Graph. AssetHub produces an in-memory, flexible, graph-based contextual model that stores all the metadata relationships about your Asset Twins and how each piece of information about the Asset Twin is related to its source data. The graph-based approach makes storing complex process relationship easy to encode and speedy for data retrieval.

Data Agent Ingress. AssetHub’s agent-based approach obviates the need for bespoke application connections. Agents can be deployed remotely, or along with the AssetHub deployment. Agents are stateless services, allowing for high reliability and better security.

Infrastructure

AssetHub is designed to support the needs of the world’s largest industrial owner/operators. It is built on the gold-standard Microsoft Azure cloud. You can determine whether it is hosted on your own Azure environment or Element’s.

Managed SaaS. Provides the benefits of on-prem software (applications are dedicated to you in your own network) and SaaS (no IT operations involvement of systems training). Additionally, Element manages patches, updates, and downtime; provides on-call support 24x7; and ensures 99.9% application availability.

Self-Healing Elasticity. AssetHub goes beyond high-availability. With a stateless microservices architecture built on Kubernetes, AssetHub auto-recovers from any intermittent issues or outages and scales up and down in runtime if it detects slow services. AssetHub provides highly performant data applications that are both reliable and cost-effective.

Enterprise Security. AssetHub utilizes data encryption controls and best-in-class threat detection to identify any cybersecurity issues. All services are isolated from one another, preventing any vulnerability from spreading, and each deployment integrates with Azure Active Directory. AssetHub is ISO27001 compliant.

ABOUT

Element unlocks industrial data, enabling modern analytics systems to find insights that transform operational performance, resulting in hundreds of millions of dollars of value for customers. Today, asset data is siloed and underutilized. Element AssetHub connects, manages, and shares asset data across the enterprise by developing Asset Twins – dynamic digital representations of equipment. With Element, any person or system can have a 360-degree view of every asset.

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