



Microsoft

Digital Twins

Use Case Deck
August 2022

Microsoft confidential

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Today's conversation

Our understanding of your context



<<Template to be customized ahead of each customer conversation>>

Section should articulate understanding of customer context, For example:

- Top of mind business priorities and outcomes for the customer
- Immediate problems customer is trying to address
- Any recent investments made by the customer

Goals of today's conversation



<<Template to be customized ahead of each customer conversation>>

Section should clearly articulate 3-4 goals for the specific conversation. For example:

- Discuss how Product Engineering can address current challenges
- Discuss reference architecture for Microsoft solutions
- Align on delivery approach & how will work together

Agenda



Manufacturing trends



IPS deep dive on Theme level



Microsoft's approach to enabling IPS



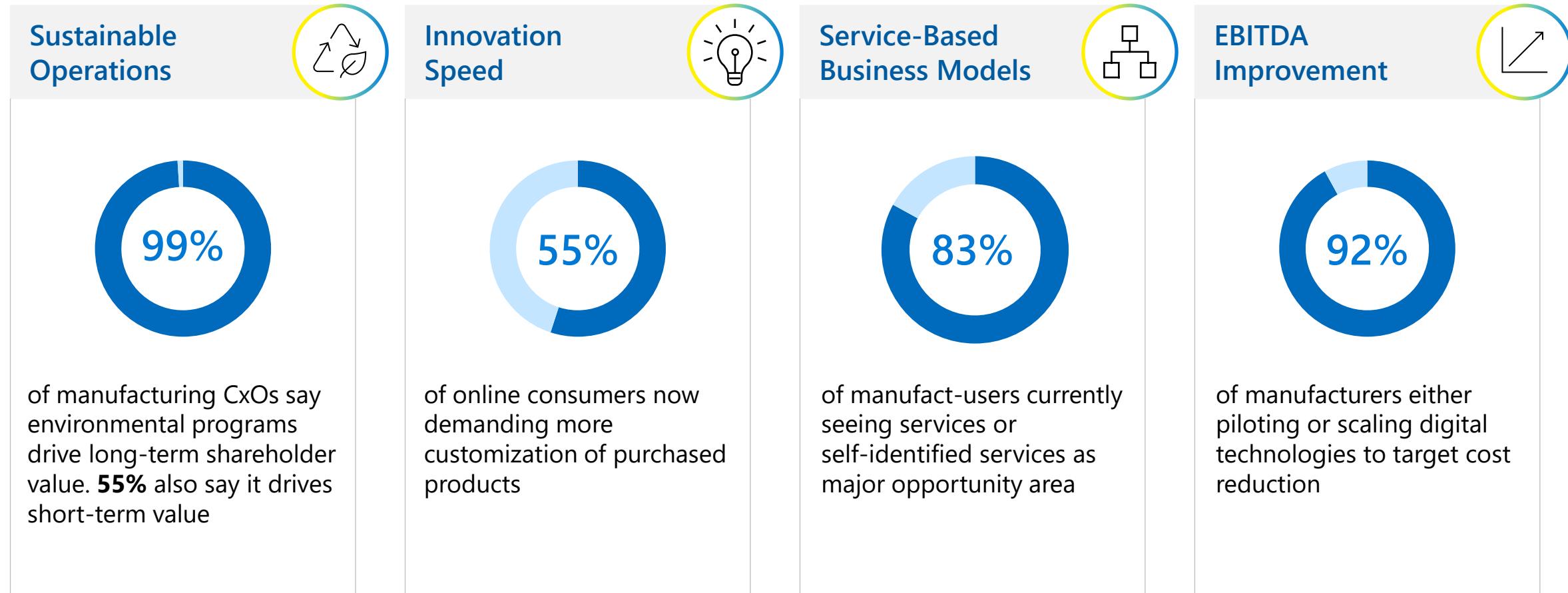
How we will work with you



Why Microsoft

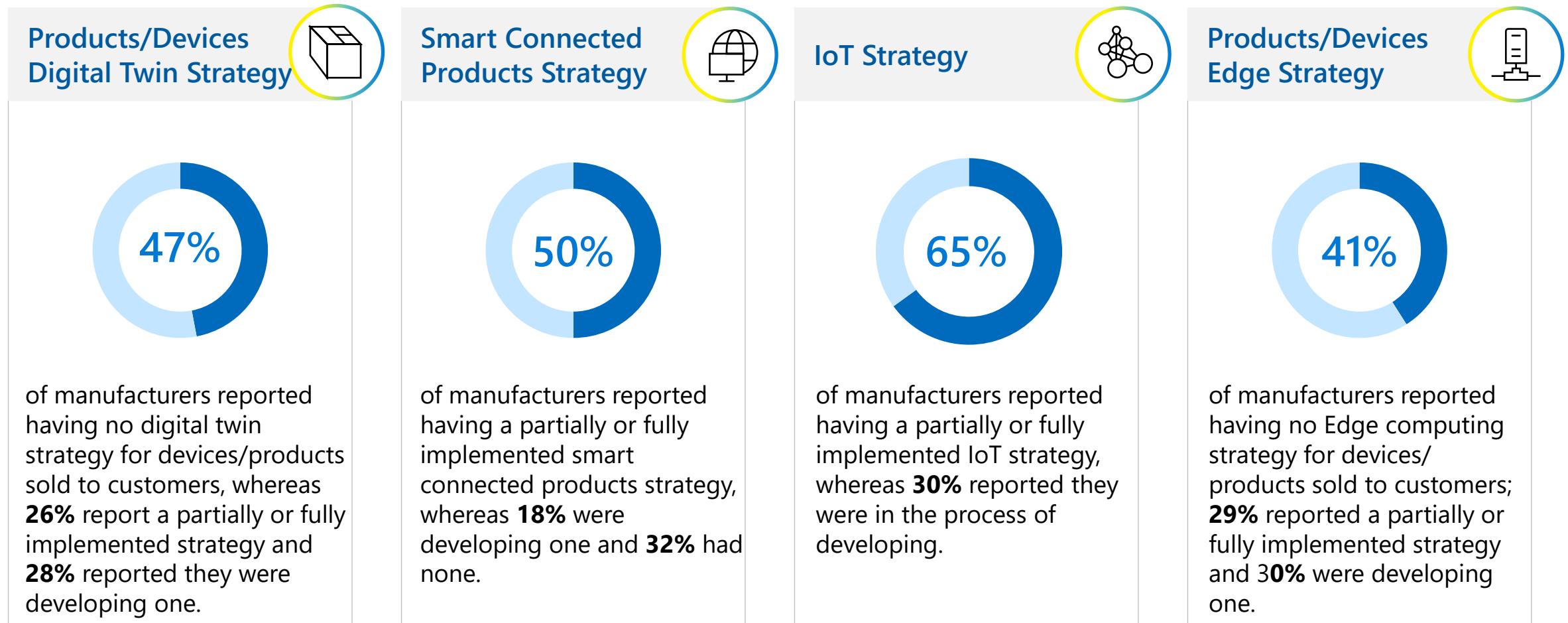
Manufacturing companies are going through a period of disruptive changes

All of them impacting your digital transformation journey



Digital Twin trends in smart products

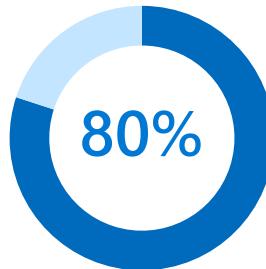
Manufacturer's IoT strategies are amongst the most advanced in digital transformation initiatives



HPC: A Game Changer in Manufacturing Industry

A combination and integration of IT-based simulations, modeling, and data analysis enables maximum support of manufacturing application scenarios through higher IT performance.

Product & Process Innovation



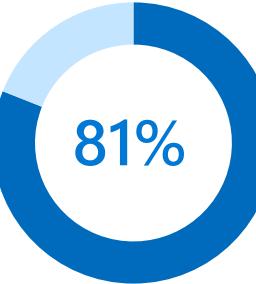
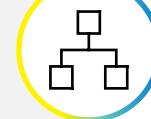
of manufacturing decision makers surveyed say HPC is a game changer for product and process innovation. **96%** of companies that have already implemented HPC agree.

Innovation Speed



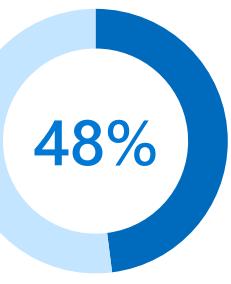
of manufacturing companies surveyed say iterations and calculations are taking too much time.

New business models



of manufacturing companies who are already using HPC want to implement new HPC-based business models.

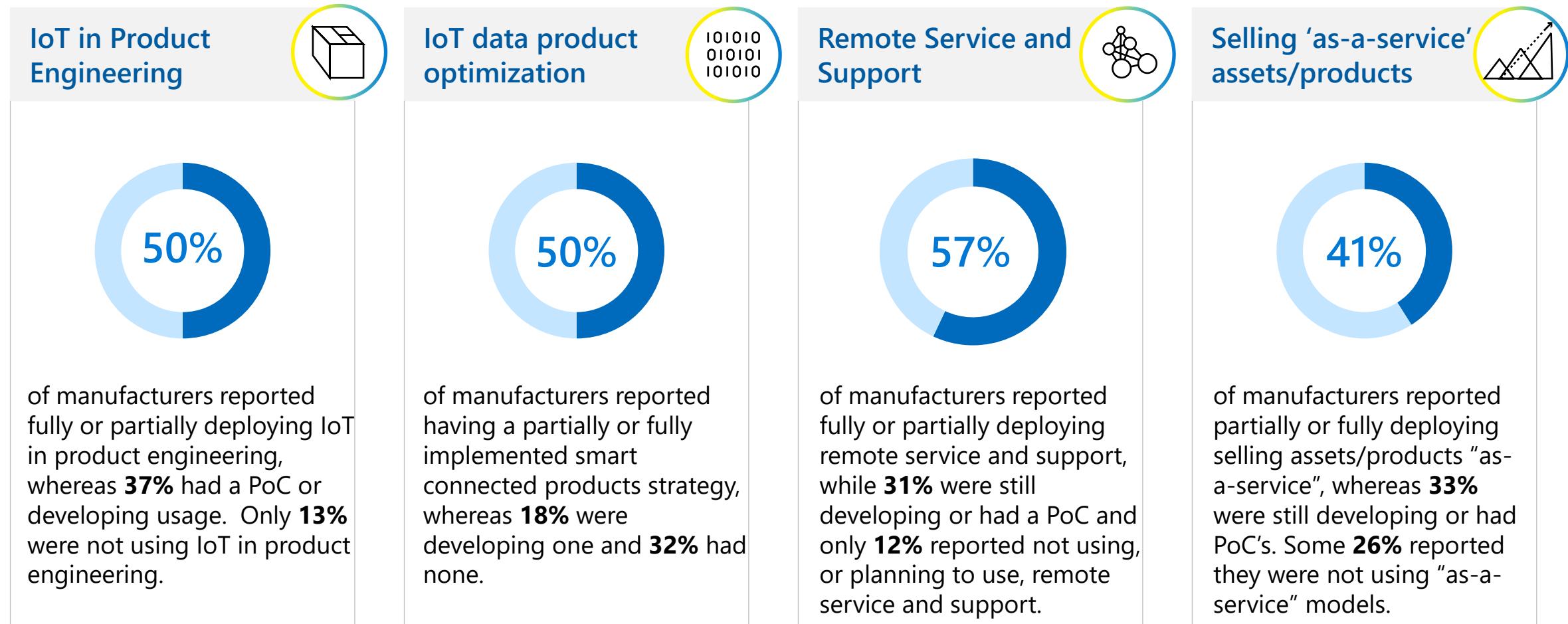
Agility and Sustainability



of manufacturing companies are already using external HPC infrastructure of a service provider, such as public cloud. A further **34%** plan to do so within 12 months.

Use Cases in Smart Product IoT Usage

Manufacturers are using IoT in an increasing number of applications to drive value



Forces at work driving transformation



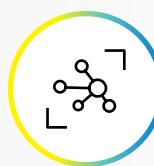
By 2030, **65%** will save 10% of OPEX through process digital twins using IoT and ML¹.



By 2024, **75%** of manufacturers will embed quality management across the value chain, including the supply chain and field service, reducing overall cost of quality by 25% ².



By 2024, **50%** of G2000 organizations will develop industry ecosystem digital operation centers to monitor capacity, expertise, market, and environmental conditions, for 50% faster time to market ².



By 2023, **25%** of manufacturers will consolidate their enterprise applications through solutions that can enable multivendor capabilities and streamline the Industry 4.0 technology stacks requirements ².



By 2024, **60%** will participate in distributed supply chain network to reduce the risk of an unplanned disruption in their value chain ².



By 2025, **30%** will utilize blockchain and IoT to provide provenance for sustainability ¹.



By 2022, to support autonomous operations, organizations will increase their investments in data governance, digital engineering organizations, and digital operations technologies by **40%** ².



By 2023, manufacturers will reduce onsite personnel by **30%**, delivering engineering and maintenance support from anywhere ².



By 2022, due to COVID-19, **70%** of consumer-facing manufacturers will leverage new direct-to-consumer channels, producing up to 15% more profits, improved customer satisfaction, and business resiliency ².



By 2022, **70%** will create 50% of new products and services using cloud-based innovation platforms ¹.

Microsoft's Framework for Manufacturing & Supply Chain

Respond | Recover | Reimagine



Transform Your
Workforce

Engage Customers
in New Ways

Build More Agile
Factories

Create More
Resilient Supply
Chains

Unlock Innovation
and Deliver New
Services

[Discrete Manufacturing](#) | [Consumer Goods](#) | [Process Manufacturing](#) | [Pharmaceuticals](#) | [Automotive](#) | [Aerospace](#)

Digital Thread & Digital Twin



Digital Twin

- Consists three main parts: physical asset or process in real space, virtual asset or process in virtual space and the connected data model that ties them together
- The extended application of simulation and visualization throughout an organization, for better decision-making, communication, and collaboration
- You cannot buy a digital twin solution per se, as digital twin is more of a methodology for integrating and modeling across multiple solutions
- It is not a reference template - it's a digital representation of each asset or process in near real-time



Digital Thread

- An integration or mapped collection of data sources related to an asset or process
- A 'single source of truth' for a given piece of data to eliminate redundancy and inconsistency for greater accuracy and access
- A digital thread is not a data lake – the data must be contextualized and structured
- Establishes a closed loop across multiple processes and systems from design through operation and service

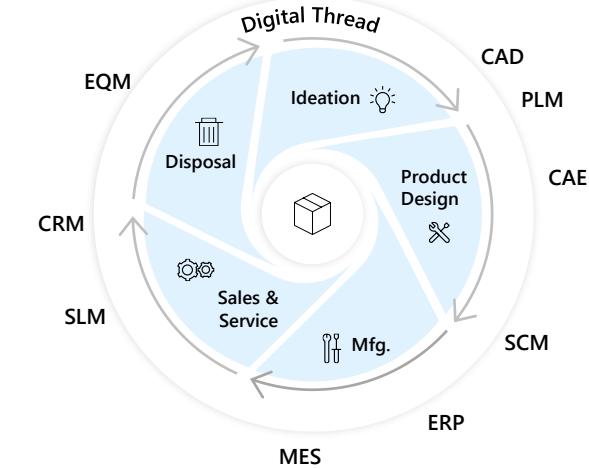
Microsoft's Digital Twin IPS Theme provides a collaboration platform to realize the product-focused, environment or ecosystem Digital Twin



Use **Digital Twin** to unlock new product insights and deliver agility

- Monitor and control products, machines, assets, and production processes from anywhere
- Rewind and replay, continuous refinement of designs and models based on real-time data
- Serialized asset tracking to optimize operability, manufacturability, inspectability, and sustainability
- Predict the behavior of products with digital verification and validation

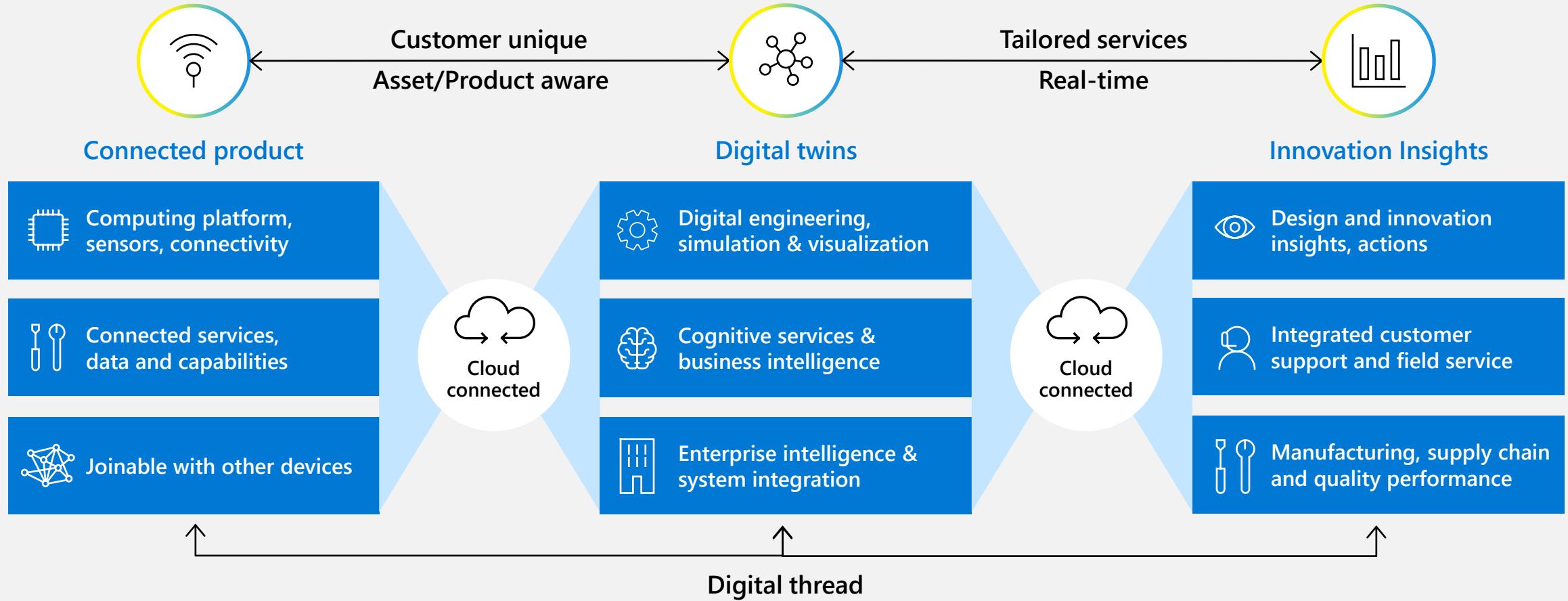
Digital Twins



Use **Digital Thread** to

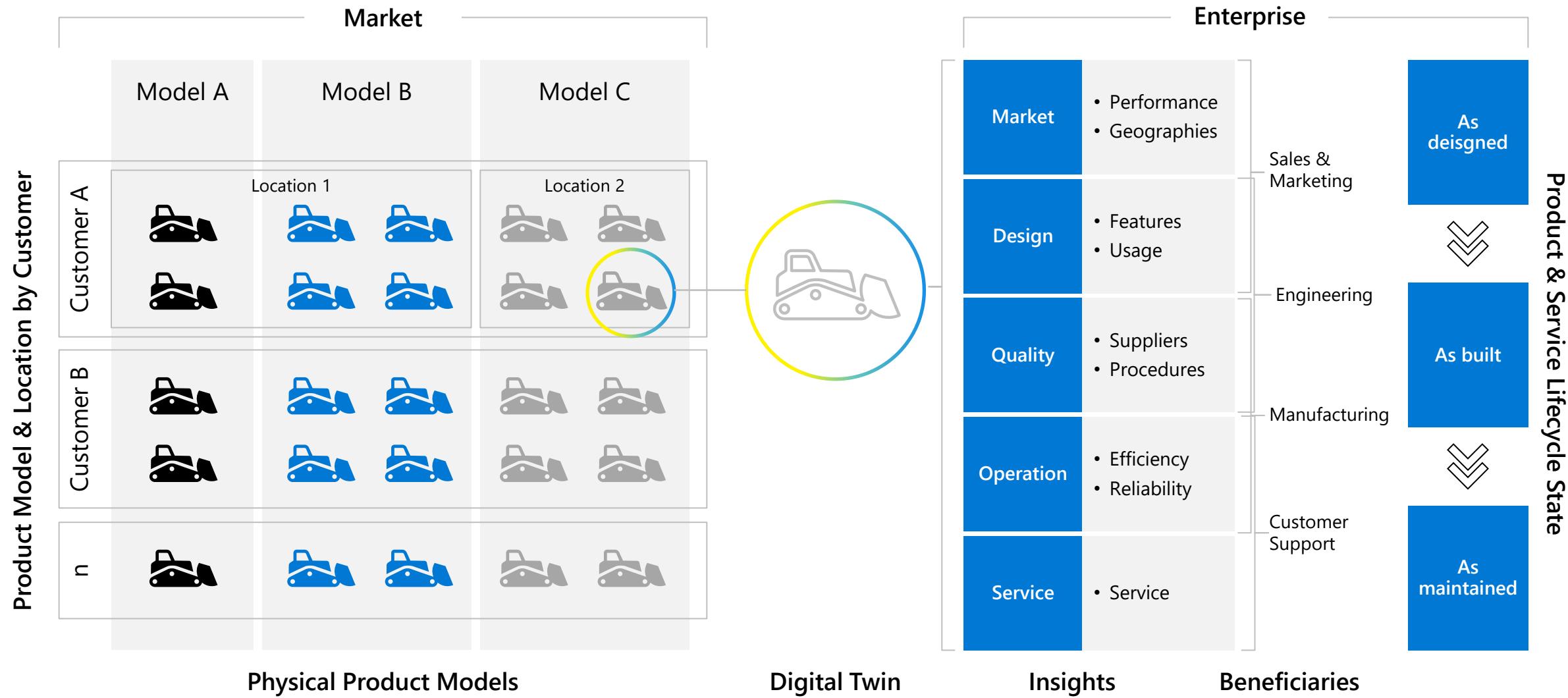
- Connect data from various functions, stores, silos and applications together
- Enable serialized asset tracking across the product life-cycle from design, through manufacturing to field service
- Have access to the right data at the right time across the value chain
- Synchronize data across processes

Connected Product Innovation: Harvest data to identify insights and design opportunities

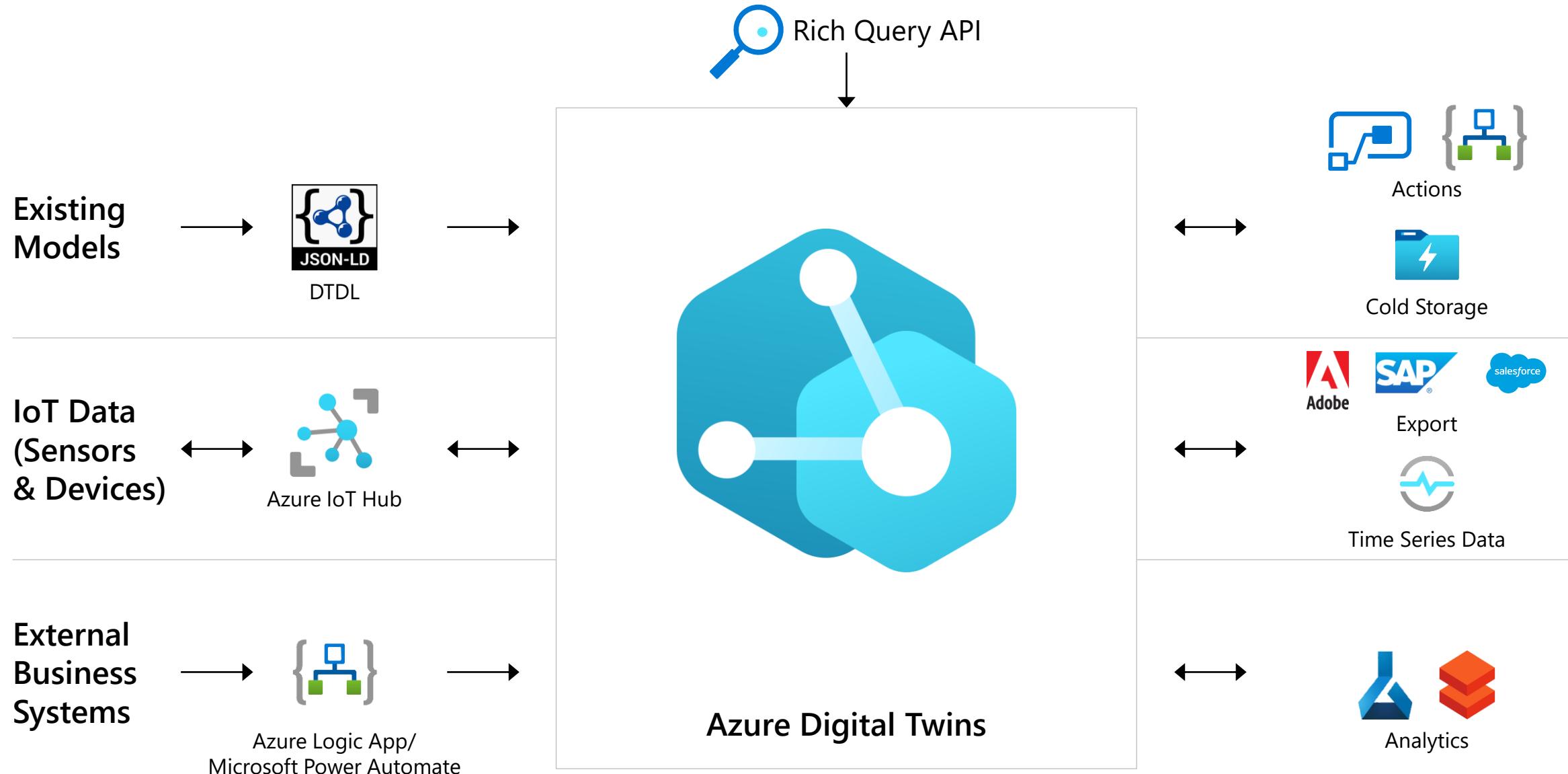


Harvest data to identify insights and design opportunities

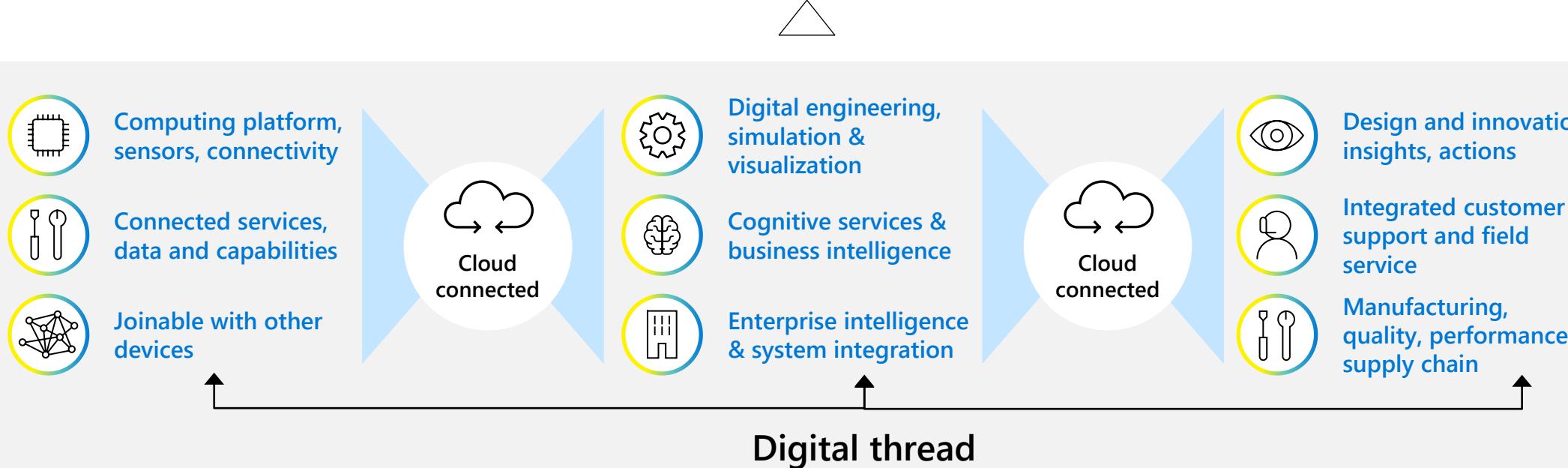
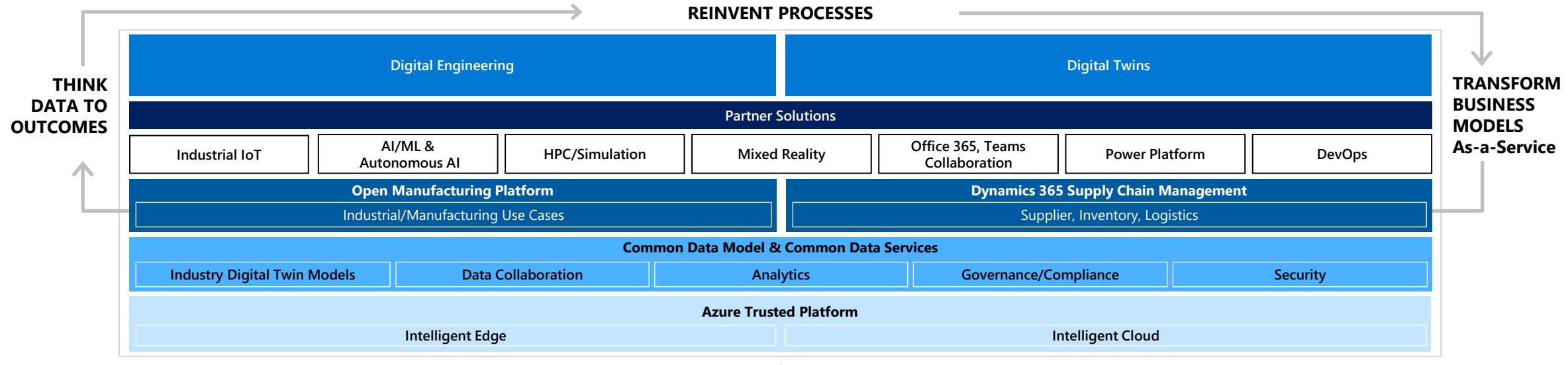
Product Digital Twin: A virtual instance of a customer's smart connected physical product



Azure Digital Twins

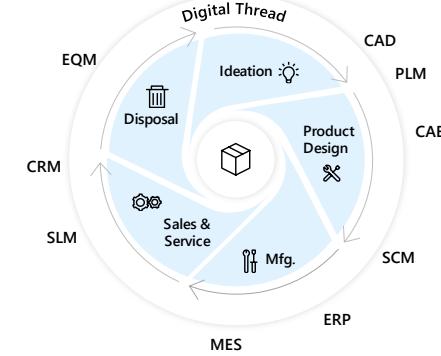
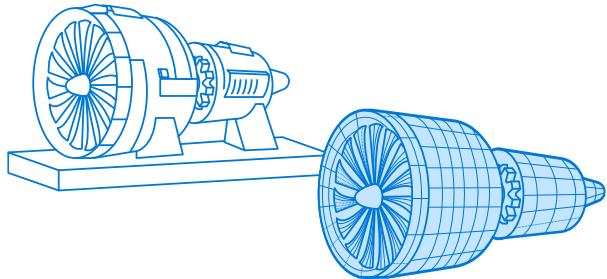


Unlock faster time to market with Digital Twin transformation



Digital Twins are virtual replicas of physical assets

Enable remote monitoring and rapid evolution of a product, environments and ecosystems



Use **Digital Twins** to create virtual replicas of physical assets and enable monitoring and rapid evolution of products :

- Live today, learning from yesterday to predict tomorrow

Up to a **30%** reduction in new product development time
Up to **70%** improvement in install base inspection efficiency

Use the **Digital Thread** to go across system silos to bring traceability into products from as-designed, as-planned to as-manufactured and as-maintained

- Synchronization of data across functional disciplines
- Integrating multiple application and data silos
- Visualization technology

Up to **16%** improvement in on-time and complete shipments
Up to **20%** improvement in successful new product introductions

Our customer references



BOSCH
Invented for life



Howden



Lexmark

CELLI group
The sustainable drinking experience

Establishing a Digital Thread powers innovation

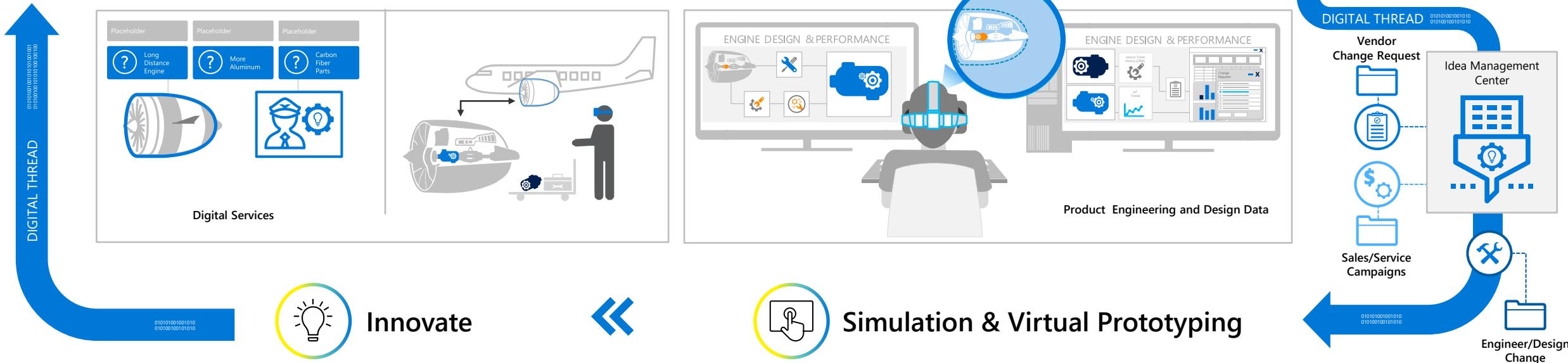
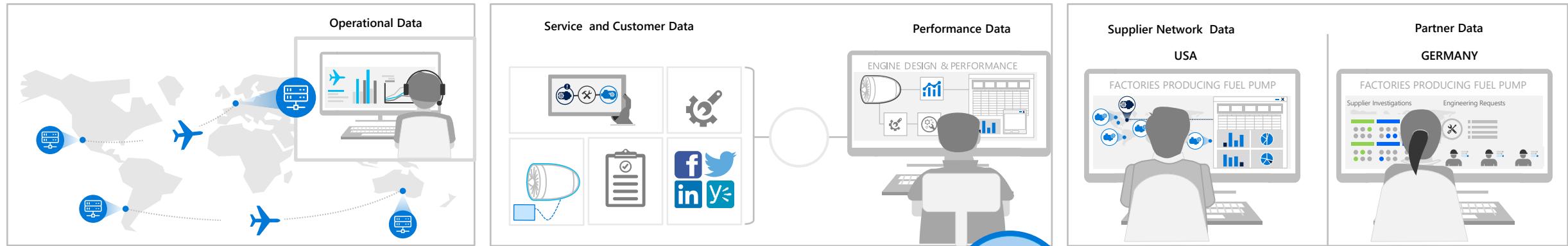
 Real time performance analytics



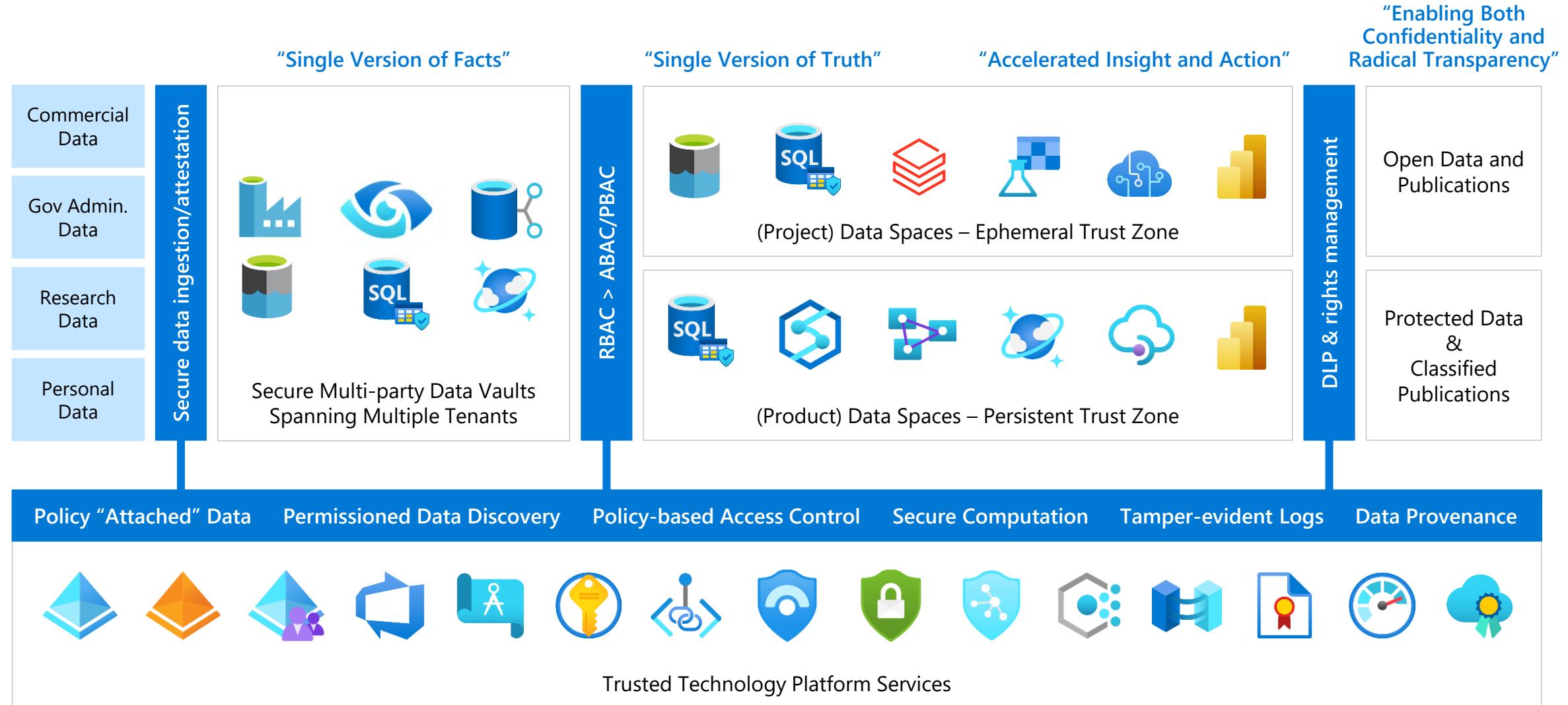
 Federated data



 Secure Collaboration



Trusted Data Platform – Secure Collaboration



Today, manufacturers do not have visibility into usage of their assets, making their business reactive in nature

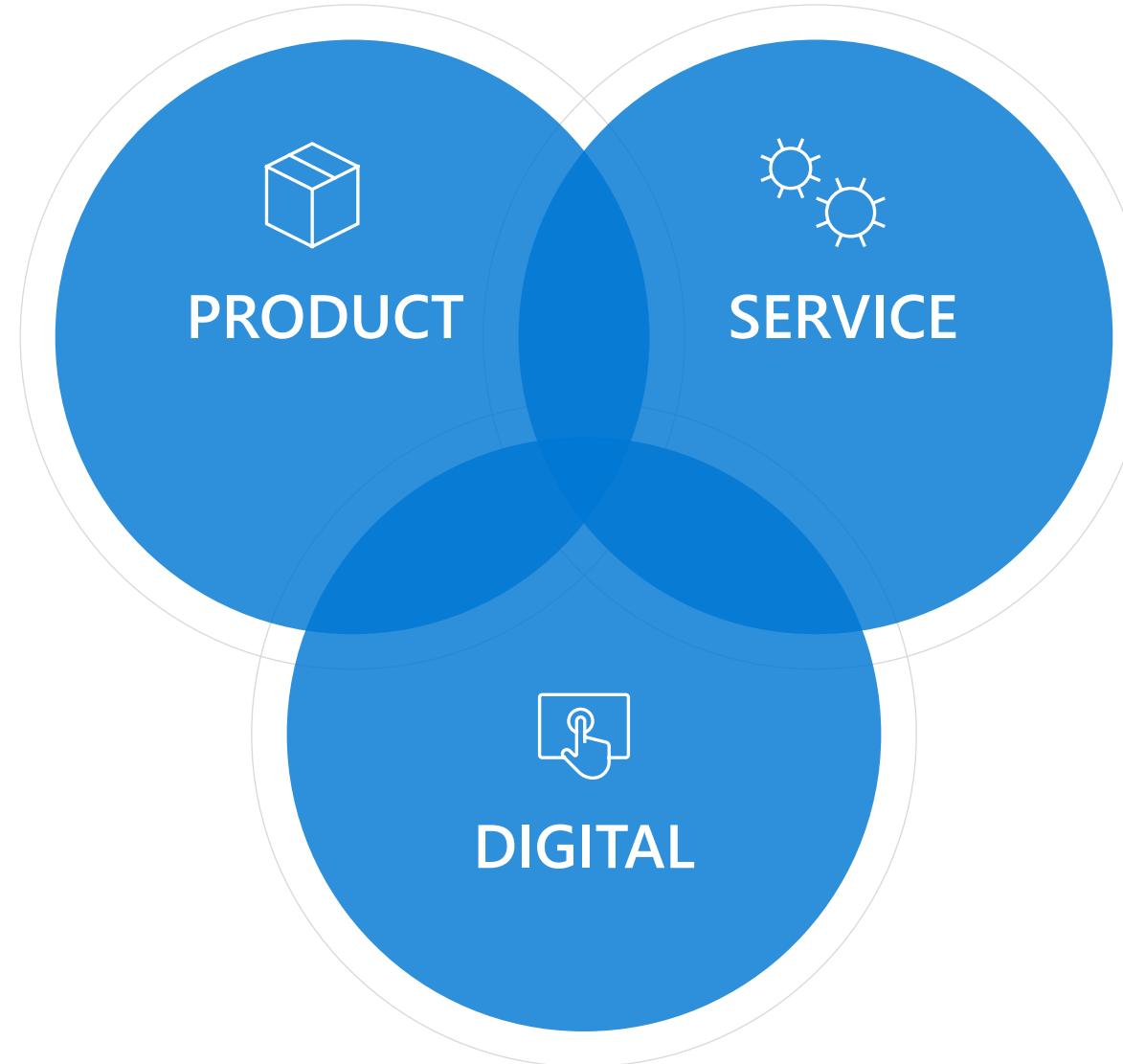
Connected products are the foundation of business models that can change the shape of revenue

To launch a connected product, manufacturers must...

- Add sensors and connectivity layer
- Enable a secure data exchange that follows privacy and IP regulations
- Adjust customer contracts and agreements to allow for data sharing and collaboration
- Establish a 'give-get transaction' for customer data – treating it as the new currency for customers

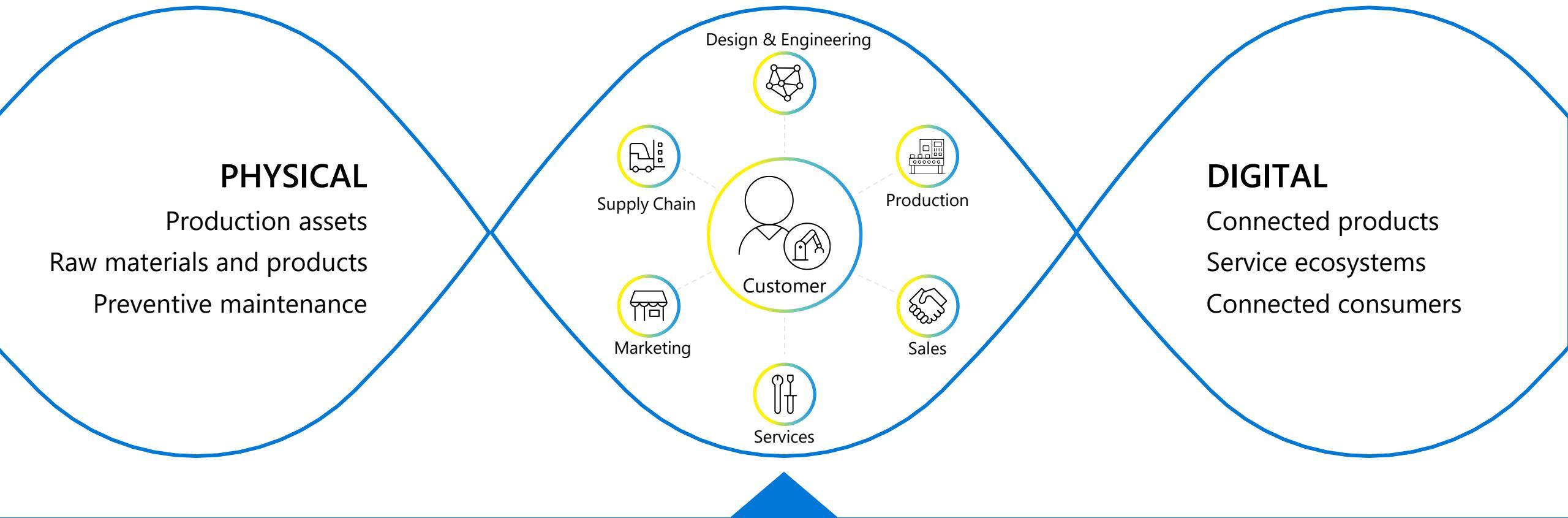


Connected Products



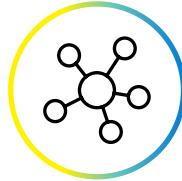
Customer centricity needs customer insights

Connected products give customer insights



Modern manufacturers are embracing customer centricity,
innovating faster and becoming more agile

Connected Products provide the foundation for...



Connectivity

- Remote Monitoring
- Asset Health
- Remote Diagnostics
- OTA Updates
- Geofencing & Security



Analytics & Insights

- Customer Usage Analytics
- Design & Engineering insights
- Remaining Useful Life
- Predictive Maintenance
- Connected Field Service



New Business Models

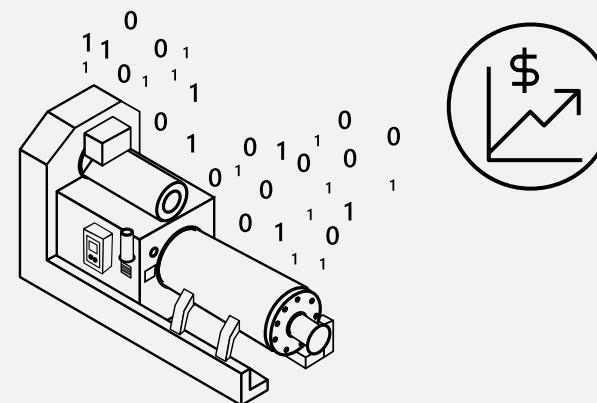
- Digital Services
- Upsell & Cross sell opportunities
- Product-as-a-Service

Connected Products

Unlock insights and provide the foundation for innovations in new business models and opportunities

Use **Connected Products** to build connectivity to assets and generate insights on:

- Customer's usage of assets, performance, asset health and remaining useful life (RUL)
- Proactive needs to ensure asset uptime
- Engaging in outcome-based contracts and building competitive differentiation
- Creating digital services for new revenue opportunities and transition to subscription based business models

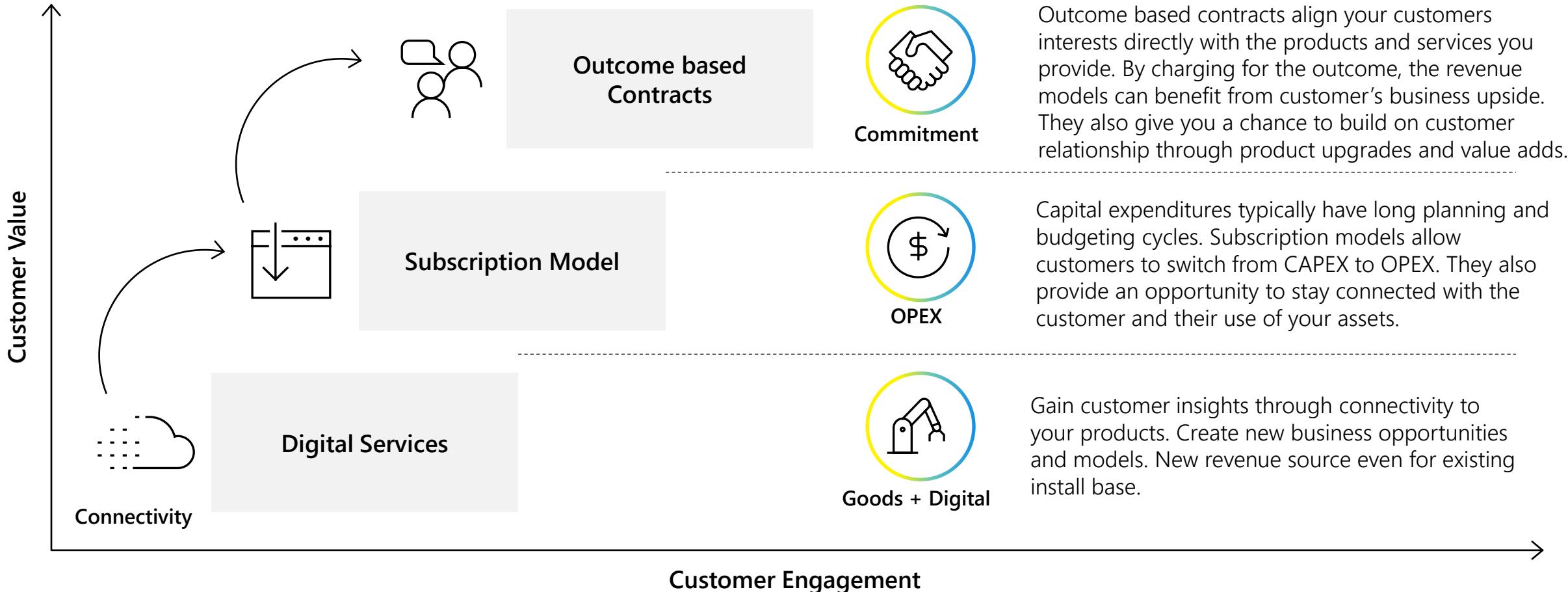


- Up to a **20%** improvement in product quality
- Up to **40%** improvement in product performance

Our customer references

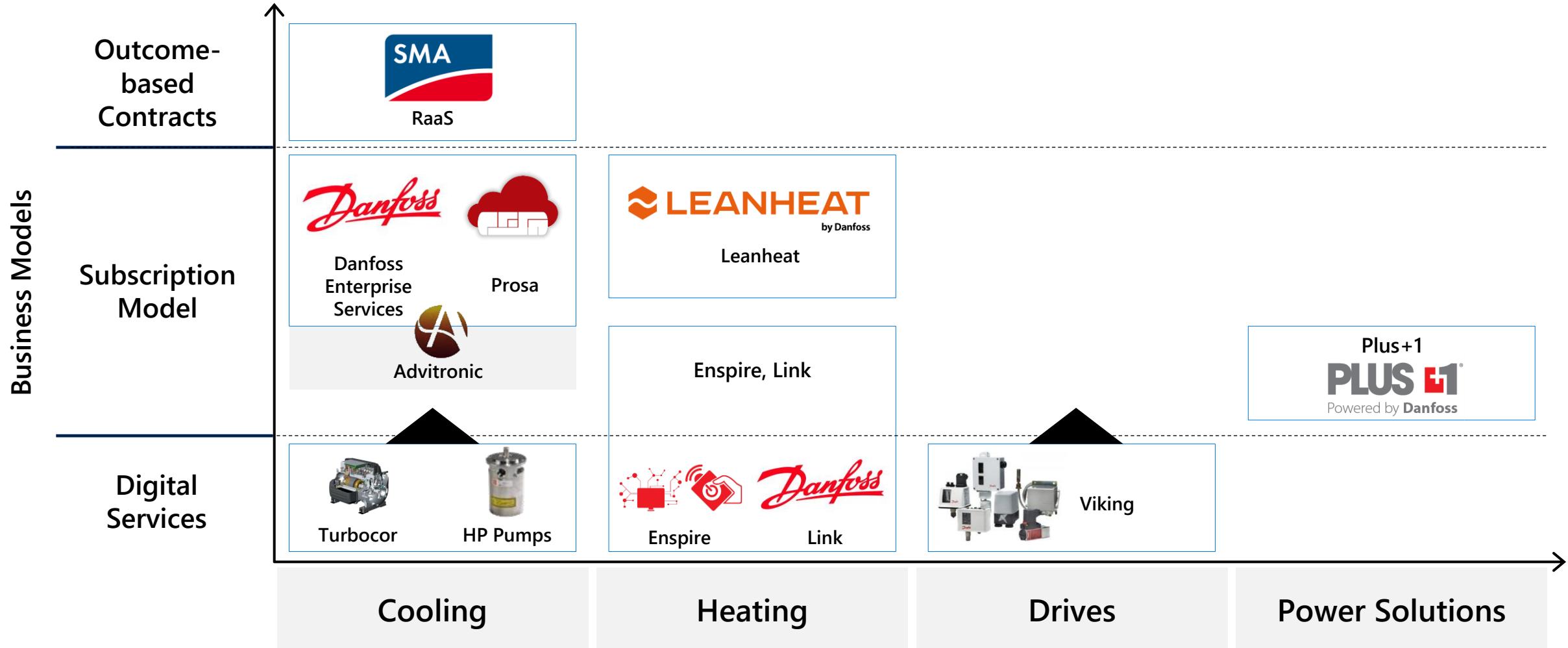


The Journey to Product-as-a-Service



Danfoss Digital Service Business Models

All 4 Danfoss segments are significantly investing in IoT services and enabling tech stack – Unique industry constraints and maturity driving business model decisions





Digital Twin

Digital Twin IPS Capability package

Description

The **Digital Thread** refers to the communication framework that allows a connected data flow and integrated view of a product, process or asset's data throughout its life-cycle across traditionally siloed functional perspectives. The **Digital Twin** is the virtual representation of a physical object or system across its life-cycle.

The **Digital Twin** offers a set of solutions and capabilities to allow manufacturers to use real-time data and other sources to enable learning, reasoning, dynamically recalibrating for improved decision making and planning for the future through simulations.

Use Cases



Digital Twin



Digital Thread



Connected Products

Digital Twin

Virtual mirror of the physical world

Living in the today, learning from yesterday, predicting tomorrow



Proven impact

25% - 900% improvement speed to market through agility

Up to a 13% improvement in production capacity

Up to a 38% reduction in energy used

Up to a 3% reduction CO2 produced

Up to a 35% reduction in production preparation lead times

Up to a 70% improvement in inspection efficiency



Real benefits

Create virtual replicas of physical products, assets, processes, people and organizations across the entire life-cycle

Enable remote monitoring and rapid evolution of products

Better understand product, asset and process performance

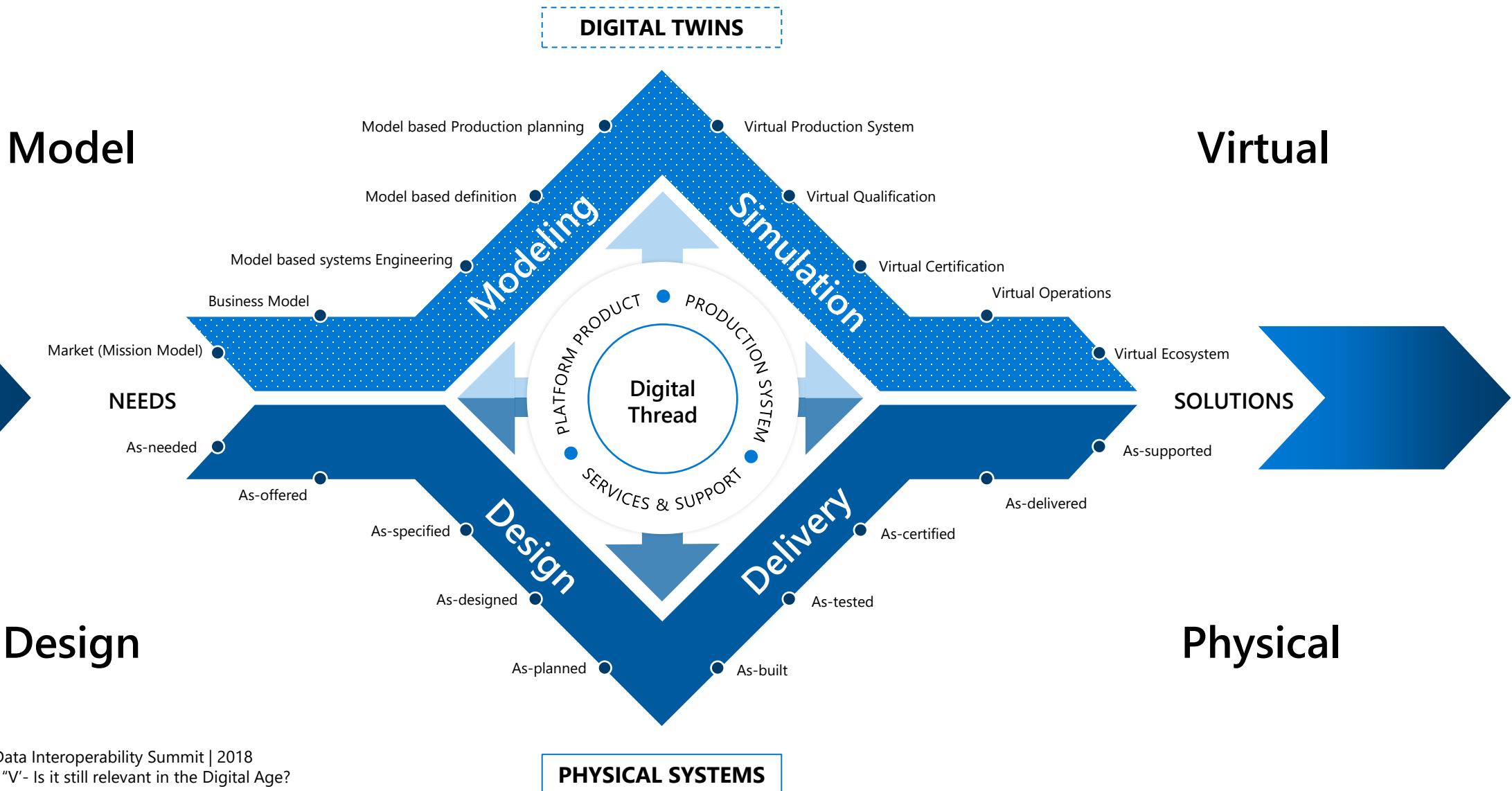
Enable sustainable production

Improved production efficiencies

Unlock product insights by being able to rewind and replay

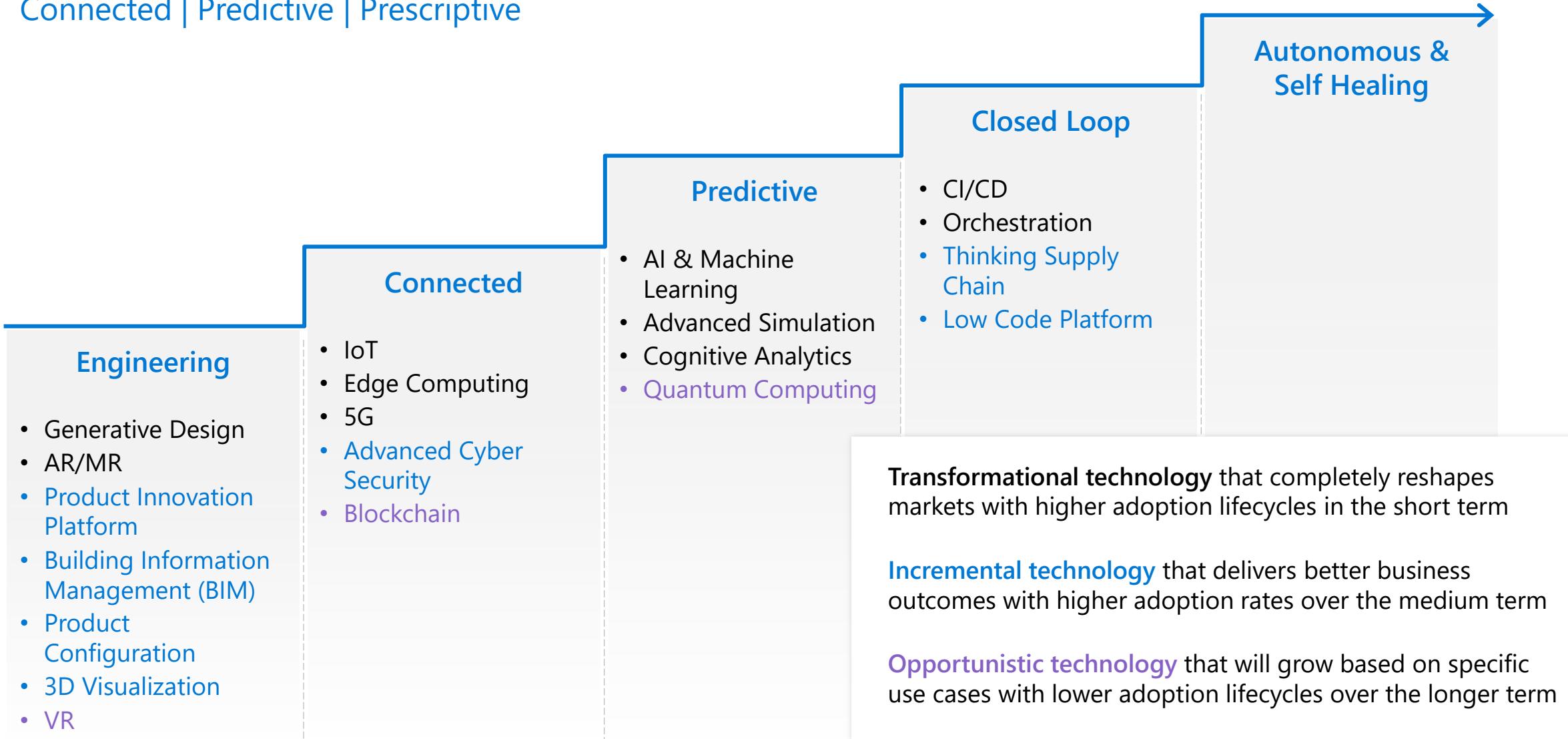
Digital Twins in Model-Based Systems Engineering

The Boeing 'Diamond'



Product-related Digital Twin Evolution

Connected | Predictive | Prescriptive



Digital Twin applications

Priority Scenarios



Product
[Unlocking Innovation]



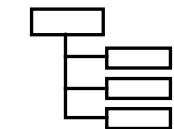
Factory
[Agile Factory]



Supply Chain
[Resilient Supply Chain]



Spaces & More
[Ecosystems]



Configuration Management



Asset Management



Process Control



Performance Management

101010
010101
101010

Simulation Modeling

ISV Partners



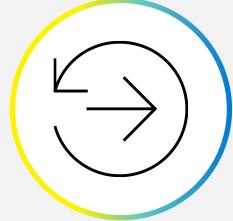
SI Partners



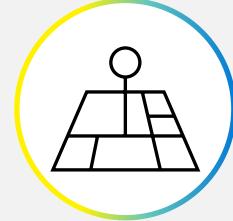
More than a simulation or dashboard, digital twins enable informed action and control



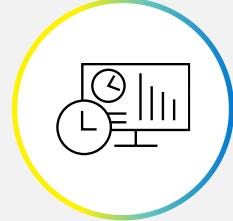
Remote
Operations



Rewind
and replay

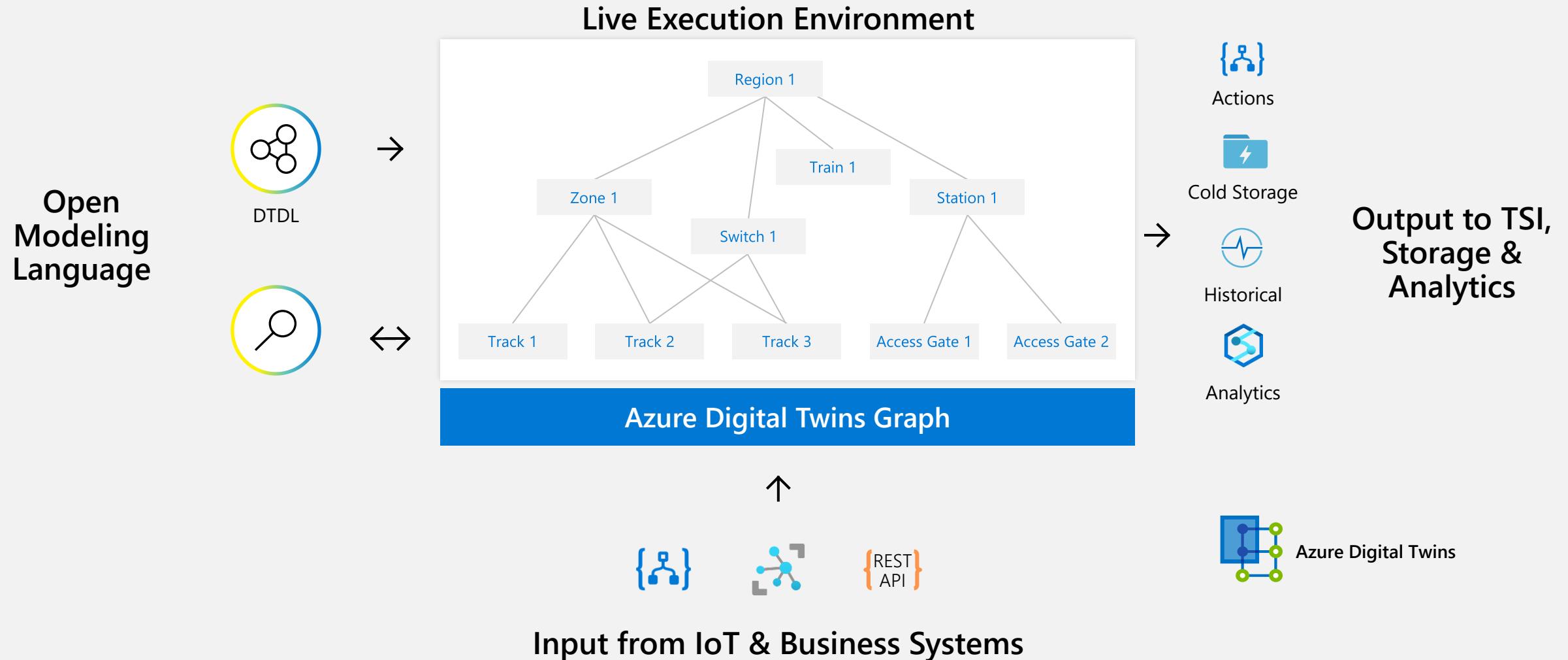


Serialized asset
tracking

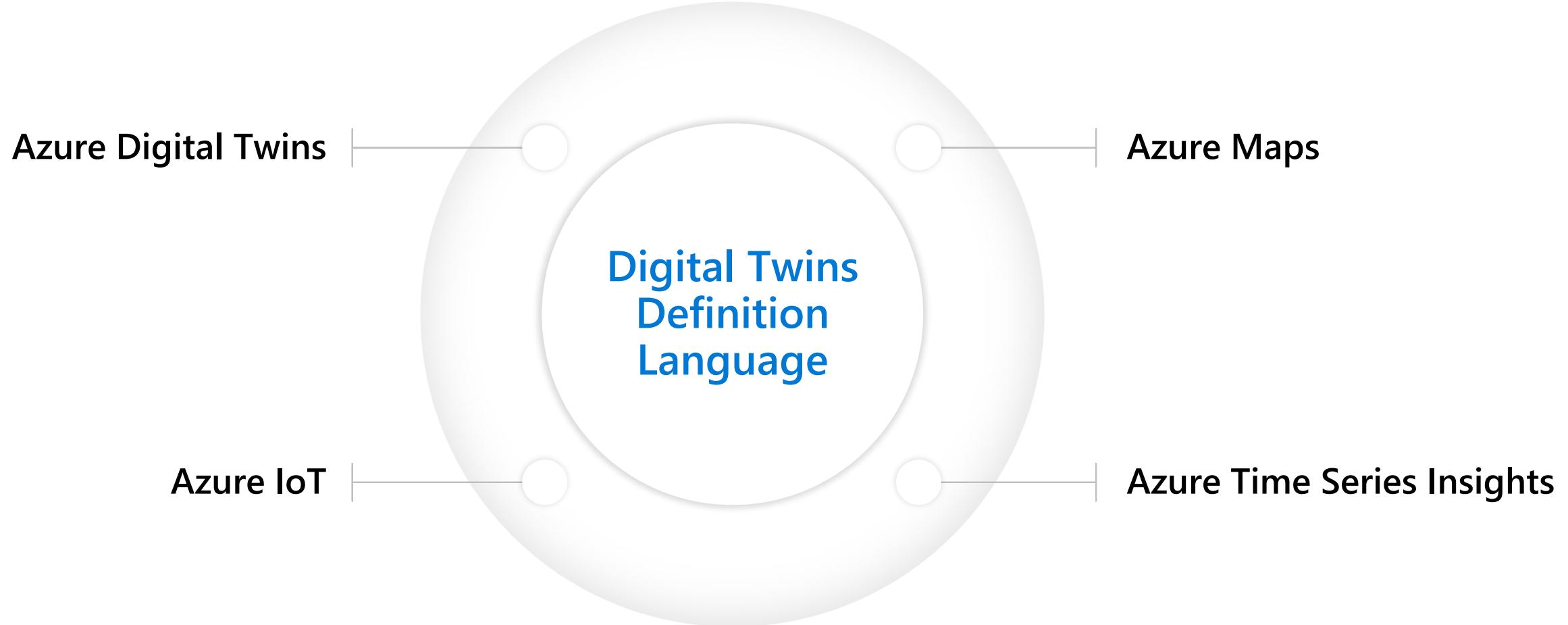


Digital verification
and validation

Azure Digital Twins accelerate Digital Twin development

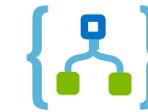


Microsoft Azure is a driving force for Digital Twin innovation



Anatomy of a Digital Twin

A complete **digital twin** solution is a data integrator that combines rich and complex data from a wide variety of sources into a consistent model that covers:



IoT Data	Structure	Geometry	Behavior	Time	Business Data
<ul style="list-style-type: none">Endpoint devices such as appliances, vehicles, or factory machines that connect, interact and exchange dataDevices that aggregate, process & provide gateway capabilities for IoT endpoints	<ul style="list-style-type: none">Industry and domain specific ontologiesTopology of modeled entities interconnected as a graphBrought to life with real time data from sensors and other sourcesRepresentation of operational state always up to date	<ul style="list-style-type: none">Abstract geometry (eg. maps)2D/3D design geometry (eg. CAD, BIM)Real geometry (eg. Spatial anchors for AR/MR applications, spatial reconstruction scans)	<ul style="list-style-type: none">Models, enabling simulation, using a model to virtually study the behavior and performance of a system under different physical conditions and constraintsHeuristic models – enabling advanced forecasting and optimizationDeep reinforcement learning	<ul style="list-style-type: none">Data history - capture and process time series data for all signals flowing through and being processed by the modelTopological history - capture how the structure and topology of the model evolves over time, with the ability to replay any part of this evolution	<ul style="list-style-type: none">Information stored in traditional LOB systems (systems of record)People and business processesLive connections (vs. static imports)

Digital Twins Consortium

Founders





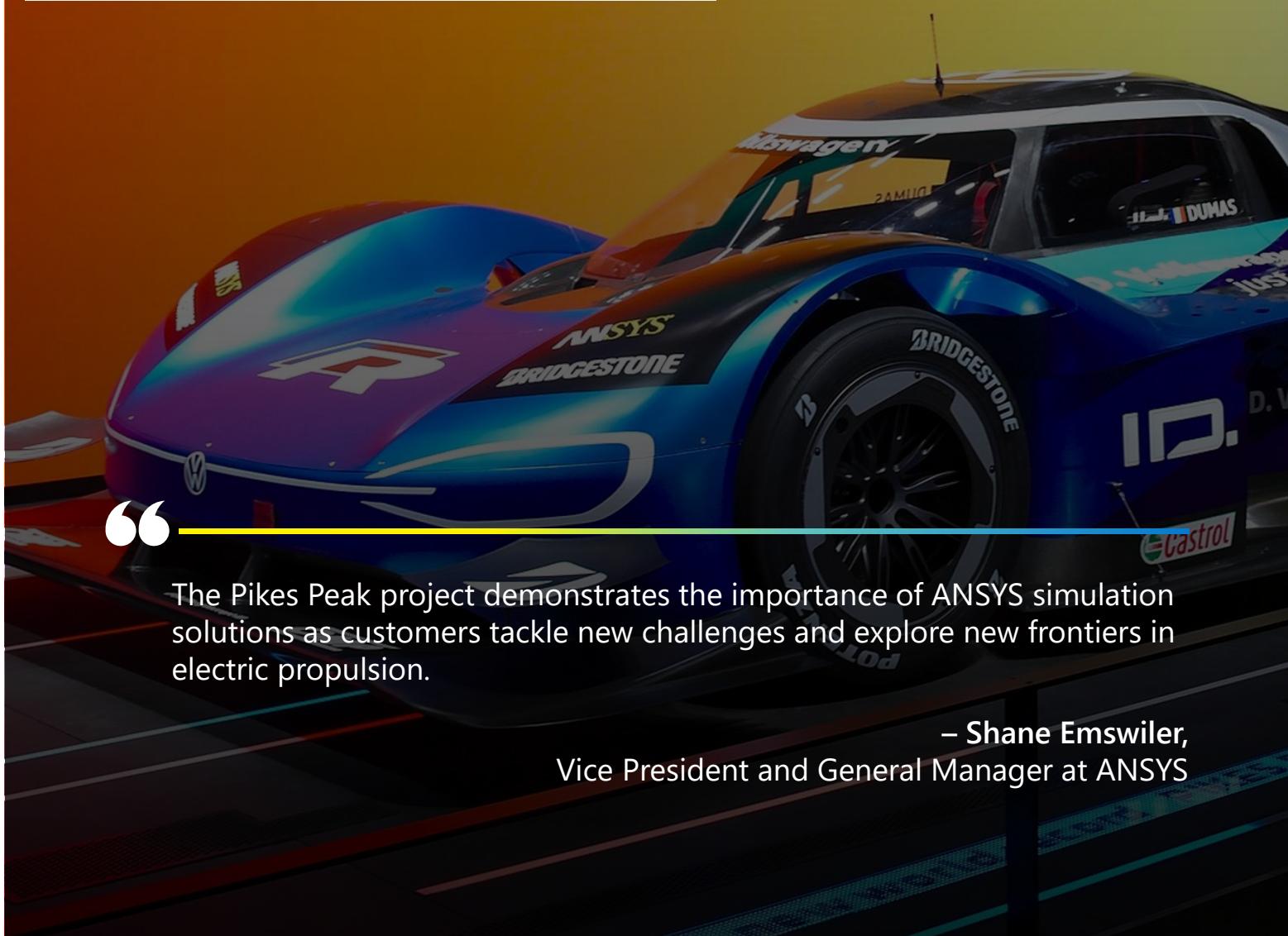
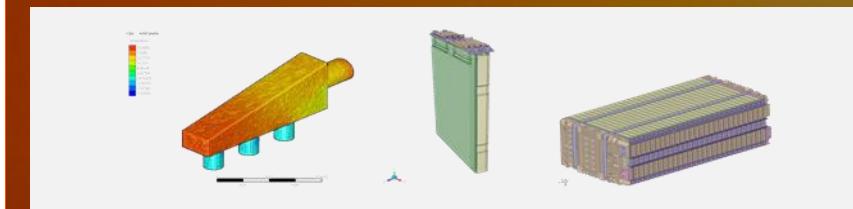
A blurred, high-angle view of a city street at night. The street is marked with yellow crosswalk stripes. Numerous people are walking across the street, their figures blurred due to motion, creating a dynamic and energetic atmosphere. The overall scene suggests a bustling urban environment.

Digital Twin Success Stories & Customer Testimonials



Record breaking design, simulation and performance

- Design, test & build electric car entry for the Pikes Peak International Hill Climb in 9 months
- Digital simulations optimized, tested, and validated the electric car battery pack's electrical and thermal properties
- Not only did it win the race and have power to spare but also beat the previous record by 8 seconds. Performance proved the accuracy of simulation.



The Pikes Peak project demonstrates the importance of ANSYS simulation solutions as customers tackle new challenges and explore new frontiers in electric propulsion.

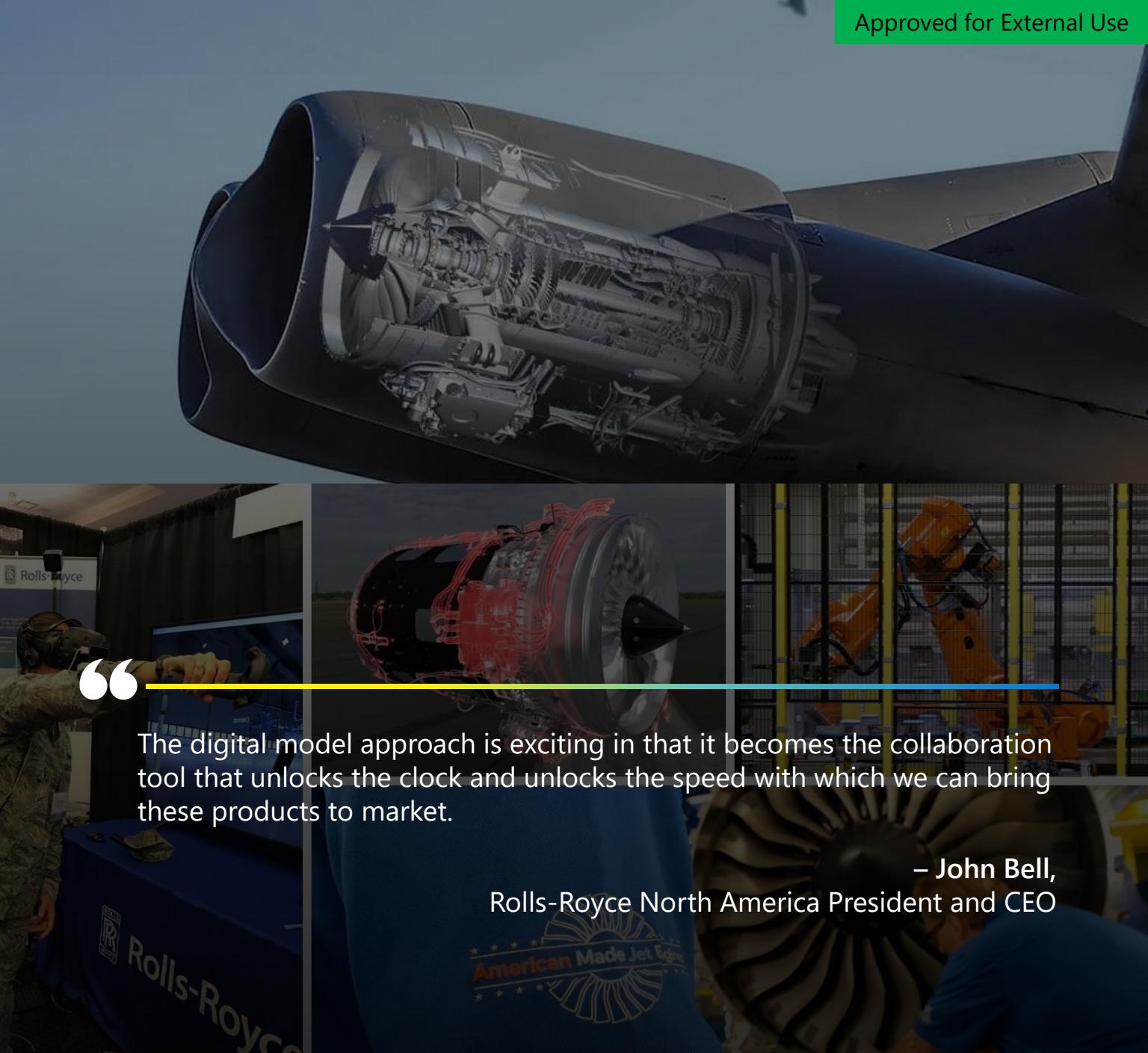
– Shane Emswiler,
Vice President and General Manager at ANSYS



Rolls-Royce

Winning through Digital Engineering Transformation and Continuous Innovation

- All digital presentation of B-52 CERP proposals
- Digitally engineered the wing, pylon, nacelle, engine integration, gearboxes, fuel flow, electrical systems, thrust, weight, circumference of the engine and nacelle diameter
- \$2.6B contract win based on digital engineering verification and validation driving down maintenance, sustainment costs and improving efficiency



“

The digital model approach is exciting in that it becomes the collaboration tool that unlocks the clock and unlocks the speed with which we can bring these products to market.

– John Bell,

Rolls-Royce North America President and CEO



BOSCH
Invented for life

Machines raise their voice when they need help: Bosch's Digital Twin – IAPM takes human-machine collaboration to the next level

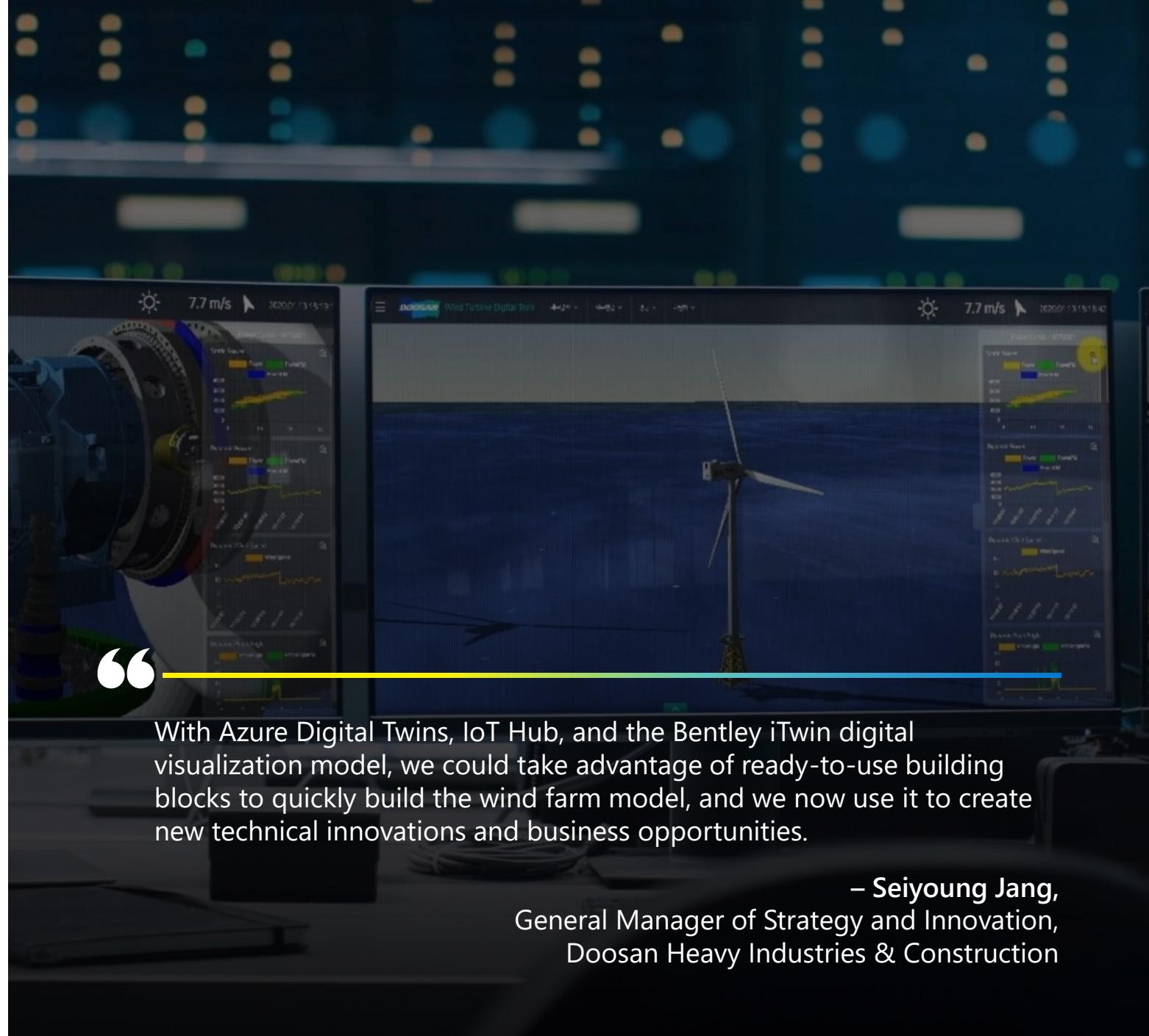
- Not too early and not too late— performing maintenance at just the appropriate time.
- Focus on reliability centered and total productive maintenance for more sustainability in production
- Digital Twin sends a message through Microsoft Teams to caretakers and handheld devices; Tickets created in Dynamics 365; Experts interact with machines through Hololens 2 and Remote Assist.





Renewable energy production efficiency

- With a strong focus on maintaining leadership in the renewable energy sector, Doosan Heavy Industries & Construction wanted to optimize the efficiency of its existing wind farm operations and collect the data needed to develop new wind turbine technology
- Doosan worked with Microsoft and Bentley Systems to develop a digital twin of one of its wind farms
- The digital twin uses Azure IoT Hub and Azure Digital Twins to process the data from the wind farm and Bentley iTwin to create the 3D model for operators to use
- Doosan uses the digital twin to accurately predict production output to help ensure that it meets production targets and minimize operations and maintenance costs
- It also uses the digital twin solutions to model and develop next-generation wind turbine technology



“

With Azure Digital Twins, IoT Hub, and the Bentley iTwin digital visualization model, we could take advantage of ready-to-use building blocks to quickly build the wind farm model, and we now use it to create new technical innovations and business opportunities.

– Seiyoung Jang,
General Manager of Strategy and Innovation,
Doosan Heavy Industries & Construction



Enabling customers to predict & optimize equipment performance, reducing unplanned downtime

- Howden, a manufacturer of industrial products, called on Microsoft partner PTC to unify their processes and help them enhance their customer experience across the lifecycle of their products
- PTC created the industrial IoT twin platform using ThingWorx for Howden's globally dispersed products
- PTC helped Howden remotely troubleshoot and update software, create predictive and simulation models, deliver effective training and reduce downtime, and respond more quickly and effectively to customer needs



“

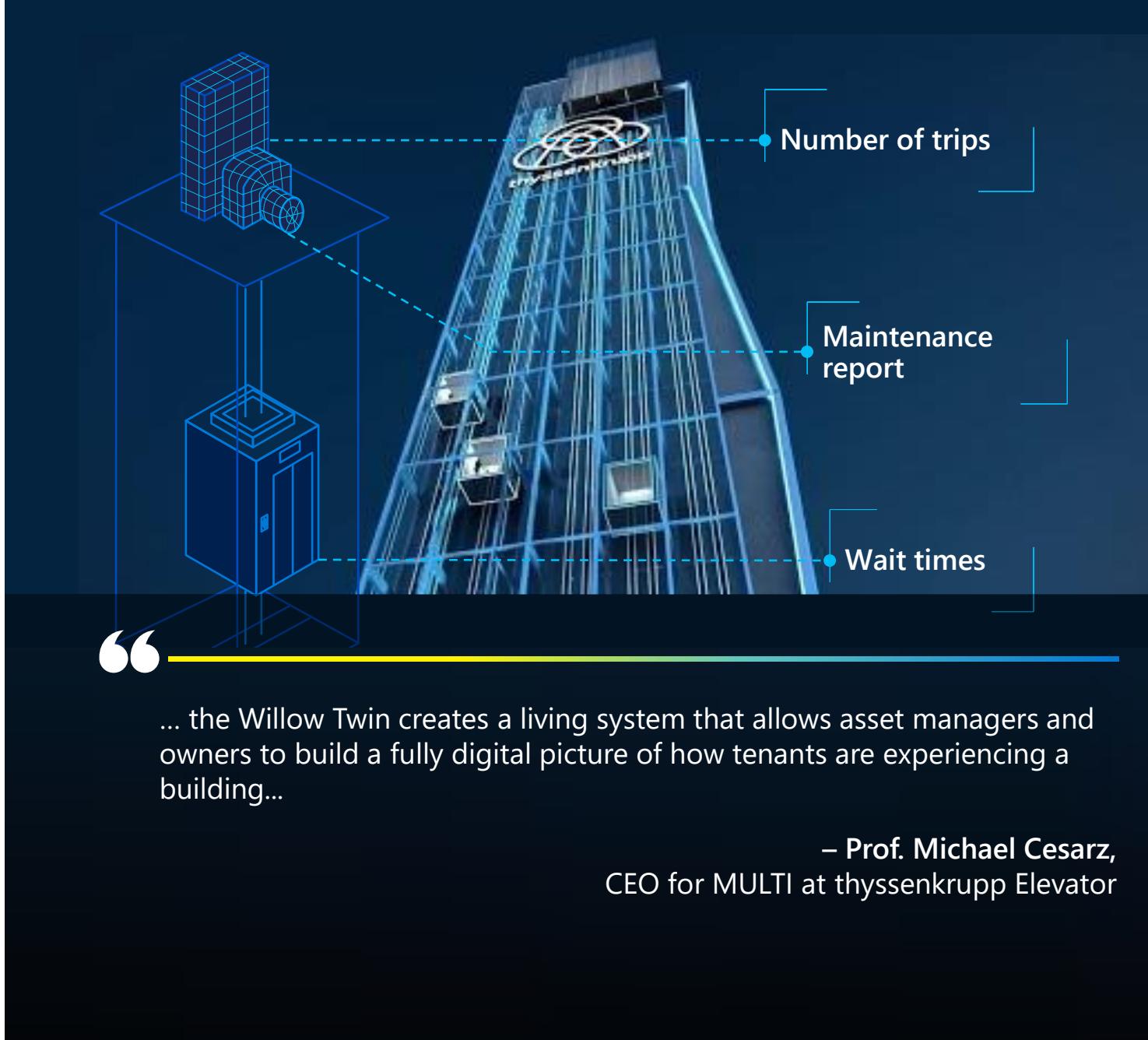
We are using augmented reality as the skin of the digital twin, by superimposing process and digital twin values in the most impactful way, by overlaying them on the physical product. Augmented reality extends the value of our IoT data and digital twin model and reshape the customer's experience of owning and operating Howden equipment.

– Maria Wilson,
Global Leader of Data Driven Advantage



Laying the foundation for intelligent buildings

- To help develop new solutions at their Innovation Test Tower, TKE needed to develop a new category of innovation for the built environment and deliver actionable insights to building manager
- TKE partnered with Willow and Microsoft to create a digital twin of TKE's 246-meter Innovations Test Tower and its unique ropeless elevator
- The "Willow Twin" is a digital replica of the building built on Azure Digital Twins and IoT
- Data-driven systems for rapid identification of problems and usage patterns
- Empowers managers and staff with daily critical insights to take preventative measures and be responsive
- Coordinates with 3rd parties to improve the tenant experience
- Helps improve elevator maintenance, emergency management, and customer experience





GE Aviation

- GE Aviation's Digital Group needed to combine two disparate systems for recording aircraft maintenance and in-flight performance to increase efficiency, reduce costs, minimize unplanned downtime, and meet strict industry safety standards
- GE Aviation's Digital Group needed to combine two disparate systems for recording aircraft maintenance and in-flight performance to increase efficiency, reduce costs, minimize unplanned downtime, and meet strict industry safety standards
- GE Aviation's Digital Group will offer a unique competitive advantage—accurate, efficient reporting capabilities and proof of compliance documentation for customers, from the fleet level to the individual aircraft and component level



“

We discovered that Azure Digital Twins is already purpose-built to do what we want to do. Instead of taking a graph database and then having to build from scratch on top of it, we have all that functionality out of the box.

– Luke Bowman,
Product Manager, Platform and Data Analytics
at GE Aviation Digital Group



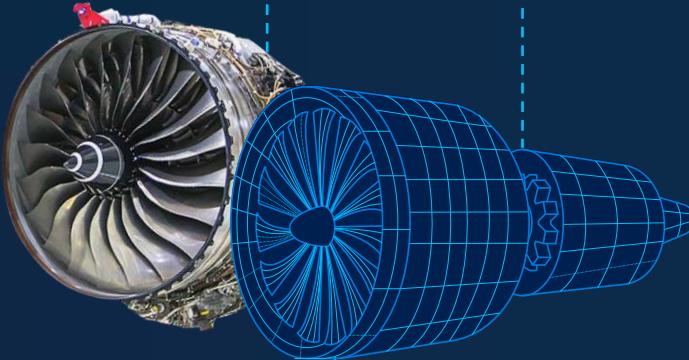
Rolls-Royce®

Rolls-Royce | Serialized asset tracking and monitoring

- Rolls-Royce has more than 13,000 engines for commercial aircraft in service around the world
- With increasing volumes of coming from many different types of aircraft equipment Rolls-Royce is using serialized asset tracking on an Azure platform
- Collects and aggregates data from disparate and geographically distributed sources like serialized on-wing engines, at an unprecedented scale
- Leverages onboard sensors that provide serialized telemetry soon after deployment of that asset
- Enables a digital feedback loop that drives product updates and informs and optimizes processes
- Enables Rolls-Royce to take on financial and operational risk on behalf of customers with "Power by the hour" performance-based contracts for engines

Remaining Useful Life

Fuel Flow, Fuel Efficiency



Temperature Differentials

“

... as data volumes increased, we were looking at a big-data problem...We quickly concluded that Azure was a ready-made solution for us.

– Richard Beesley,
Senior Enterprise Architect Data Services,
Rolls-Royce

Our Partners for Digital Twin and Digital Thread Capability

Digital Twin



SIEMENS

Ansys



Simio



aspentech



Rockwell
Automation

AVEVA

Infosys

Capgemini

SIGMA

HCL

accenture





Digital Thread Use Case Pack

Digital Twin IPS Capability package

Description

The **Digital Thread** refers to the communication framework that allows a connected data flow and integrated view of a product, process or asset's data throughout its life-cycle across traditionally siloed functional perspectives. The **Digital Twin** is the virtual representation of a physical object or system across its life-cycle.

The **Digital Twin** offers a set of solutions and capabilities to allow manufacturers to use real-time data and other sources to enable learning, reasoning, dynamically recalibrating for improved decision making and planning for the future through simulations.

Use Cases



Digital Twin



Digital Thread



Connected Products

Digital Thread

Integrated cross-domain view of data throughout the lifecycle

Connected data flow, orchestration and integrated view of a product data throughout the product and service lifecycle from design, through field service



Proven impact

Up to 16% improvement in on-time complete shipments¹

Up to 20% improvement in successful new product introductions¹

10% reduction in service costs²

8% improvement in planned intervention²

5% capex reallocation²



Real benefits

Enables product traceability from design, through manufacturing into field service across the life-cycle

Visibility across the value chain

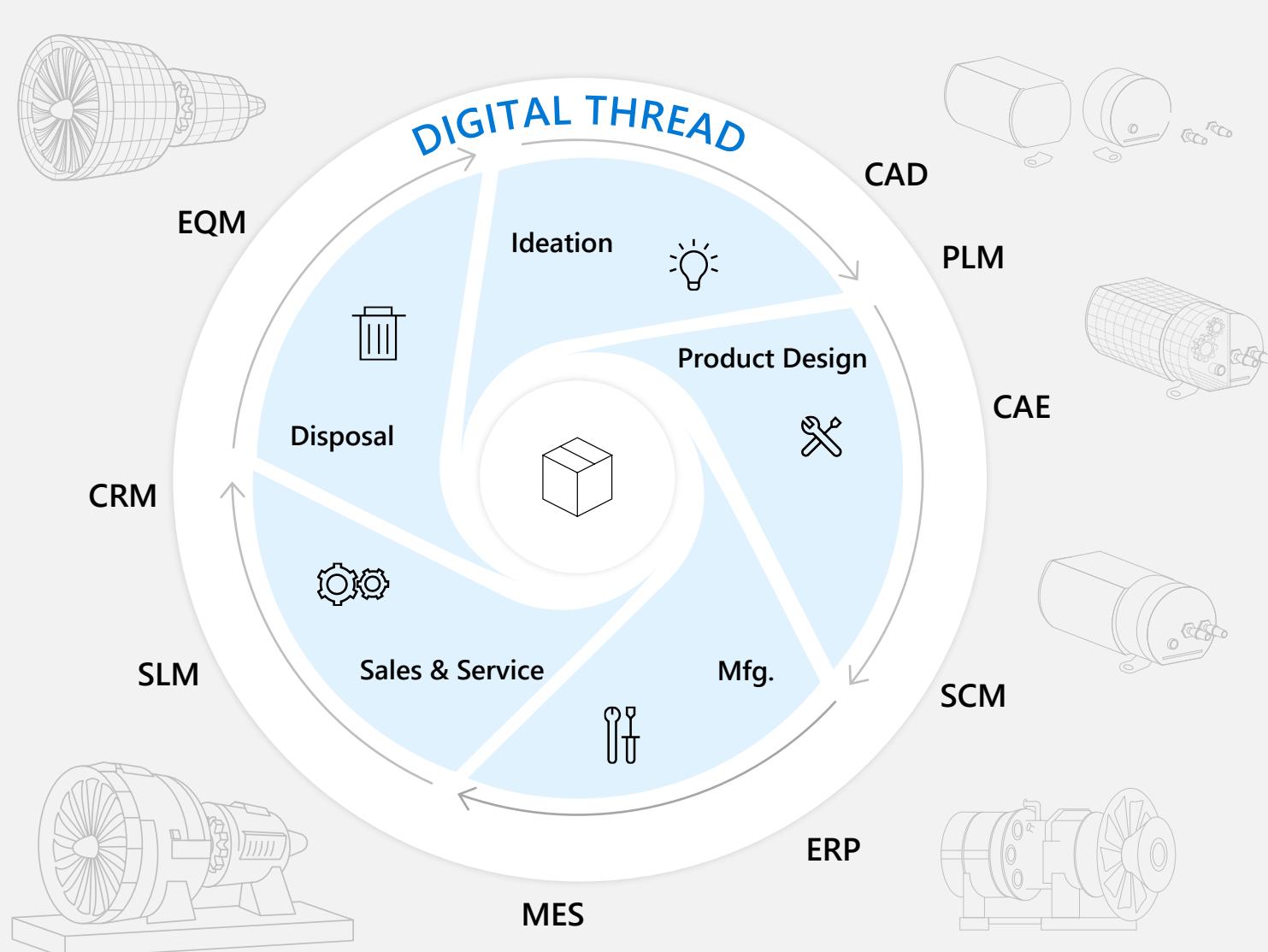
Accessibility across traditionally siloed functional domains

Common source of product truth

Increased customer acquisition

Identify component issues, combine real-time data, simulation and enable new business models based on extended digital thread

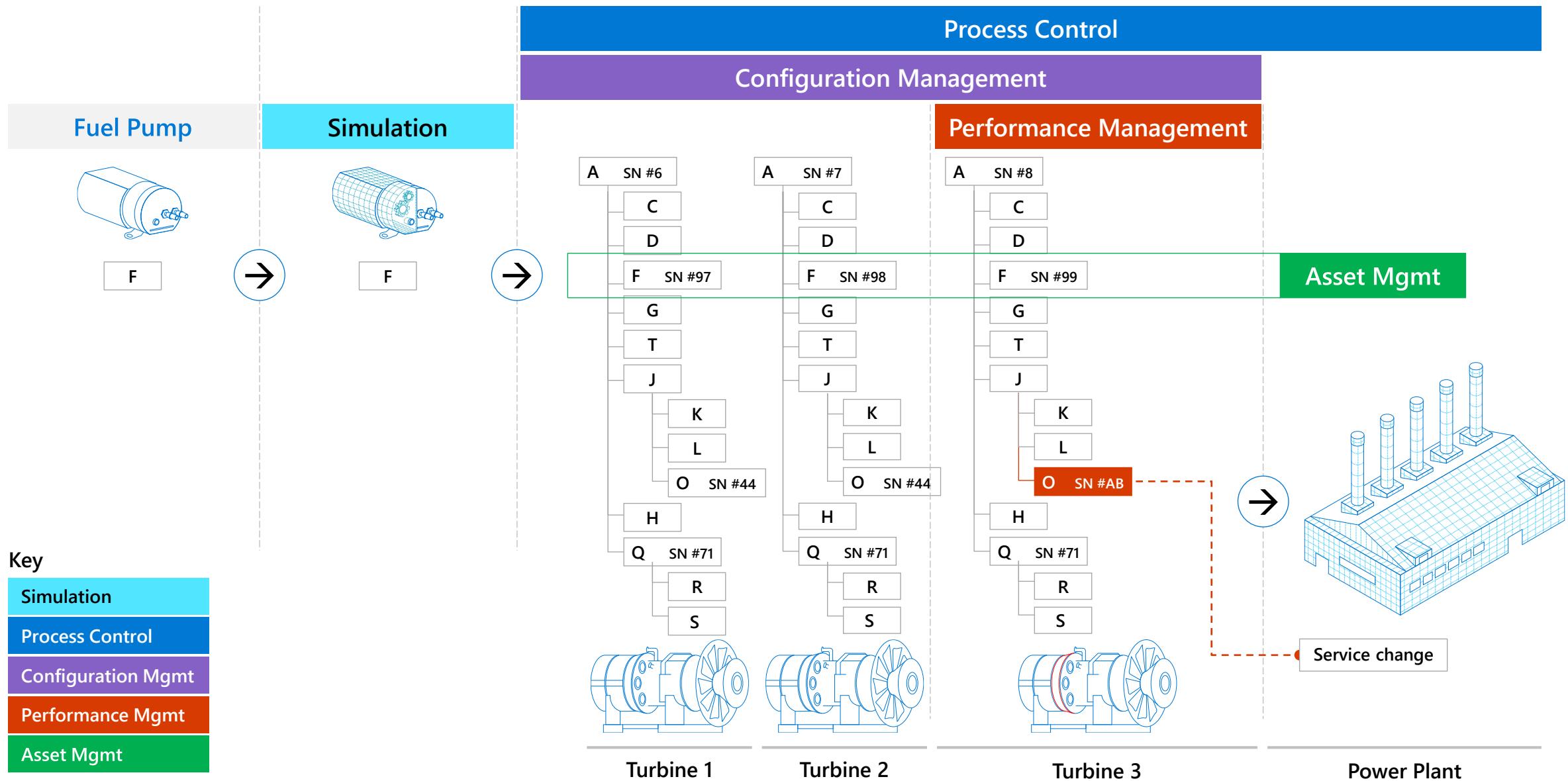
Establishing the Digital Thread



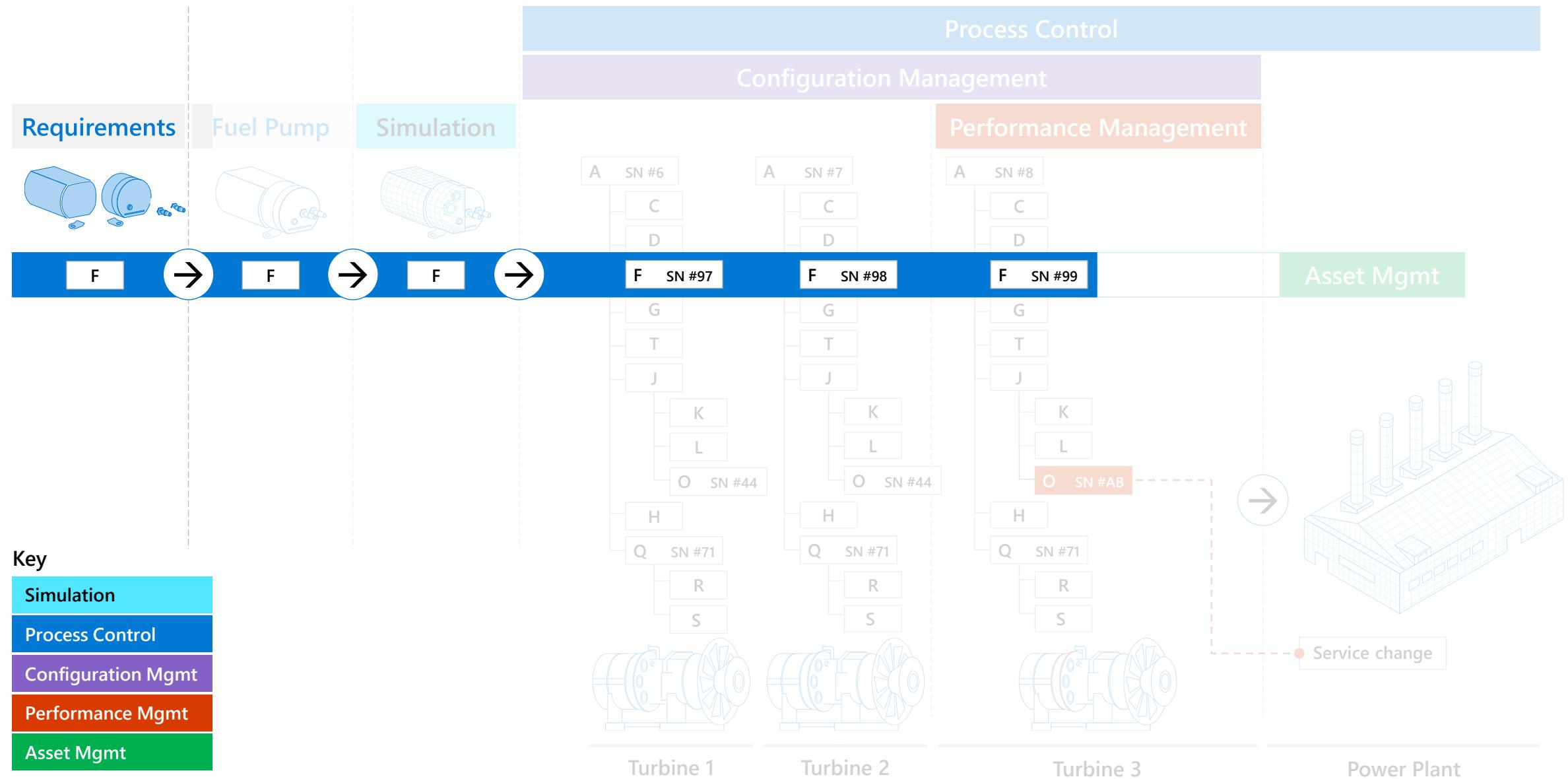
The Digital Thread enables:

- Connection between digital and physical products
- Bi-directional communication
- Orchestration of data flow
- Common source of product truth
- Structured and contextualized role-based data
- Searchable to empower decision making
- Scale to manage data growth
- Driven by technologies such as AR/MR, MES, ERP, SCM, IIoT and IIoT
- Use-case driven workflows

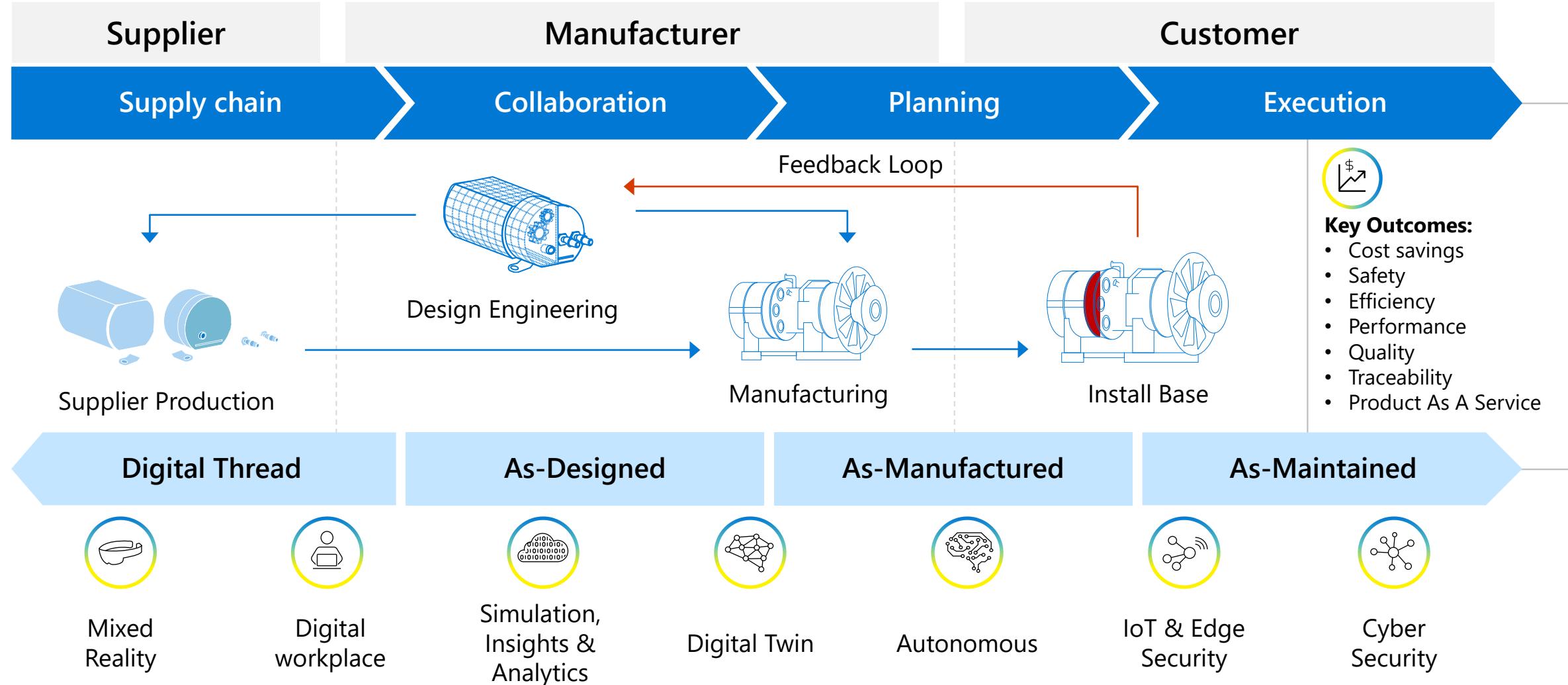
Digital Capabilities Across the Enterprise



Tracing the Digital Thread

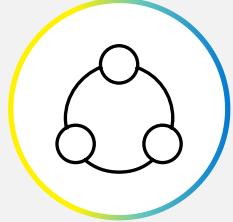


Connected Product Innovation

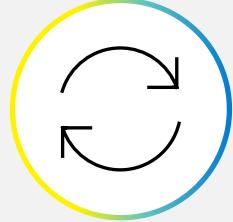


Cloud & Edge | Data & AI | Trust & Security | Sustainability

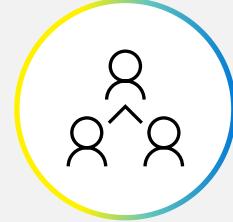
Pervasive throughout the value chain, digital threads enable continuity across functions



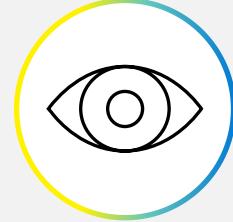
Design with a 360-view of product lifecycle



Synchronize across processes

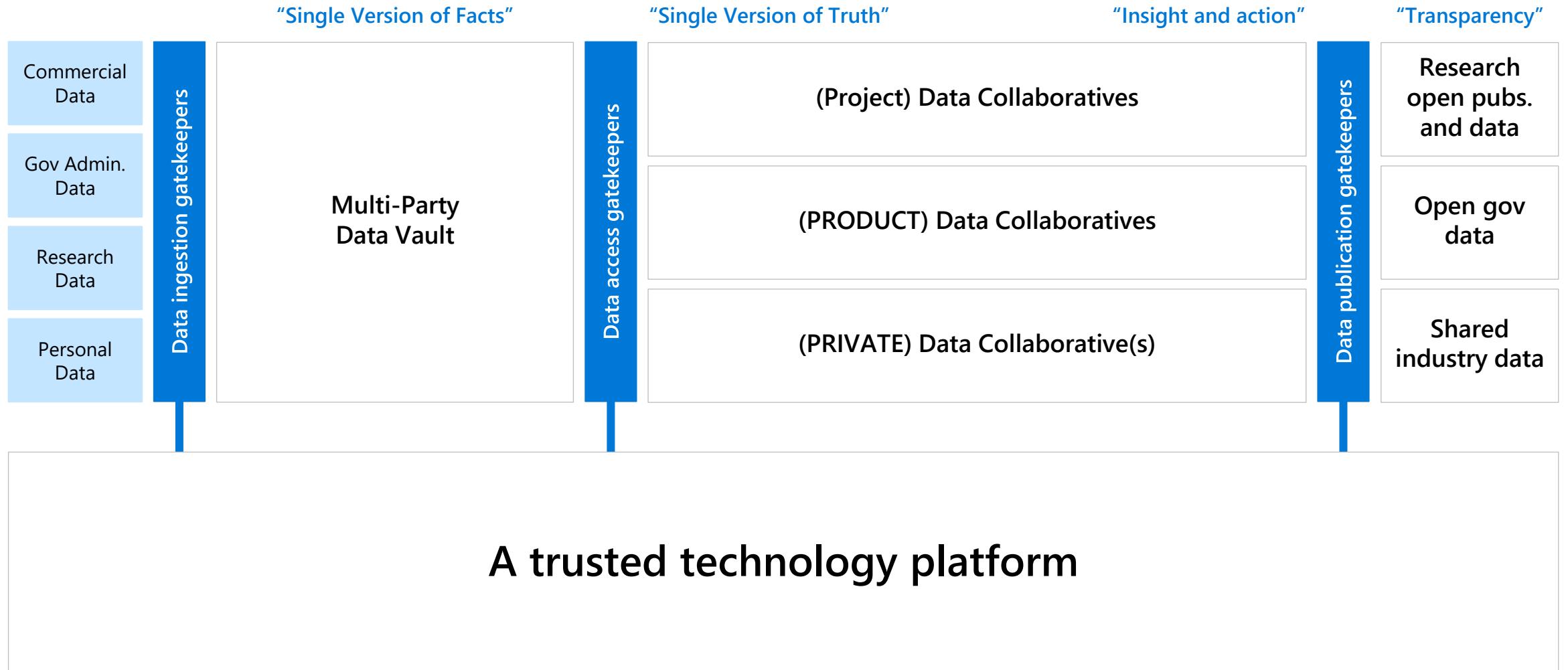


Accessibility across silos



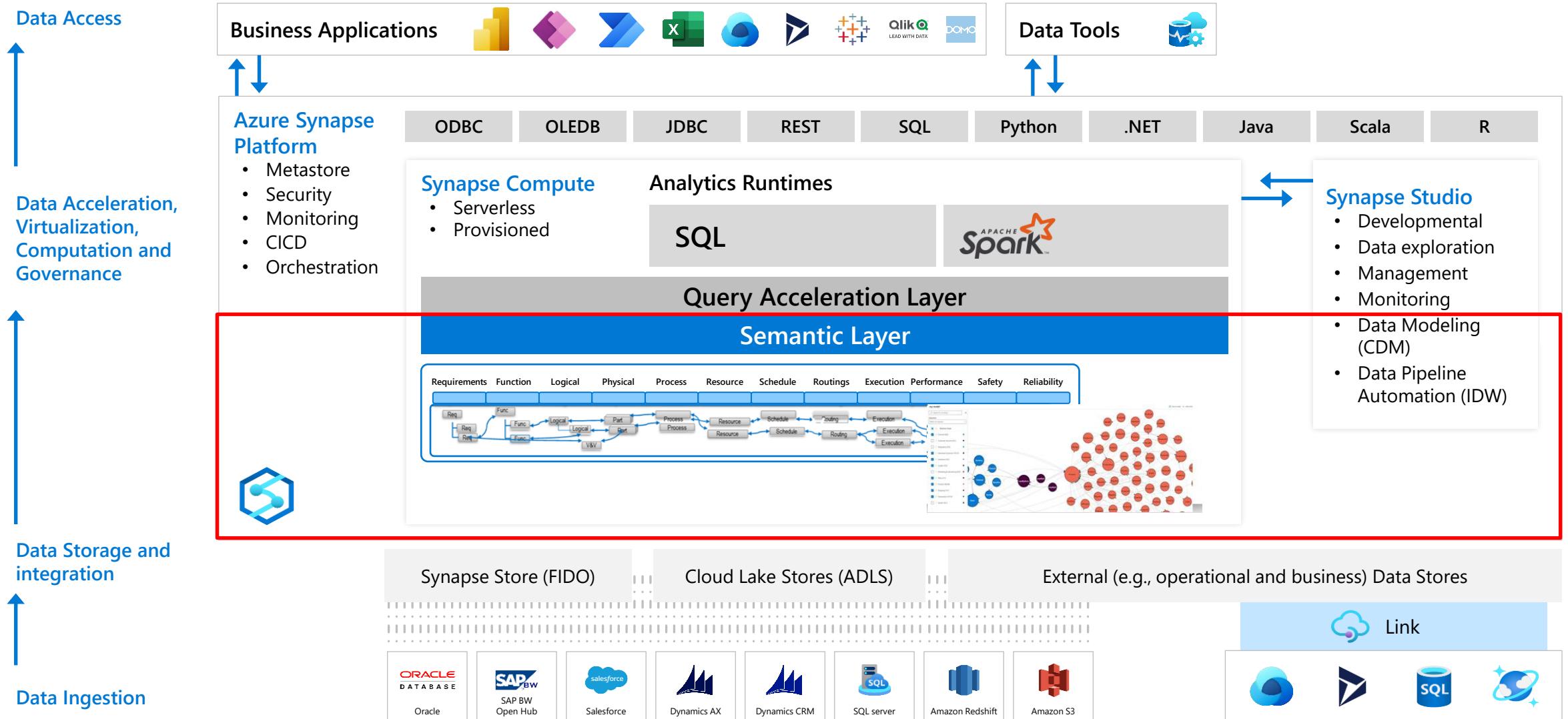
Visibility across the value chain

Trusted Data Platform – Authoritative Data Sets



Trusted Data Platform – Digital Thread

Semantic Data Integration





Digital Thread
Success Stories &
Customer Testimonials



Business model transformation with connected drinks dispensers and integrated engineering, design & digital twins

- Implemented a model-based system integrating PLM & IoT
- Reduced equipment failures by 13%, Improved product quality by 27%, predictive maintenance reduced service costs by 10%
- Integrating PLM & engineering added benefits: 5% in Capex reallocation, 20% increase in remote monitoring and diagnostics resolution, 8% increase in planned interventions





Business transformation to Cloud Printing Services with IoT connected Digital Thread

- Digital Thread strategy key to business transformation
- Azure PaaS services, D365, AI/ML deliver cloud printing infrastructure services to customers
- Able to track data from sensors on printers that influence the entire life-cycle from design, manufacturing, distribution and out to the customer, also with connected field service



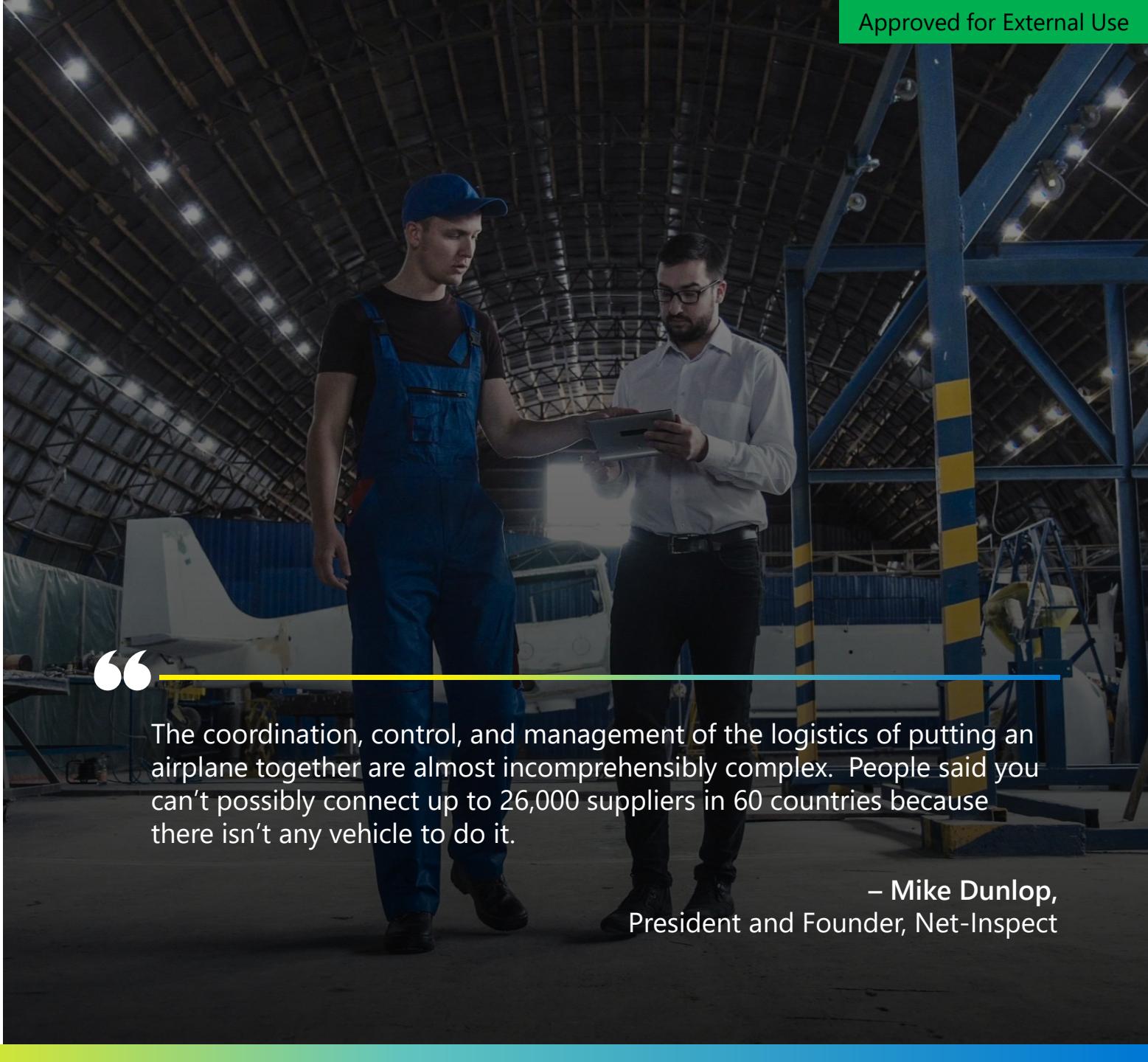
We can track data from our printers that influences the entire product and service lifecycle, through design, manufacturing, distribution, and out to the customer for ongoing support. And when we can use our data to that level, we can deliver a new level of predictable, quality service at price points that are unmatched.

– Brad Clay,
Senior Vice President,
Chief Information and Compliance Officer, Lexmark



Orchestrate data proliferation and synchronization across aircraft assembly supply chain

- Find a platform to connect, coordinate, control and manage distribution of data across a complex global supply chain
- Fast data import, export and processing of large volumes of data to make smarter, faster, more informed business decisions
- Securely move data throughout the supply chain with a single digital thread



“

The coordination, control, and management of the logistics of putting an airplane together are almost incomprehensibly complex. People said you can't possibly connect up to 26,000 suppliers in 60 countries because there isn't any vehicle to do it.

– Mike Dunlop,
President and Founder, Net-Inspect

Our Partners for Digital Thread Capability

Digital Thread





A blurred, high-angle view of a city street with yellow crosswalk stripes, symbolizing fast-paced urban life.

Connected Product Use Case Pack

Digital Twin IPS Capability package

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The **Digital Twin** offers a set of solutions and capabilities to allow manufacturers to use real-time data and other sources to enable learning, reasoning, dynamically recalibrating for improved decision making and planning for the future through simulations.

Use Cases

- A Digital Twin
- B Digital Thread
- » C Connected Products

Connected Products

Unlock customer insights and provide the foundation for newer business models



Proven impact

Up to a 20% improvement in product quality

Up to 40% improvement in product performance

Up to 25% improvement in Technician Productivity¹

Up to 12% savings with Predictive Maintenance²

3 - 10% improvement in Customer Satisfaction



Real benefits

Securely connect your assets in the install base with Edge devices that leverage AI based technology

Understand your customers priorities and usage as well as performance of your assets

Align priorities, features and capabilities to that of your customers

Enable proactive service features to maximize asset availability and uptime



Connected Product
Success Stories &
Customer Testimonials



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Buhler

- Just one grain infected with a highly carcinogenic mold called aflatoxin can be all it takes to poison the whole harvest and sicken or even kill people and animals, not to mention the waste of having to throw out the lot when contamination isn't found in time
- Buhler has built LumoVision, a data-driven optical sorter that's connected to the cloud for data analysis and uses powerful new cameras and ultraviolet lighting to hunt for hidden infections
- LumoVision's real-time identification and elimination keeps toxins from spreading and infecting even more kernels
- Reduces the amount of healthy grain that gets wasted in the process to less than 5%, down from as much as 25% with existing machines!



“

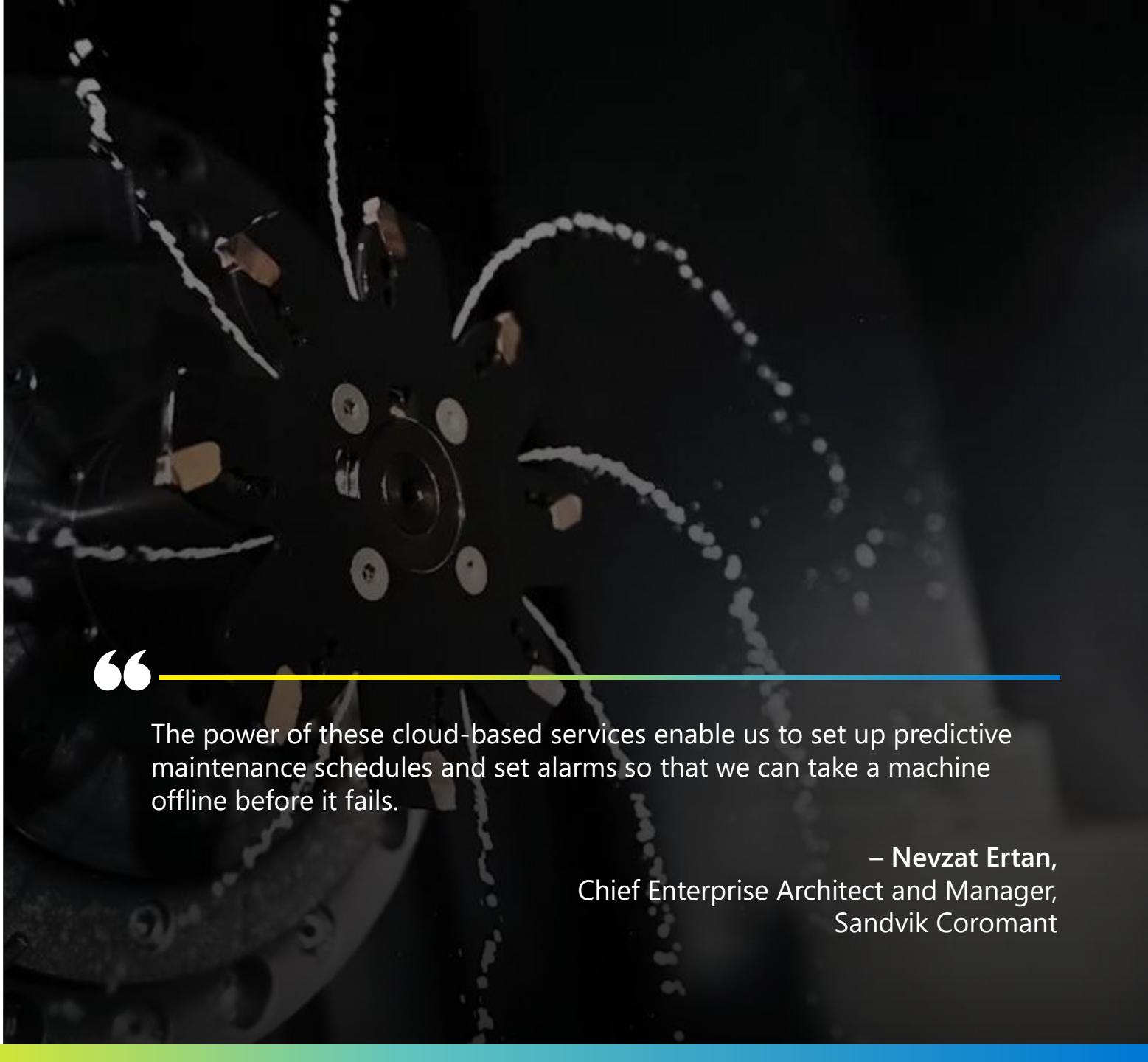
We're not only going to get economic results, but hopefully we can transform and save lives at the same time.

– Ben Deefholts,
Bühler's senior research engineer for digital technologies



Sandvik

- Employees have in-depth knowledge of machining and tooling processes
- The company wanted to capture this know-how digitally and apply machine learning to optimize production processes and improve decision-making
- Sandvik Coromant deployed a predictive analytics solution based on Microsoft technologies that integrates people, machines, tools, materials, orders, storage handling, and scheduling
- The solution includes Azure IoT Hub, Azure IoT solution accelerators, Cortana Intelligence Suite, and Microsoft Dynamics 365 Field Service
- With the Microsoft solution, Sandvik Coromant management can make productive, profitable decisions based on objective, integrated production data
- The solution optimizes processes and provides predictive analytics that help avoid machine downtime

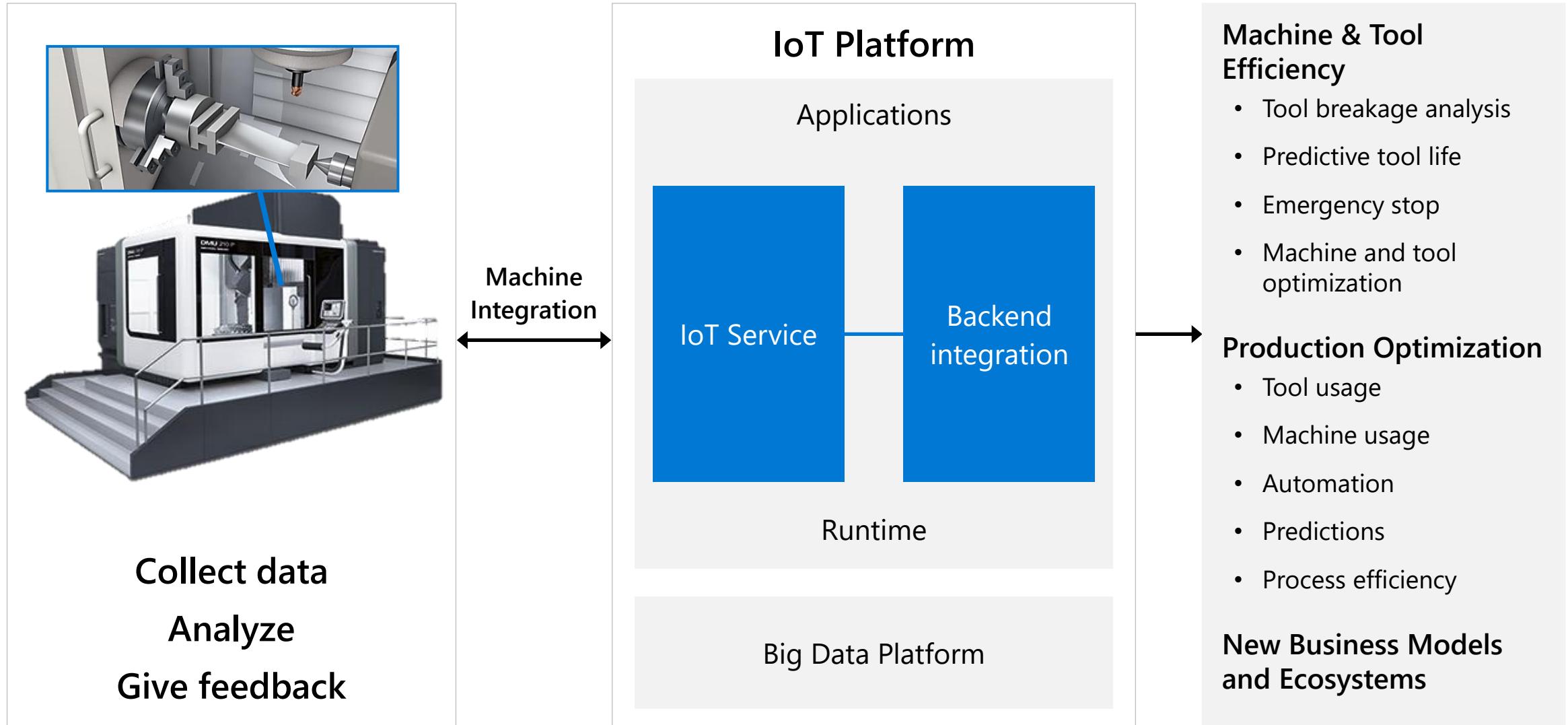


“

The power of these cloud-based services enable us to set up predictive maintenance schedules and set alarms so that we can take a machine offline before it fails.

– Nevzat Ertan,
Chief Enterprise Architect and Manager,
Sandvik Coromant

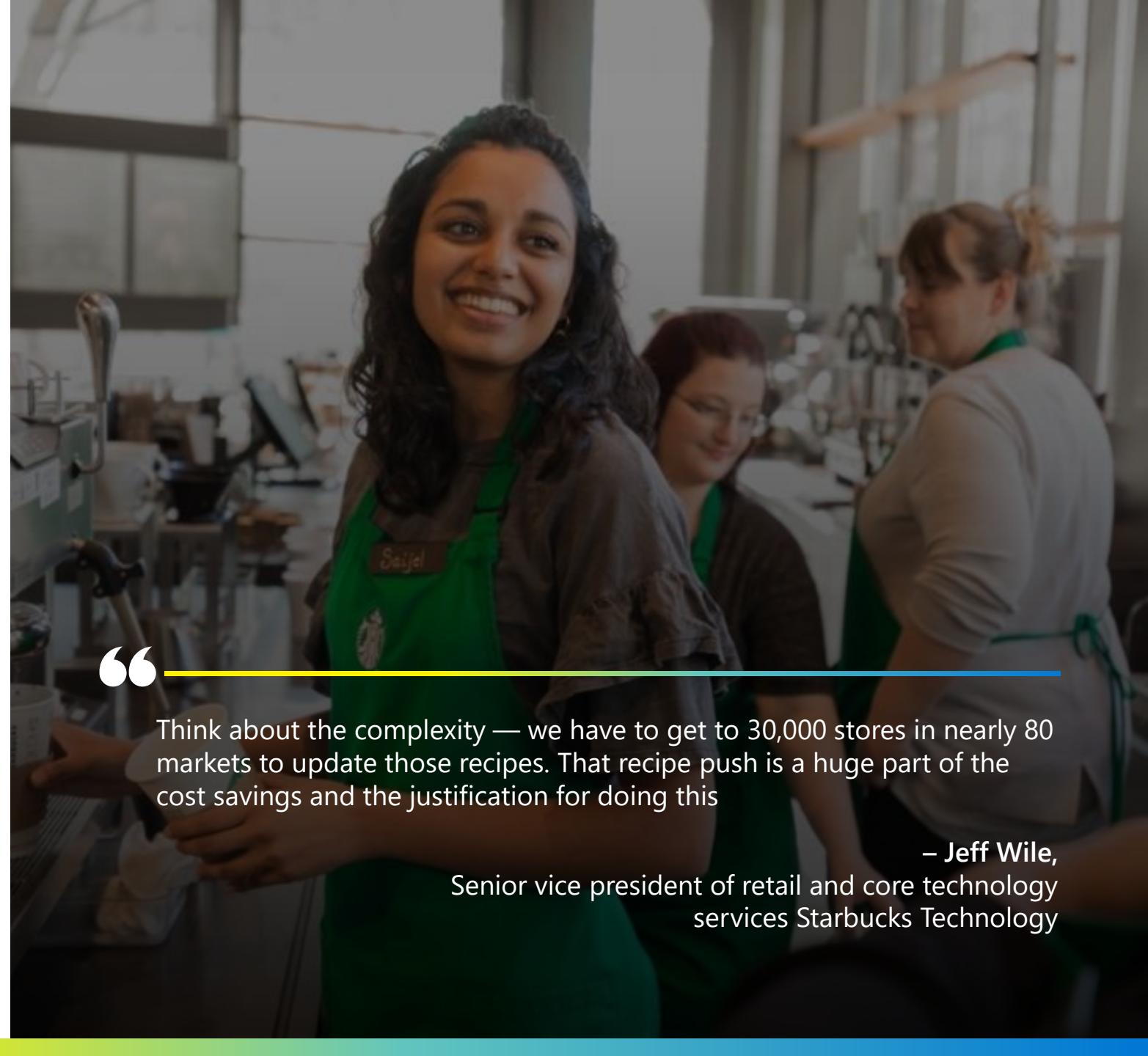
Sandvik Coromant: Cloud-based IIoT platform





Starbucks

- Each Starbucks store has more than a dozen pieces of equipment, from coffee machines to grinders and blenders, that must be operational around 16 hours a day
- A glitch in any of those devices can mean interference with the goal of providing high-quality customer experience and service calls that rack up repair costs
- To reduce disruptions to that experience and securely connect its devices in the cloud, Starbucks is partnering with Microsoft to deploy Azure Sphere, designed to secure the coming wave of connected internet of things (IoT) devices across its store equipment
- The solution will enable Starbucks to send new coffee recipes directly to machines, which it has previously done by manually delivering the recipes to stores via thumb drive multiple times a year
- Now the recipes can be delivered securely from the cloud to Azure Sphere-enabled devices at the click of a button



“

Think about the complexity — we have to get to 30,000 stores in nearly 80 markets to update those recipes. That recipe push is a huge part of the cost savings and the justification for doing this

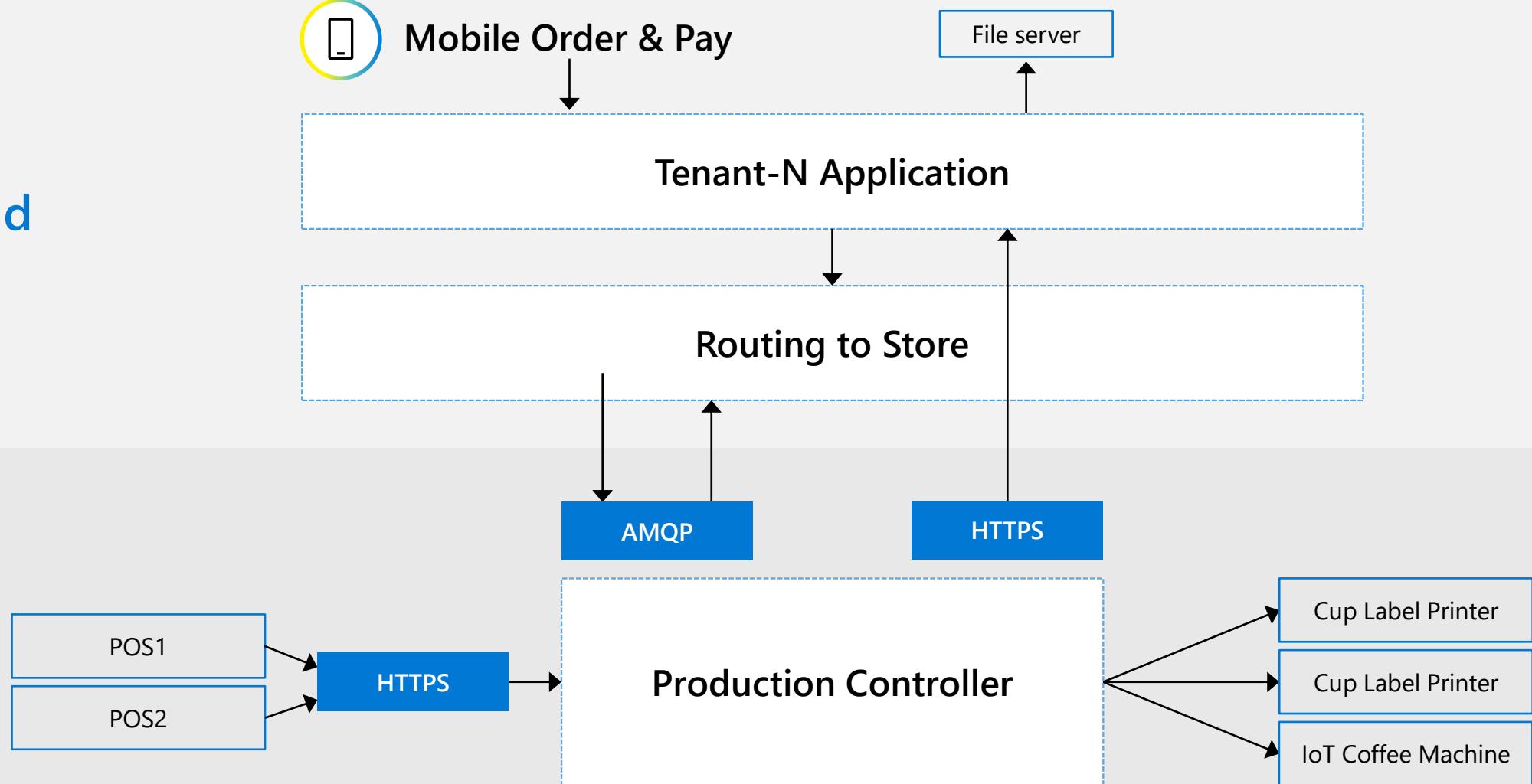
– Jeff Wile,
Senior vice president of retail and core technology services Starbucks Technology

Starbucks



Azure Cloud

Store





Eaton

- Eaton wanted to maintain its role as an industry technology leader and develop a set of internal platforms to support development of innovative products like its smart energy management circuit breaker (EMCB)
- Eaton has built multiple company-wide platforms on Microsoft Azure
- The company is also looking into using Azure IoT Central as a platform for building apps that work with its connected solutions
- The company has saved more than 1 million hours of engineering time by building applications on top of Azure and its internal platforms
- Eaton has accelerated its entire DevOps lifecycle to simplify the delivery of feature enhancements, making the whole business more agile



“

We've seen Microsoft make the cloud a core part of the company's fabric, and we trust that it will continue to lead the field in terms of cloud investment and scale.

– Michael Regelski,
Senior Vice President and Chief Technology Officer
Electrical Sector, Eaton

Sustainability with Connected Products



The journey to an intelligent packaging platform



Codified package



Connected package



Intelligent package



Before purchase

- Product Information
- Product engagement



After purchase

- Product Information
- Product engagement



After consumption

- Product Information
- Re-order
- Disposal

Results for dairy producer customer

Up to **16%**
Increase in
sales

17k
Number of
users



Rolls-Royce®

Rolls-Royce

Connected → Contextually aware →
Comprehending

- Rolls-Royce need to connect jet engine data to Microsoft's intelligent cloud for insights to improve aircraft performance, safety and maintenance
- Rolls-Royce used a Microsoft solution to scale quickly and efficiently, aggregate data across customer fleets and process data in real time
- The solution created more efficient flight and maintenance plans, gained targeted and actionable fuel efficiency insights, and generated reports and dashboards to tell compelling stories and deliver high-quality insights

“

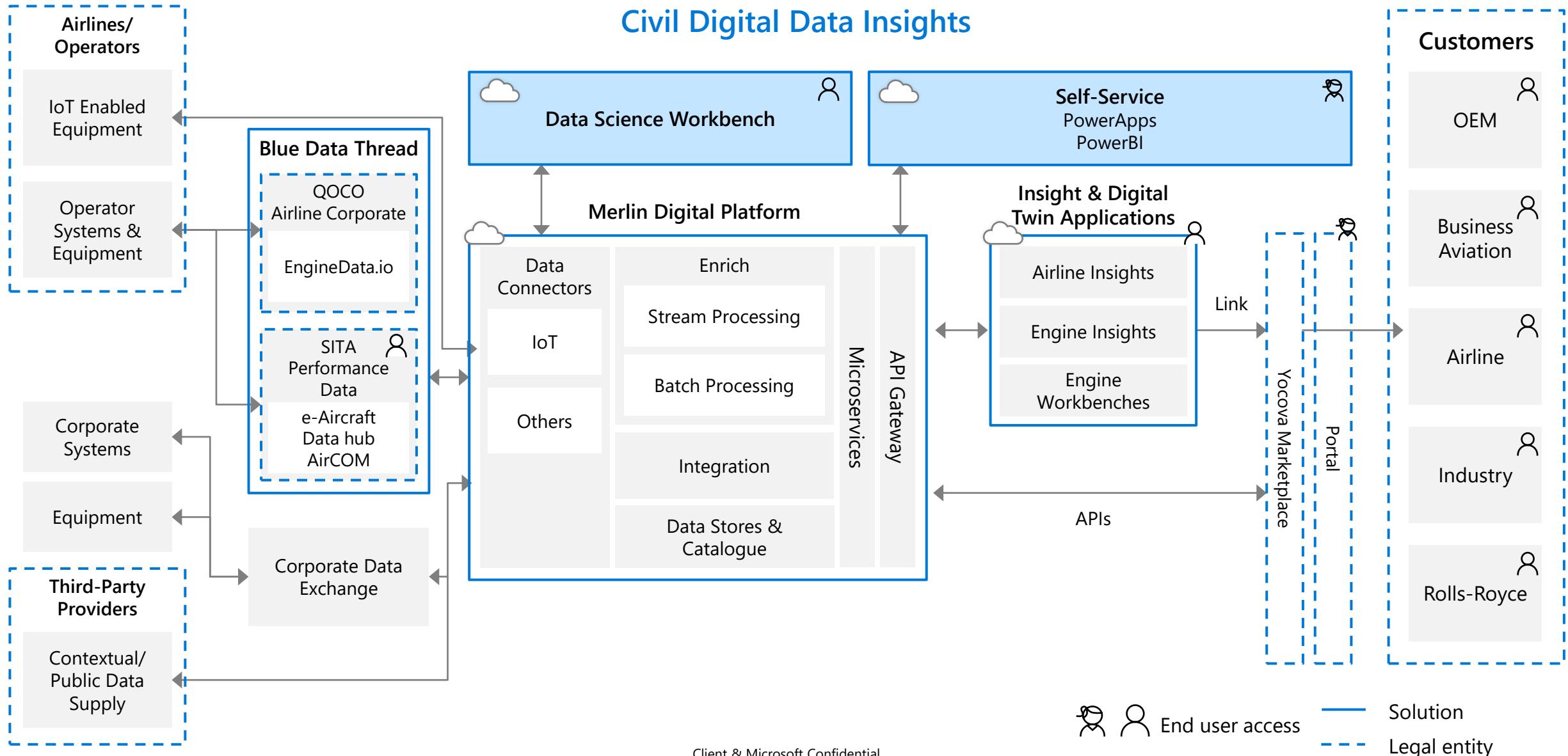
Our goal is not data for the sake of data, but to embrace the cloud and analytical technologies to deliver more expert insights to the right stakeholders at the right time.

– Nick Farrant,
Senior Vice President, Rolls-Royce

Rolls-Royce Merlin Architecture



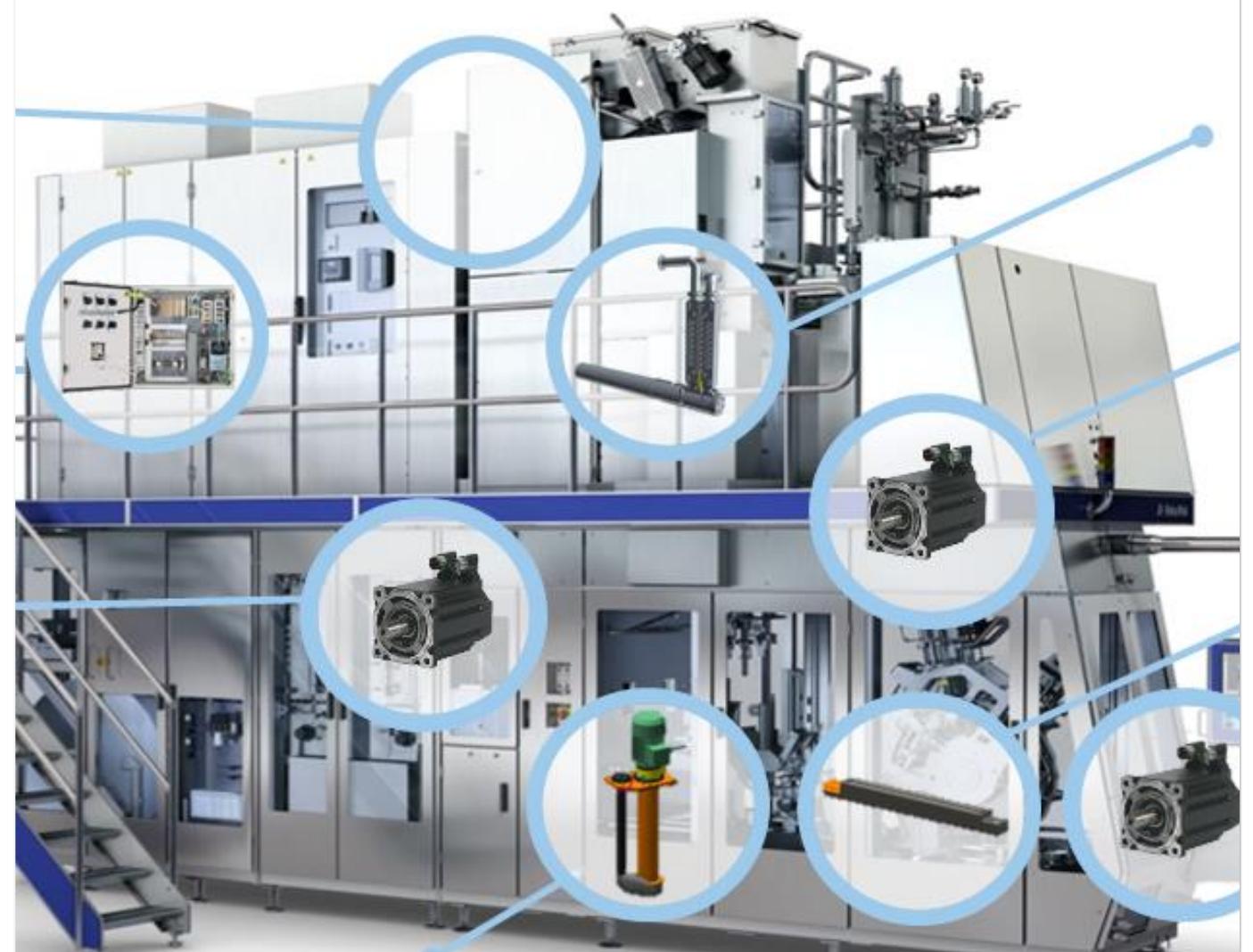
Civil Digital Data Insights



Condition Monitoring

Predictive Maintenance

Package as a Service



Our Partners for Connected Products

Connected Products



SIEMENS



Honeywell

McKinsey
& Company



ABB



HCL

accenture



RA Rockwell
Automation

MICROLAND®



AVEVA



cognizant



ROLD
connected to innovation

SIGHT
MACHINE
Powering Digital Manufacturing

A blurred, high-angle view of a city street at night. The street is marked with yellow crosswalk stripes. Numerous people are walking across the street, their figures blurred due to motion, creating a sense of constant activity and movement. The overall atmosphere is dynamic and urban.

Business Value Model

Lighthouses have seen significant impact across Digital Twin use cases

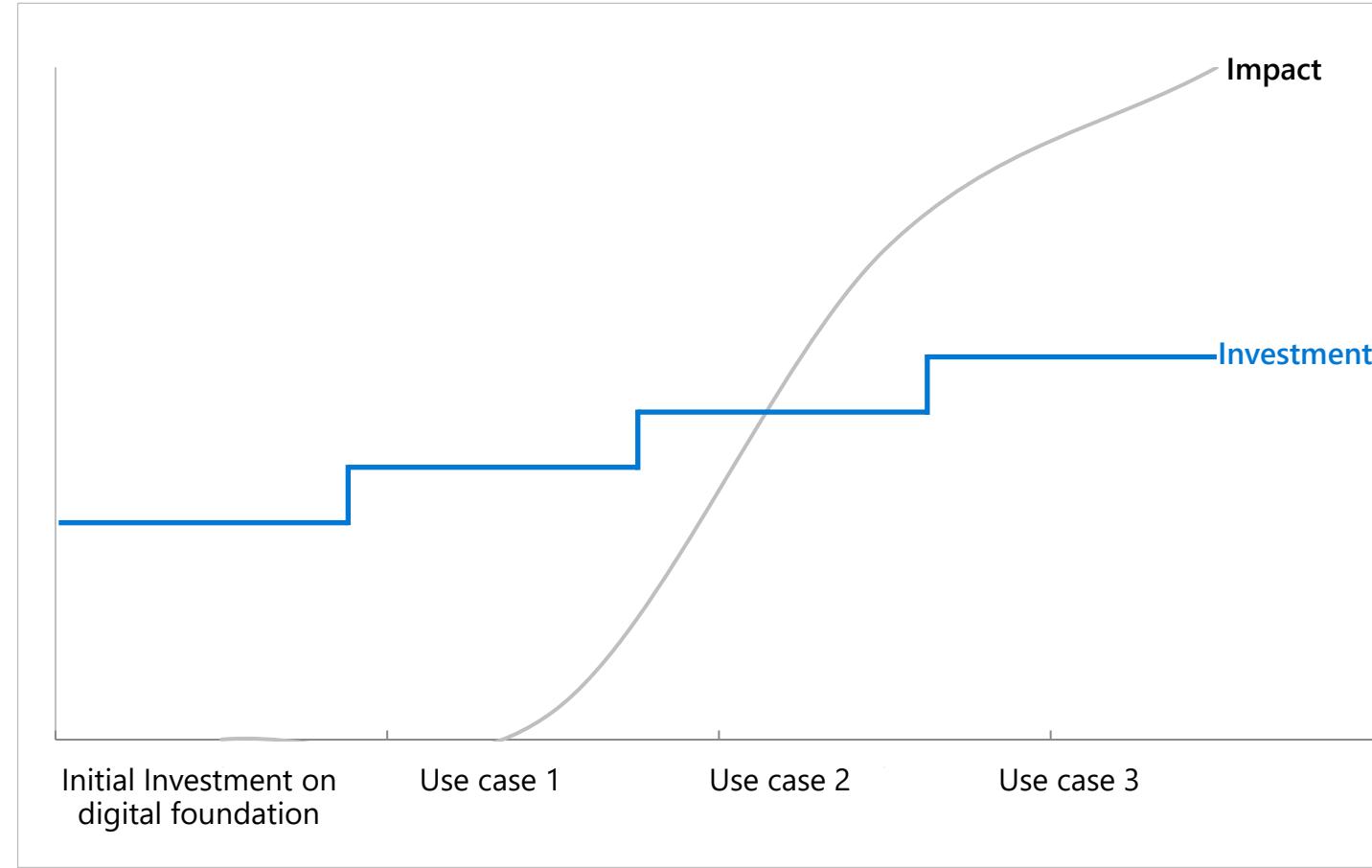
Company	Application	KPIs	Impact
 gsk	Digital twin planning	Capacity	↑ 13%
 Haier	3D digital twin for product development and testing	New product development time	↓ -30%
 Henkel	Digital twin of sustainability	Energy	↓ -38%
 HITACHI	Digital twin to simulate customer systems	Inspection efficiency	↑ 70%
 MODEC	Process plant digital twin	Downtime in first year of operation	↓ -65%
 MAXUS	Digital twin in production	Preparation lead time	↓ -35%

Lighthouses have seen significant impact across Digital Twin use cases

Company	Application	KPIs	Impact
	Digital twin for flexible production planning	Speed to Market	 900%
	3D digital twin for product design and testing	Product development time	 70%
	Digital twin for production optimization	Light catalytic gas oil yield	 30%
	Digital twin of sustainability	Annual tons CO ₂	 3%

At scale, the Product Twins IPS Theme maximizes impact and minimizes investment by building one system to enable multiple use cases

Illustrative view of IPS Theme Impact & Investment over time



Key takeaways

Investments are needed upfront to enable IPS Theme and impact will come after first phase of investment .

<...>

Initial investment enables digital foundation for faster deployment of additional use cases

- IPS Theme **minimizes investment** by building **one system** to enable multiple use cases.

Key requirements to scale

- ...
-

Potential risks that will lessen impact or increase investment.

- ...
- ...

TEMPLATE business case – Illustrative customer example

Example customer with \$5BN in annual revenue, \$M.

	Area of impact	Impact range, %	Total cost or rev ²	Initial cost or rev addressed 20% of total	Initial impact ³			At scale cost or rev addressed 40% of total	At scale impact ³ Year 5
					Year 1	Year 2	Year 3		
BENEFITS									
Factory output increase	4 – 6% ¹	5,000	1,000	-	-	20 ⁴	2,000	40 ⁴	
Inventory reduction	5 – 15	1,350	270	16	24	27	540	54	
Raw material cost reduction	3 – 5	2,025	405	-	16	16	810	32	
Overtime reduction	15 – 25	270	54	11	11	11	108	22	
Indirect labor reduction	2 – 4	68	14	-	5	5	27	8	
Total recurring impact				(11)	(32)	(51)		(102)	
INVESTMENTS									
Investment required	Range of costs	Total # of suppliers ²	Initial # of suppliers 20% of total	Initial investment ⁶			At scale # of suppliers 40% of total	At scale investment ⁶ \$M	
Recurring Solutions cost per supplier ⁵	0.3 – 0.35	100	20	(2)	(4)	(6)	40	(13)	
One-time investment (e.g., consulting & implementation services)	10 – 15	N/A	N/A	5	9	15	N/A	15	

■ One-time impact or investment (shown as cumulative)

Source: Expert interviews; World Economic Forum; impact ranges have been adjusted to center on median of WEF ranges

4. EBITDA impact shown for factory output increase; assuming 40% margin

5. Includes full range of recurring costs needed to support Solutions, including software, incremental FTEs, and 3rd party licensing support costs

6. Calculated as (average of costs) * (# of lines); initial investment, both recurring & one-time, is phased 30%, 30%, 40% for Year 1 – 3

1. WEF provides benchmark range of 12-200% for the output increase; assumed 4-6% sales increase

2. Assumed – based off of hypothetical customer example

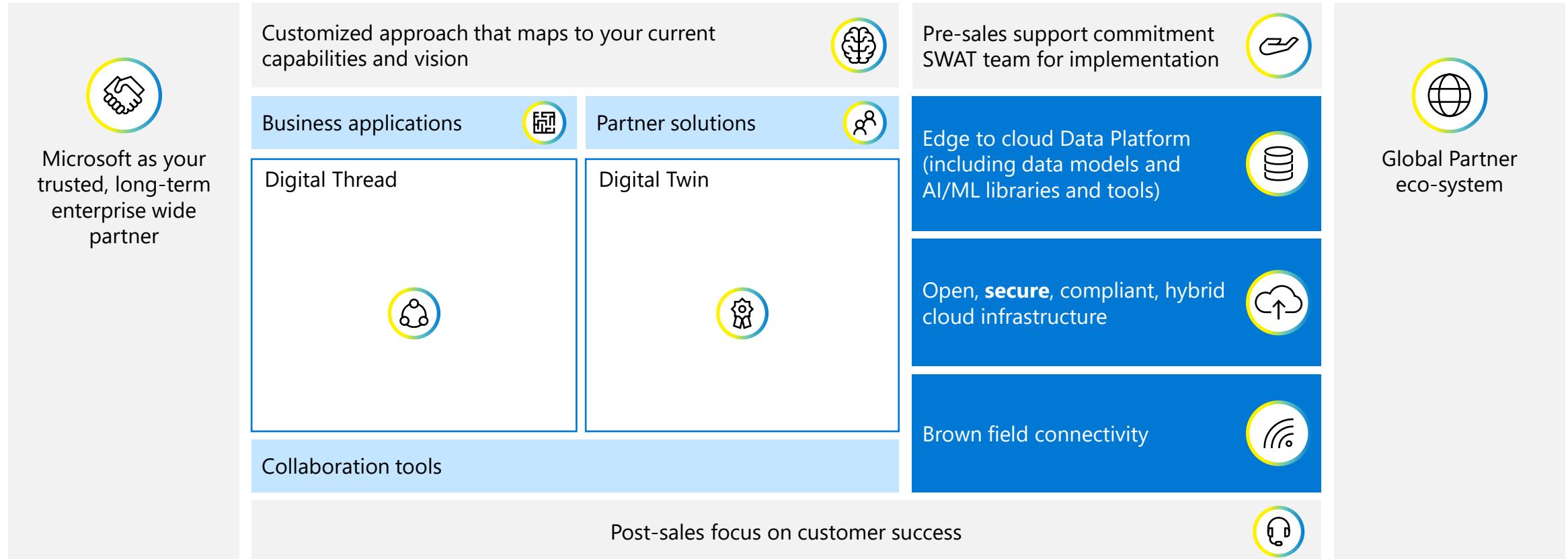
3. Calculated as (average of impact range) * (initial or at scale cost/rev addressed)



Why Microsoft?

Why Microsoft? We will be your trusted partner along the end-to-end journey

We have a comprehensive technology stack, our SWAT teams will help you implement and unlock value quickly
Our robust ecosystem of partners will help deploy ready solutions and our CS team will focus on your success.



Our commitment to you



SECURITY – We'll help you keep your data secure



PRIVACY and CONTROL – Your data is private and under your control



TRANSPARENCY – You know what we are doing with your data



COMPLIANCE – We manage your data in accordance with the law



RELIABILITY – We provide enterprise grade uptime for cloud services



Building a trusted, responsible, inclusive cloud

AccountGuard | Cloud for Global Good | The Future Computed | Microsoft AI Principles | AI for Earth | Cybersecurity Tech Accord

Partners for the Digital Twin IPS Capability

For third party solutions, Microsoft plays a central, coordinating role between partner & client teams, holding responsibility for customer outcomes

Digital Twin



SIEMENS

Ansys



►Simio



HEXAGON

aspentech



Rockwell
Automation

AVEVA

Infosys

Capgemini

SIGMA

HCL

accenture

EY

S

Digital Thread



Infosys

SIEMENS

HCL

accenture

Capgemini

IDEAL GRP
an atos company

iSiD

EY

Microsoft offers both 1P and 3P Connected Product use case solutions to address varying needs across business operations

For third party solutions, Microsoft plays a central, coordinating role between partner & client teams, holding responsibility for customer outcomes

	Spotlighted solution providers	Solutions / offerings
Connected Products	 ptc	Smart Connected Products/ThingWorx for Azure
	 iconics	IoTWorX by ICONICS
	 MICROLAND®	Remote Monitoring Solution
Product as a Service	 Microsoft	Azure IoT Central
	 McKinsey & Company	Advisory services
Product as a Service	 accenture	Digital Manufacturing
	 Microsoft	M365, D365, Azure

Our partners for the Connected Products

Connected Products

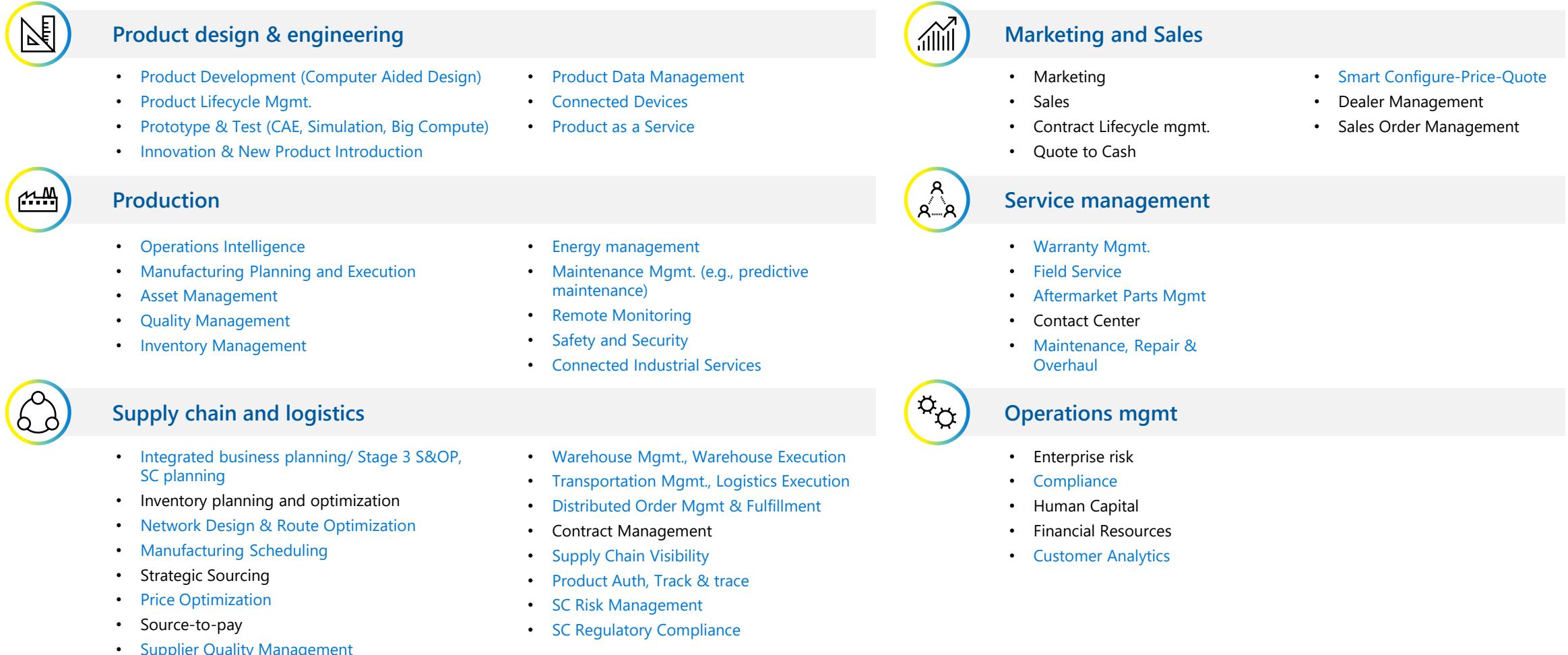
				
		McKinsey & Company		
				
 Make the Invisible Visible™		MICROLAND®		
				



Process Map

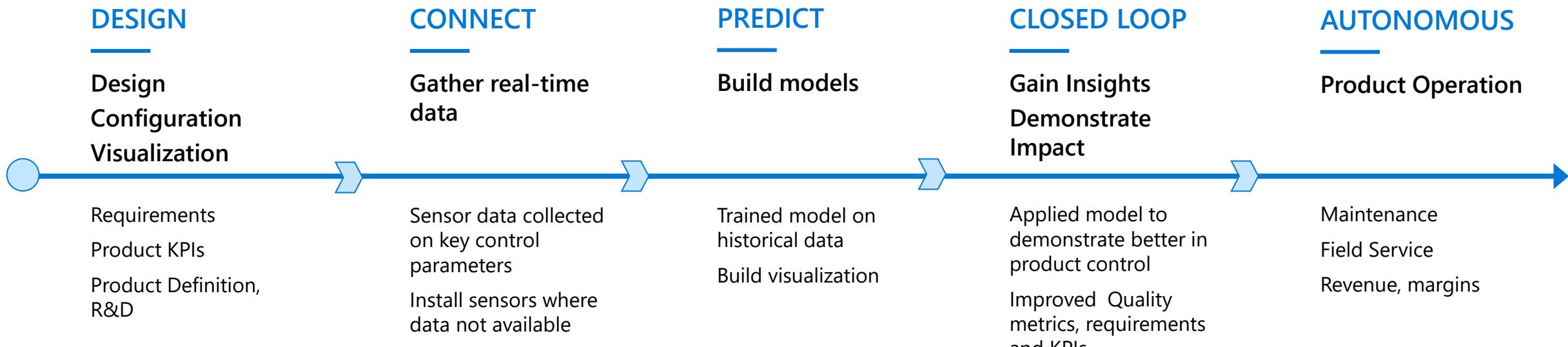
Digital Twin and Digital Thread IPS Theme focuses on Digital Twin and Digital Thread use cases within the overall manufacturing process

Overall Manufacturing Process Map

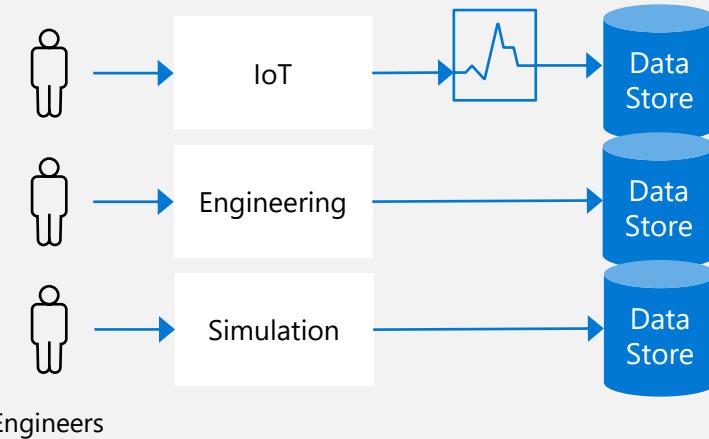


*Within Digital Twins IPS Theme

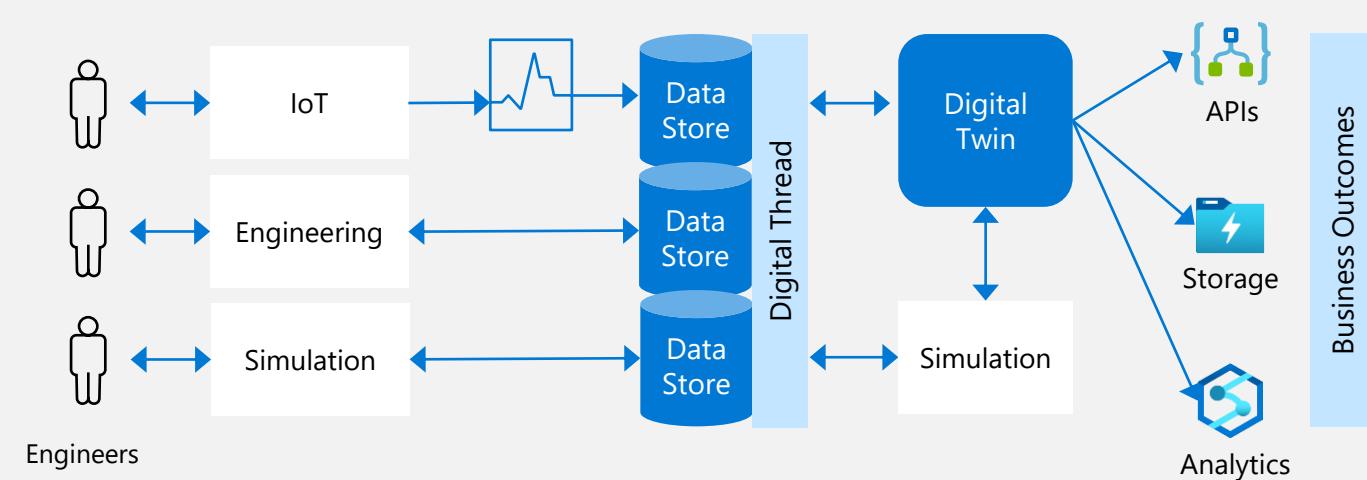
Digital Twin – Process Map: Digital Twin Powered by Digital Thread



DISCONNECTED PROCESSES & SILOS



DIGITAL TWIN POWERED BY DIGITAL THREAD



Connected Products Theme transforms several manufacturing process

Overall Manufacturing Process Map



Product design & engineering

- Product Development (Computer Aided Design)
- [Product Lifecycle Mgmt.](#)
- Prototype & Test (CAE, Simulation, Big Compute)
- [Innovation & New Product Introduction](#)
- [Product Data Management](#)
- [Connected Devices](#)
- [Product as a Service](#)



Marketing and Sales

- [Marketing](#)
- [Sales](#)
- Contract Lifecycle mgmt.
- [Quote to Cash](#)
- Smart Configure-Price-Quote
- Dealer Management
- Sales Order Management



Production

- Operations Intelligence
- Manufacturing Planning and Execution
- [Asset Management](#)
- Quality Management
- [Inventory Management](#)
- [Energy management](#)
- Maintenance Mgmt. (e.g., predictive maintenance)
- [Remote Monitoring](#)
- Safety and Security
- [Connected Industrial Services](#)



Service management

- [Warranty Mgmt.](#)
- [Field Service](#)
- Aftermarket Parts Mgmt
- [Contact Center](#)
- Maintenance, Repair & Overhaul



Supply chain and logistics

- Integrated business planning/ Stage 3 S&OP, SC planning
- Inventory planning and optimization
- Network Design & Route Optimization
- Manufacturing Scheduling
- Strategic Sourcing
- Price Optimization
- Source-to-pay
- Supplier Quality Management
- Warehouse Mgmt., Warehouse Execution
- Transportation Mgmt., Logistics Execution
- Distributed Order Mgmt & Fulfillment
- Contract Management
- Supply Chain Visibility
- Product Auth, Track & trace
- SC Risk Management
- SC Regulatory Compliance



Operations Mgmt

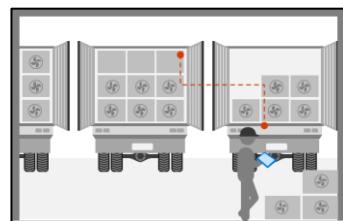
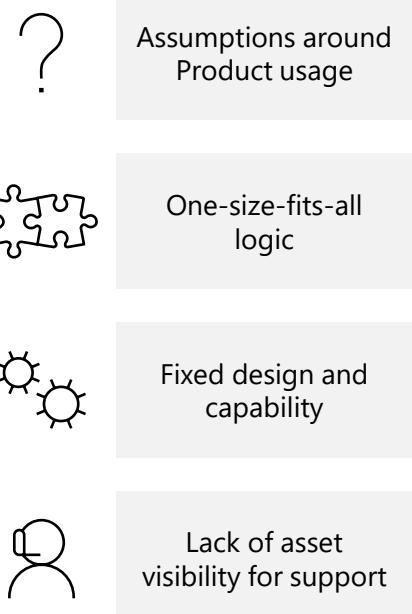
- Enterprise risk
- Compliance
- Human Capital
- Financial Resources
- [Customer Analytics](#)

*Within Connected Products and Product as a Service Capabilities

Connected Products – Process Map

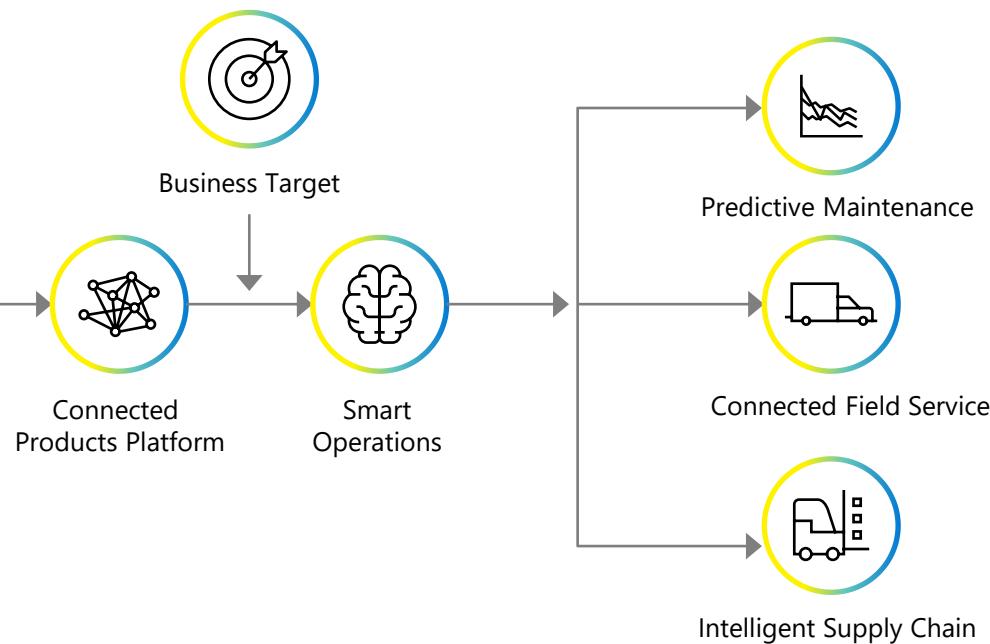
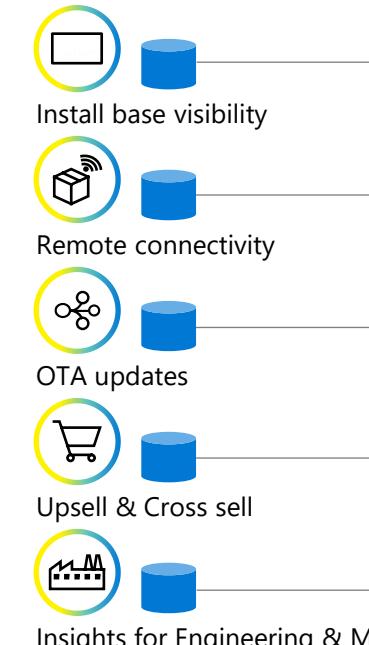


TRADITIONAL PRODUCT DEVELOPMENT

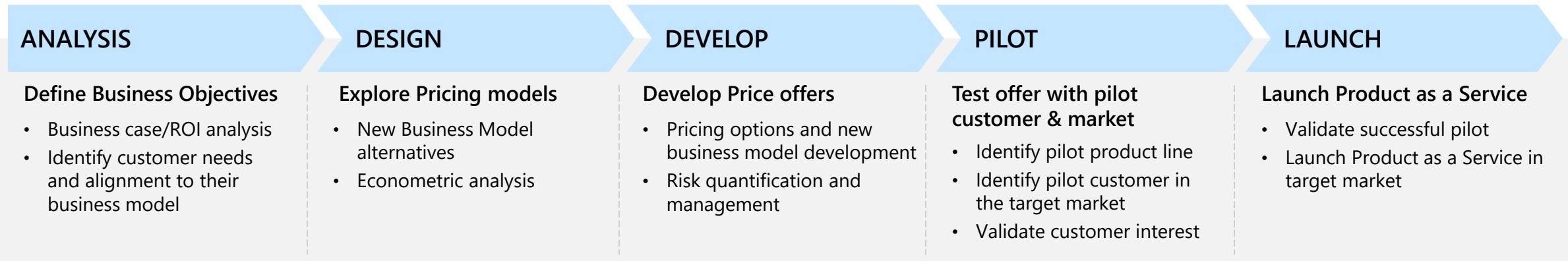


- Lack of visibility into asset usage
- Lack of visibility into customer sentiment
- Difficult to diagnose remotely
- Capability upgrades require new equipment

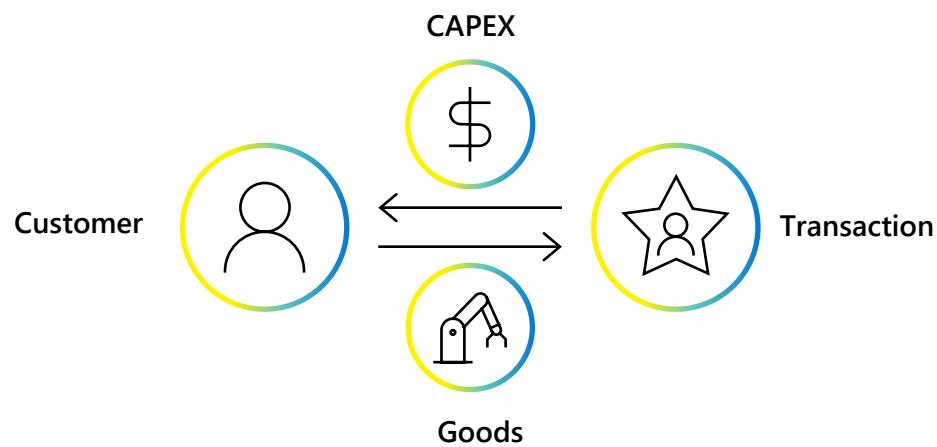
CONNECTED PRODUCT DEVELOPMENT & OPERATIONS



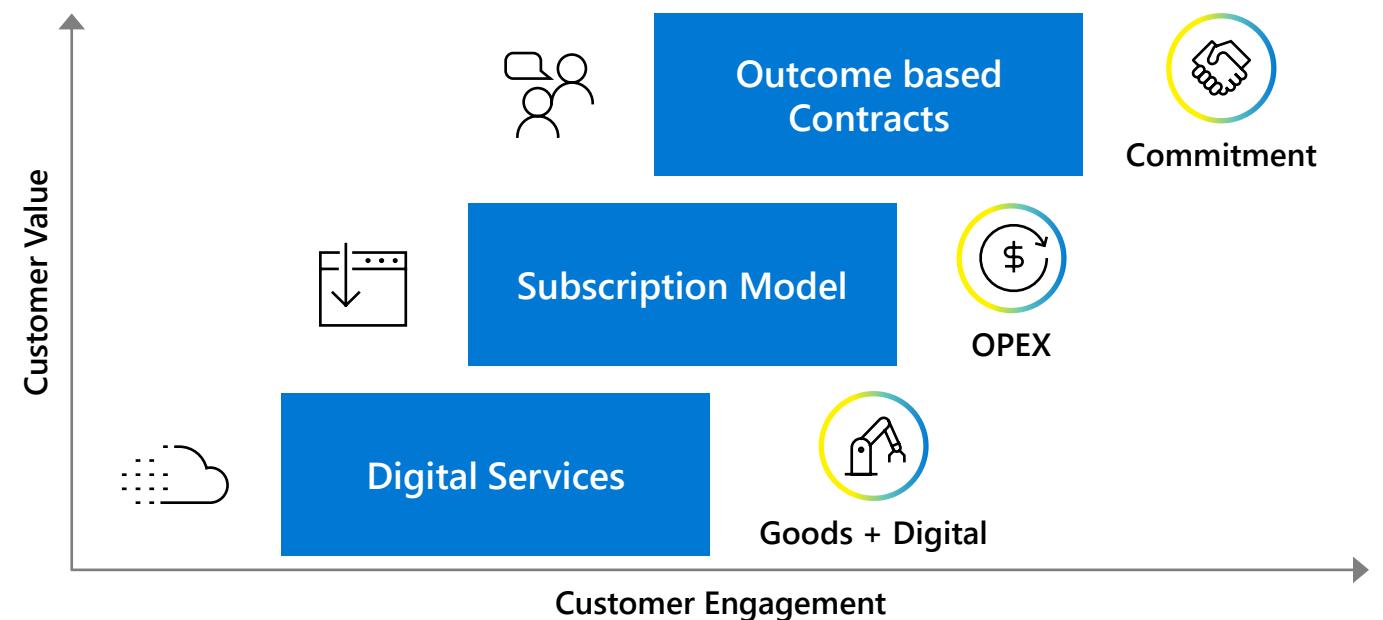
Product as a Service – Process Map



TRADITIONAL PRODUCT SALES



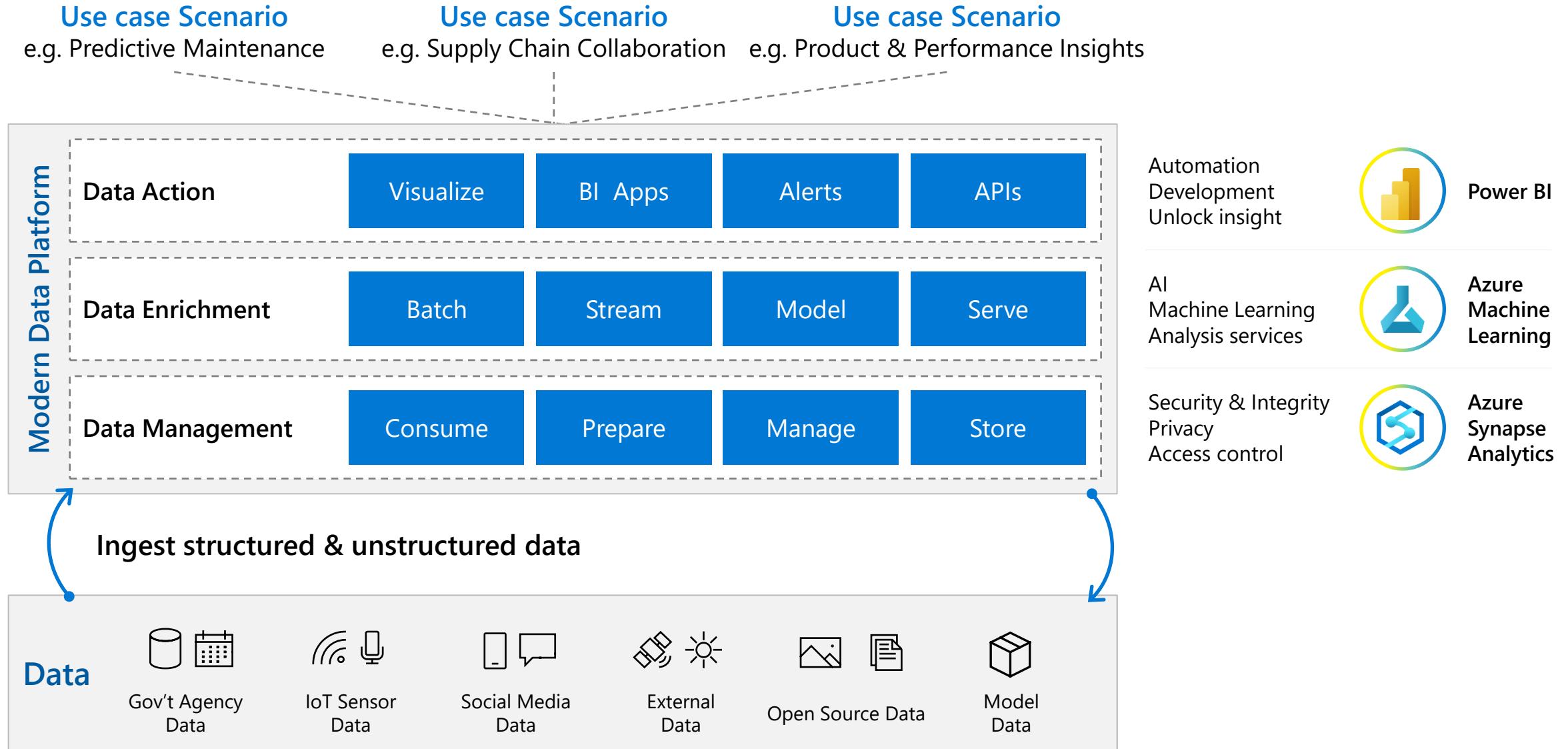
OFFERING PRODUCT AS A SERVICE



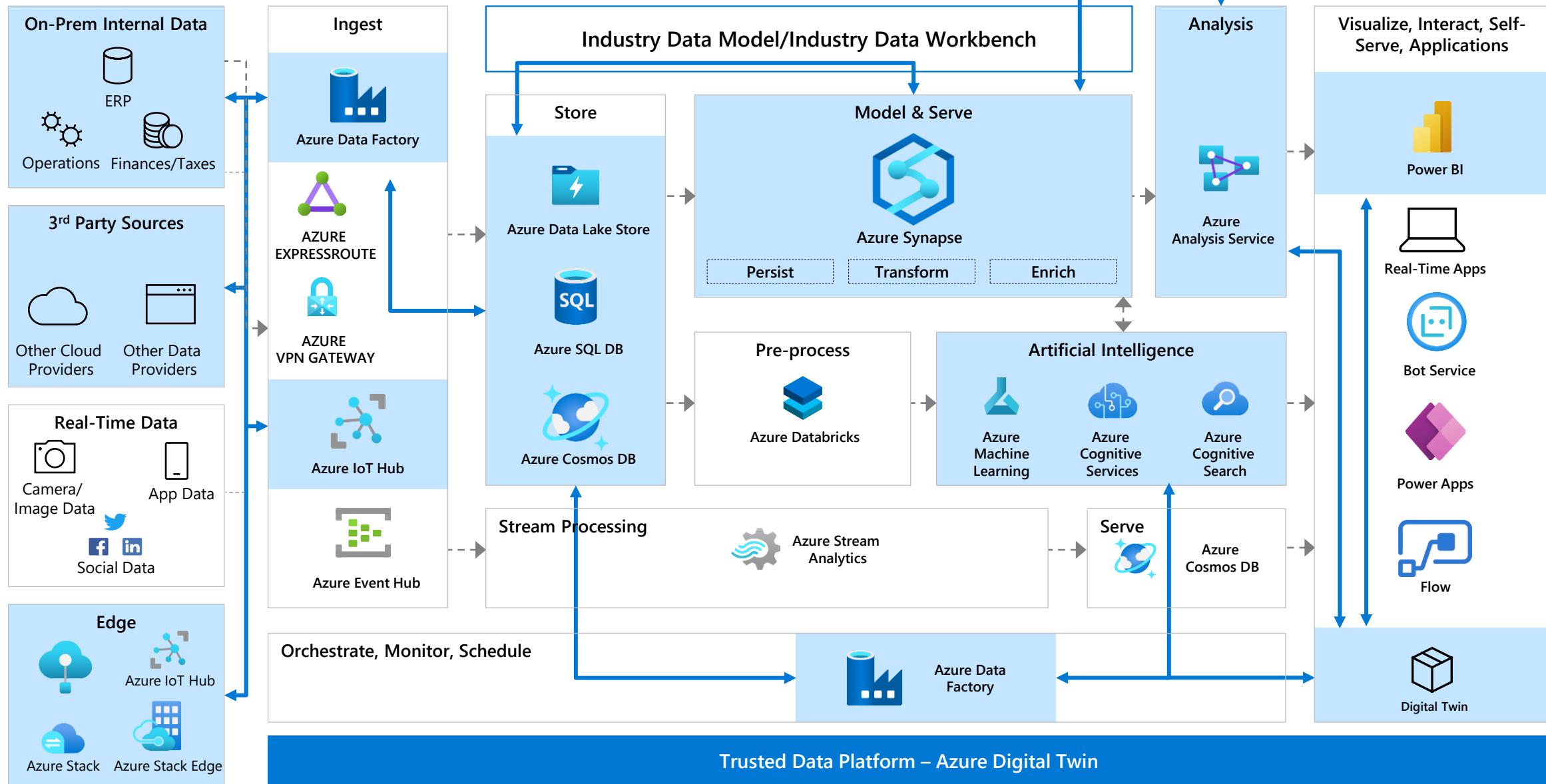


Reference Architecture

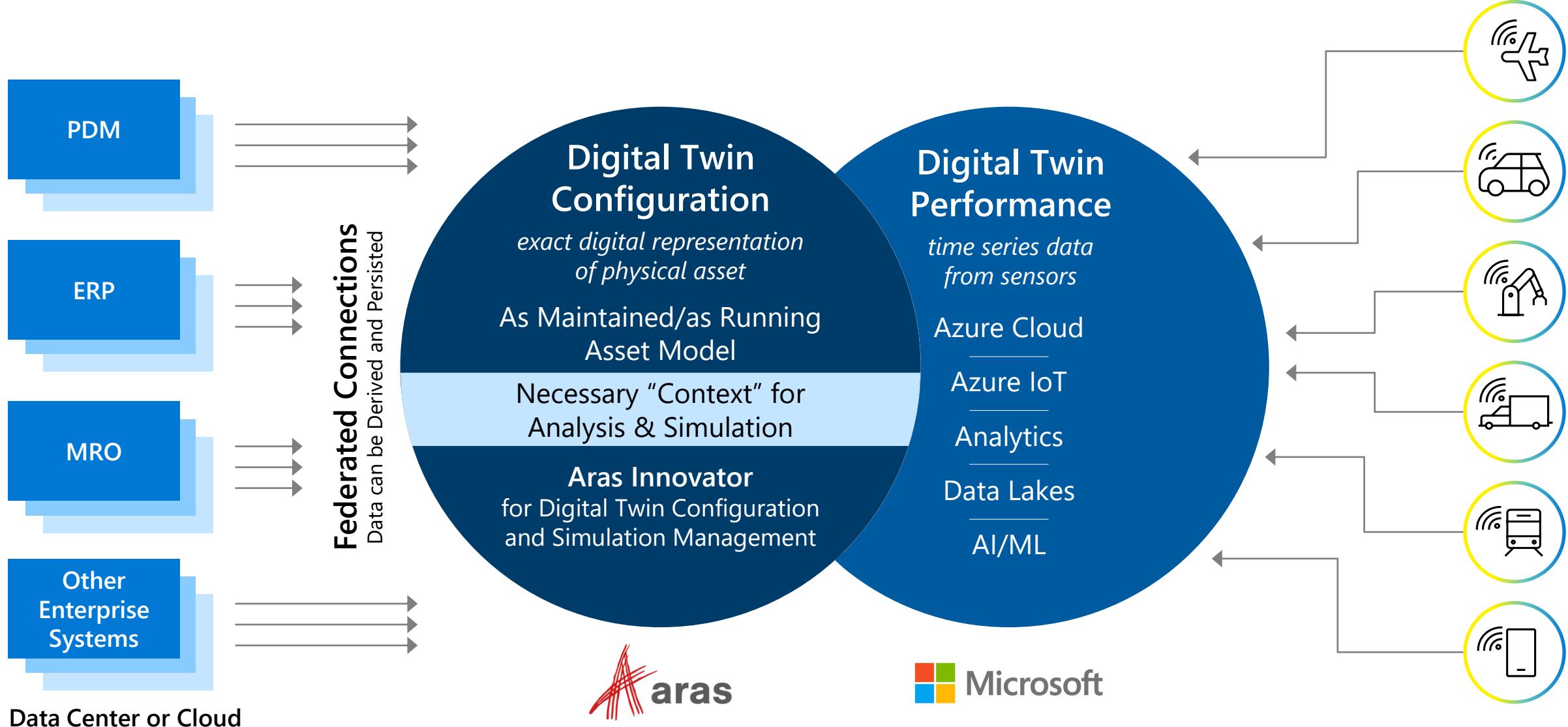
Executive Architecture – Modern Data Platform



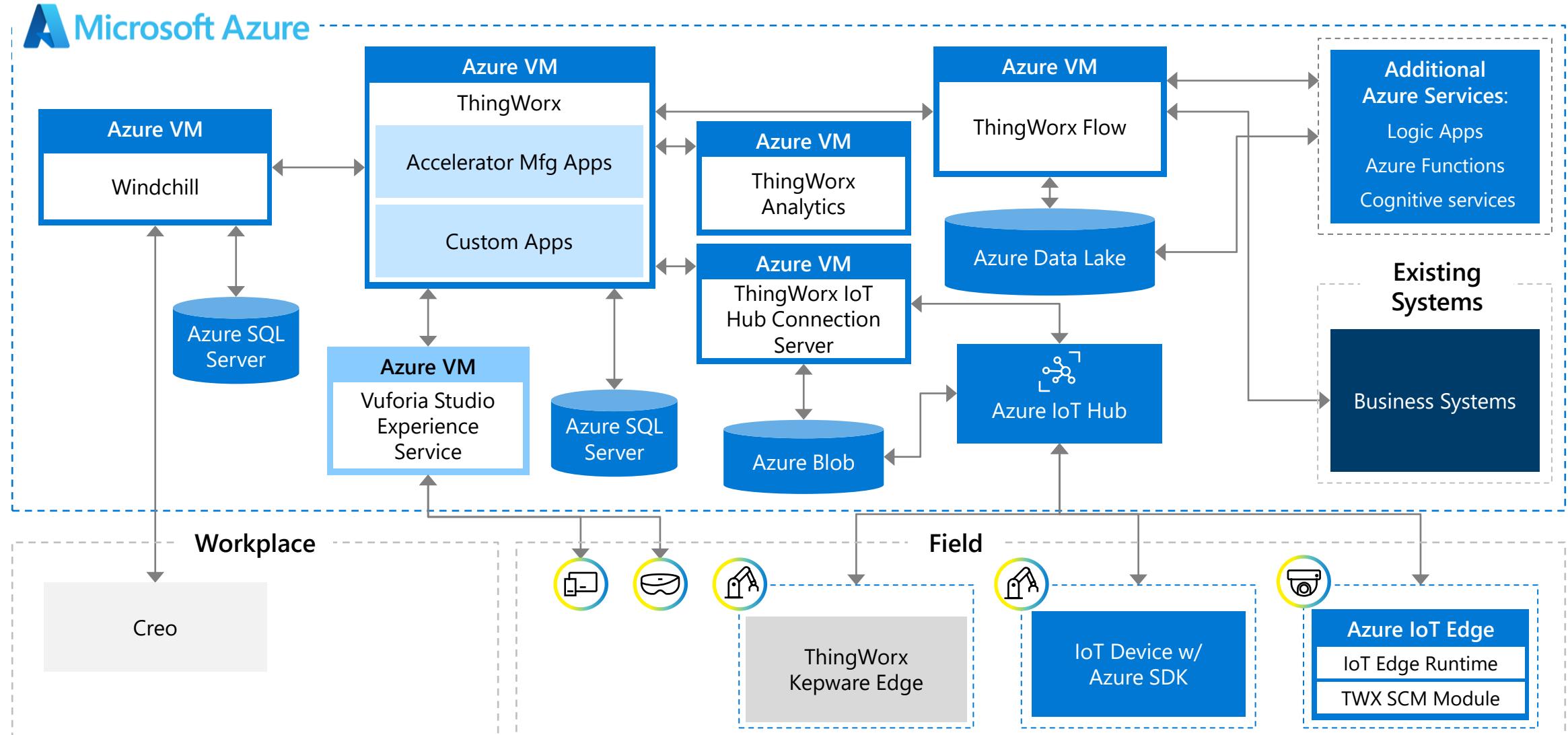
Modern Data Platform architecture



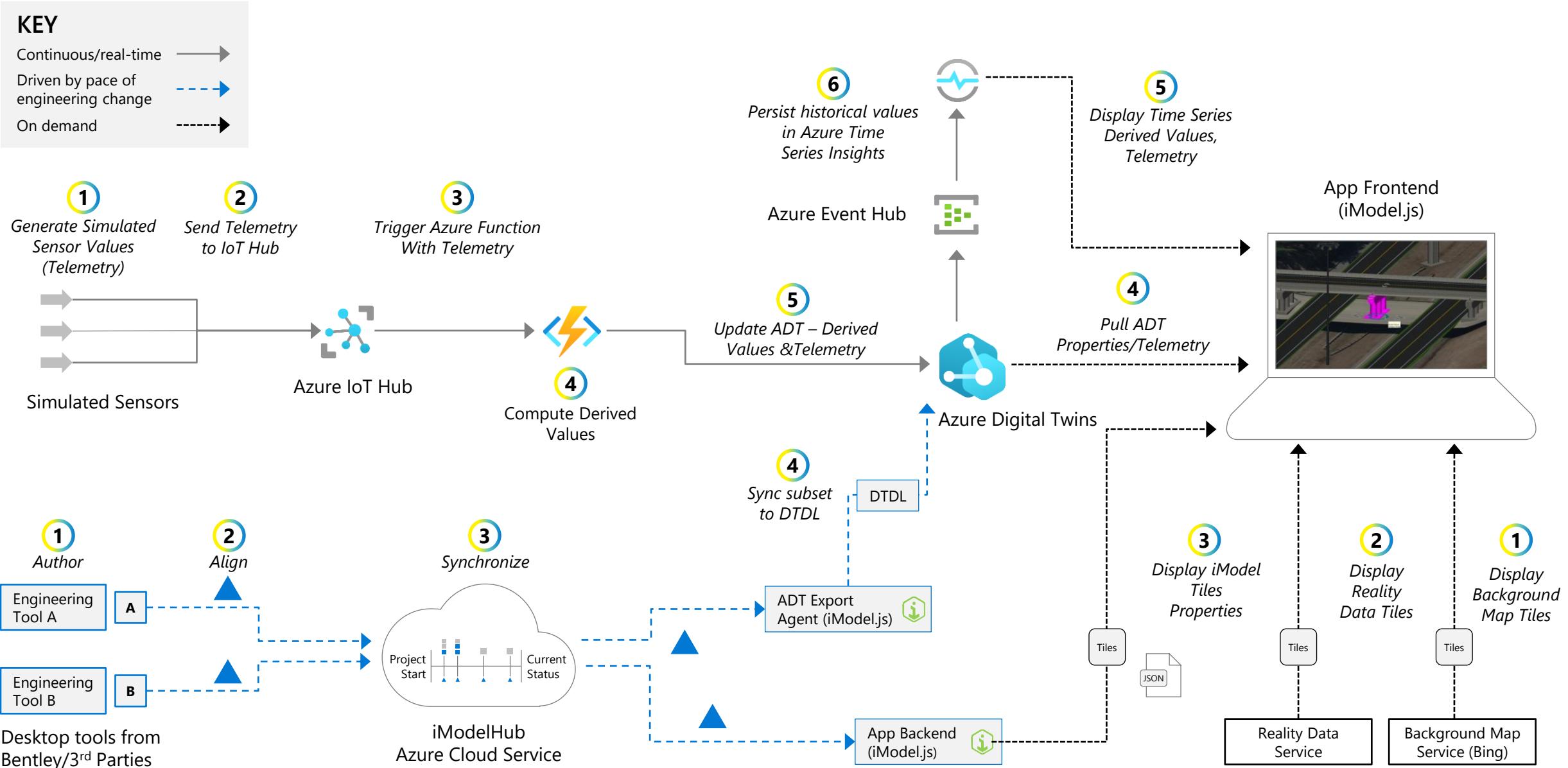
Digital Twin Configuration + Digital Twin Performance Architecture



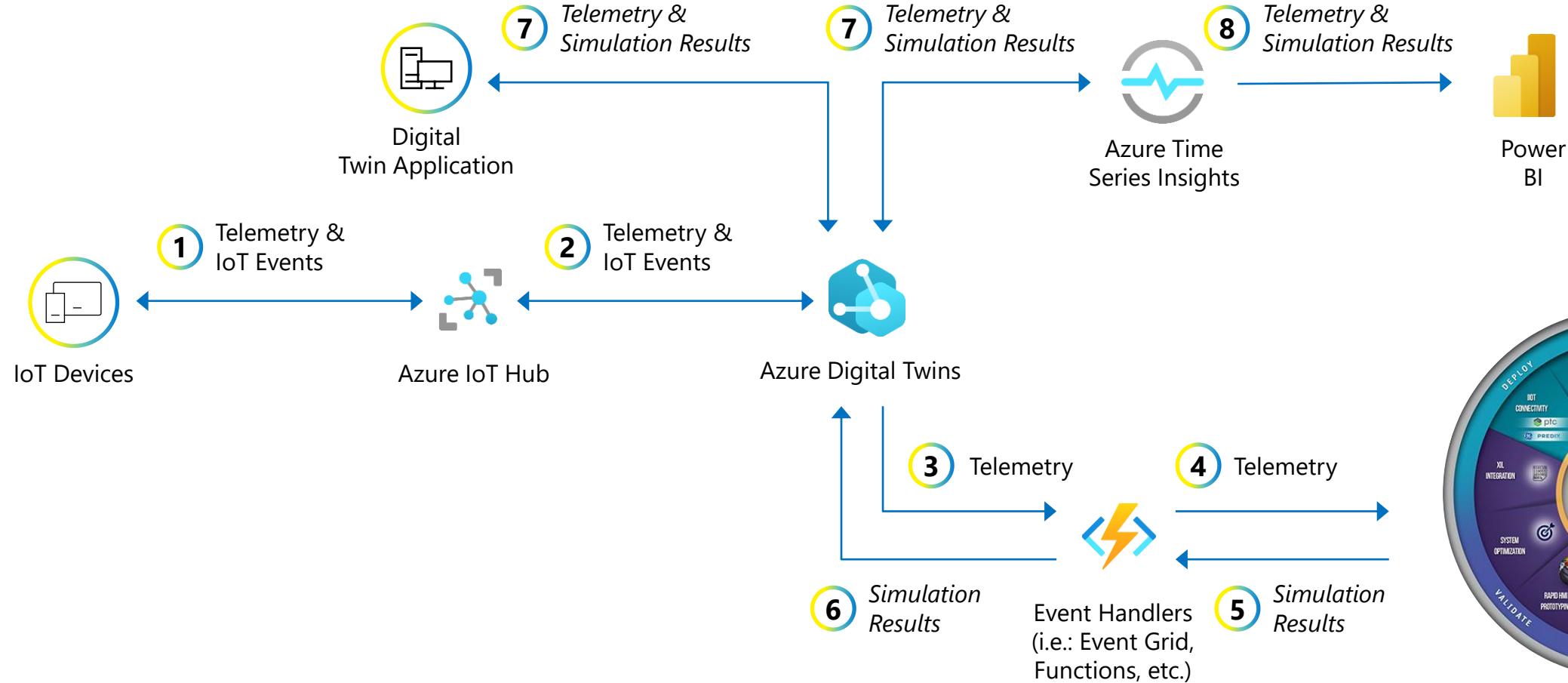
PTC Digital Twin solution architecture



Microsoft & Bentley Systems Digital Twin Architecture

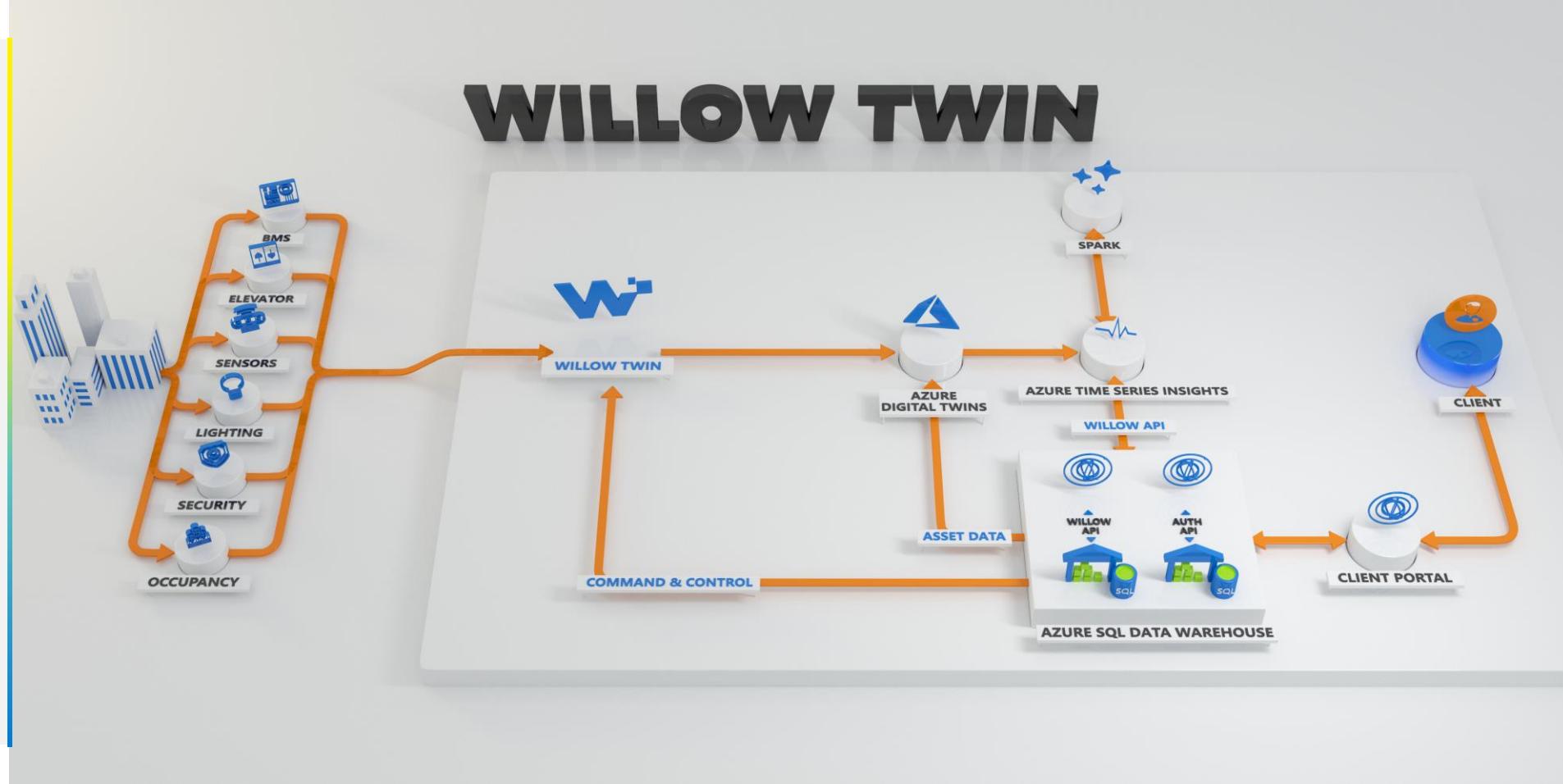


Ansys Digital Twin for Simulation – Reference Architecture



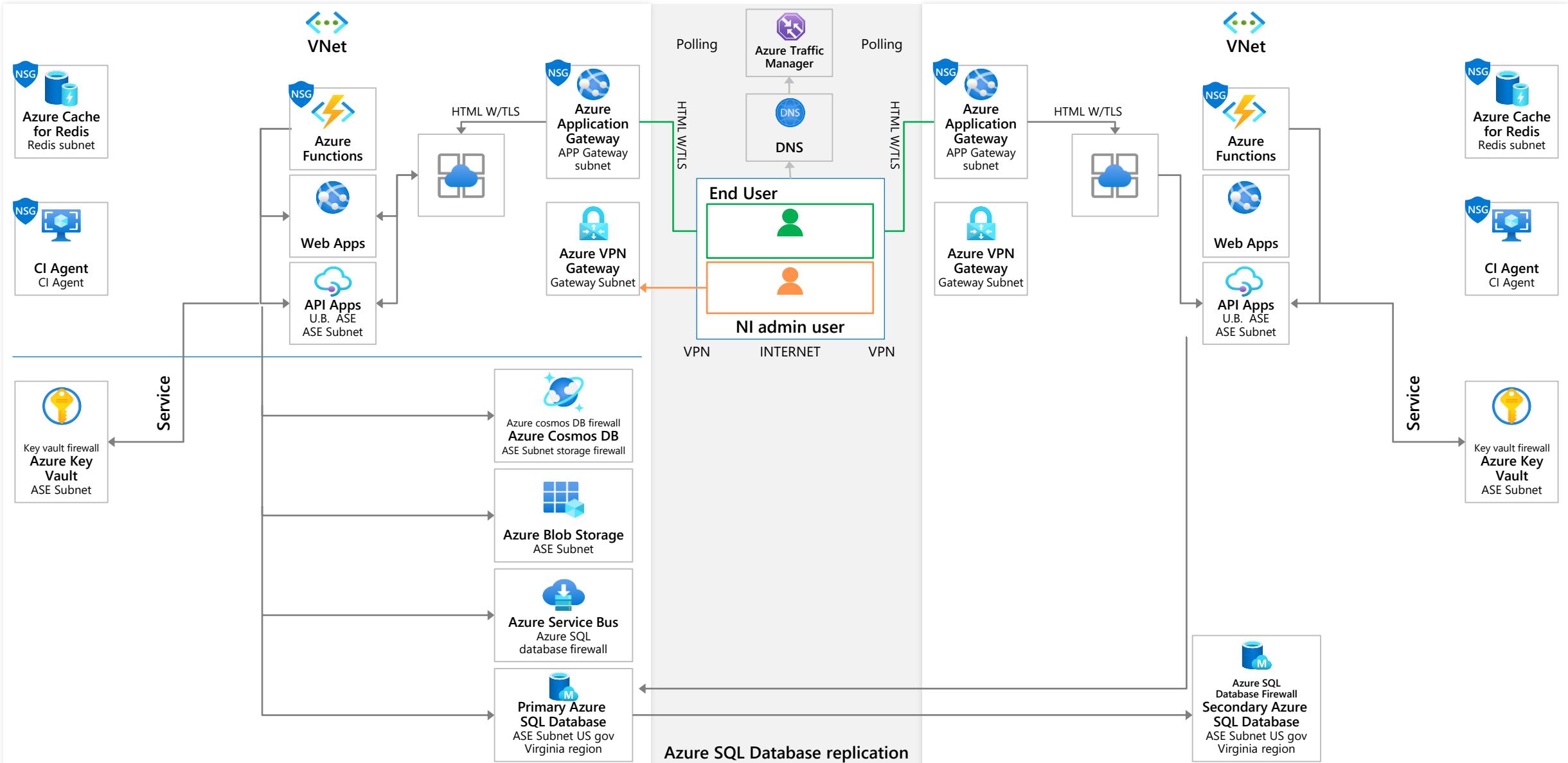
Ansys Twin Builder Runtime

Willow Twin Reference Architecture

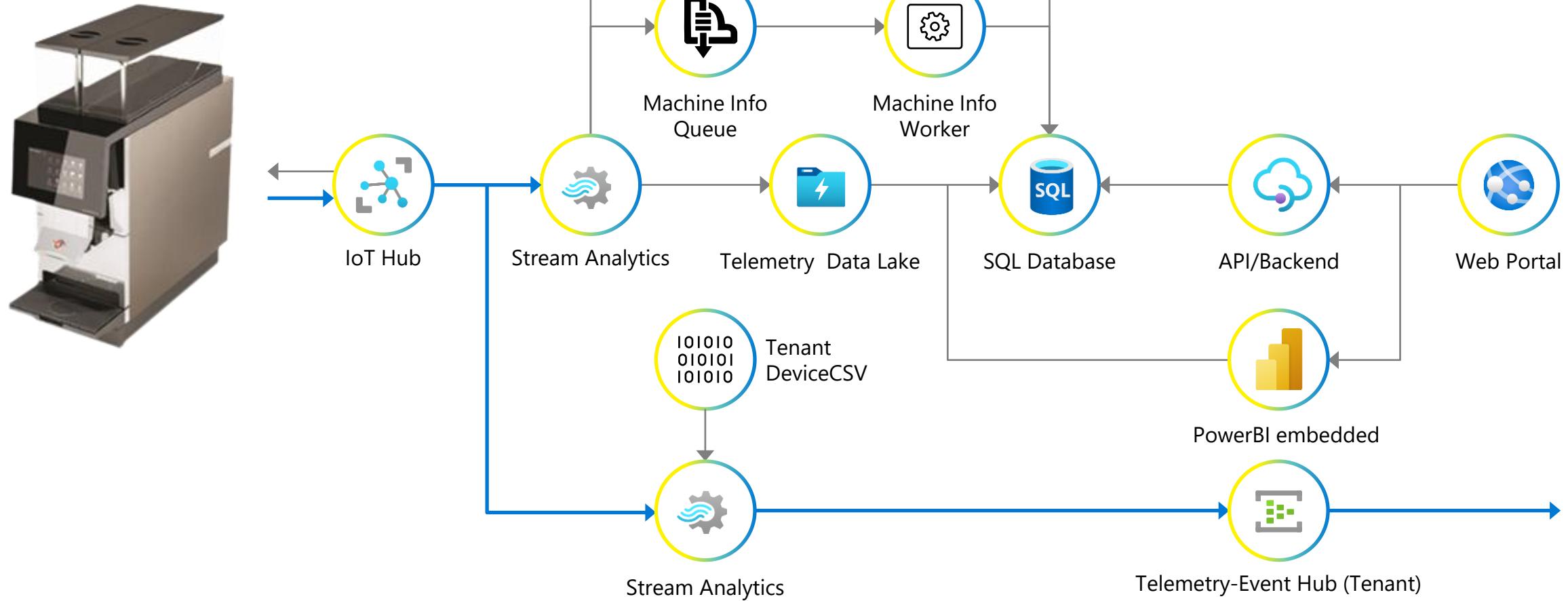


Net-Inspect Digital Thread Architecture

net-inspect

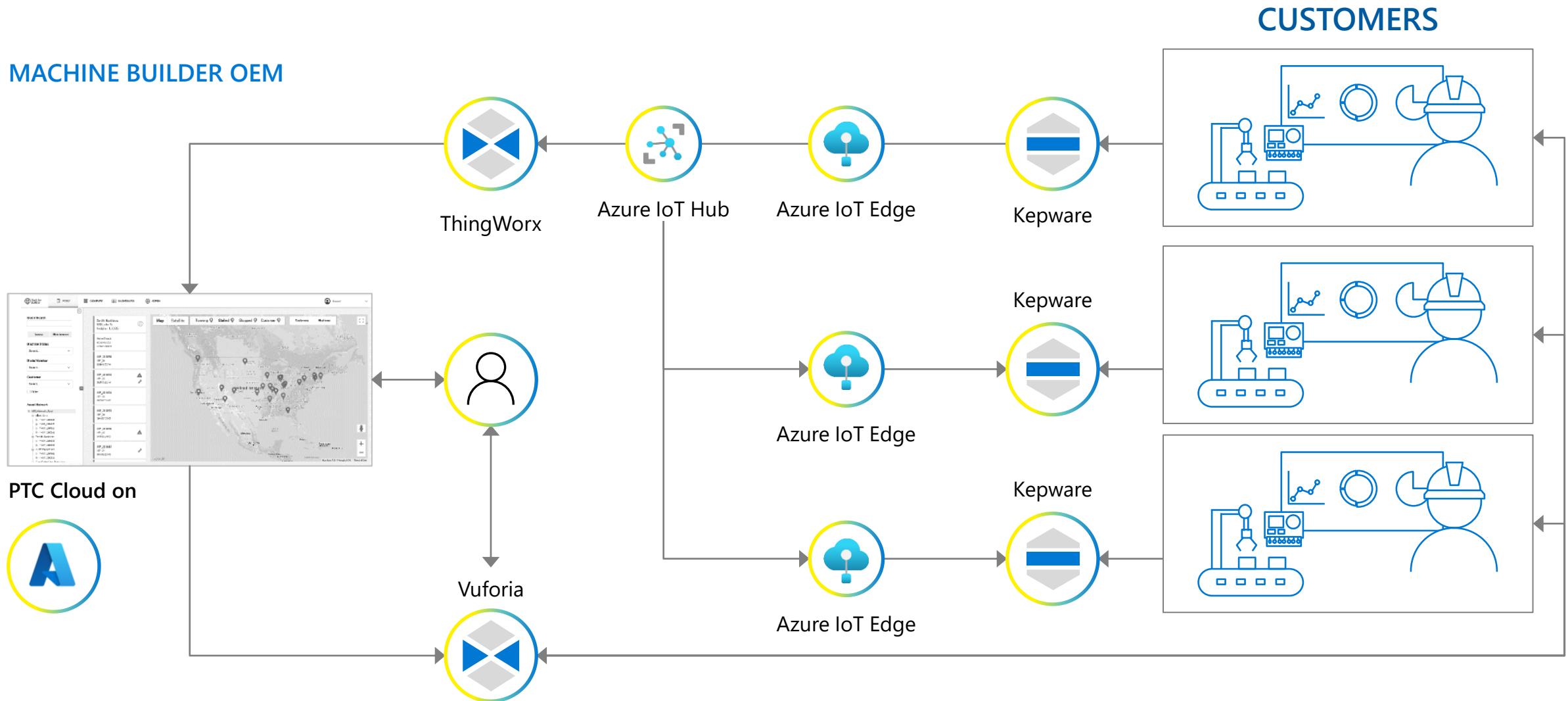


Connected Products: Basic Reference Architecture

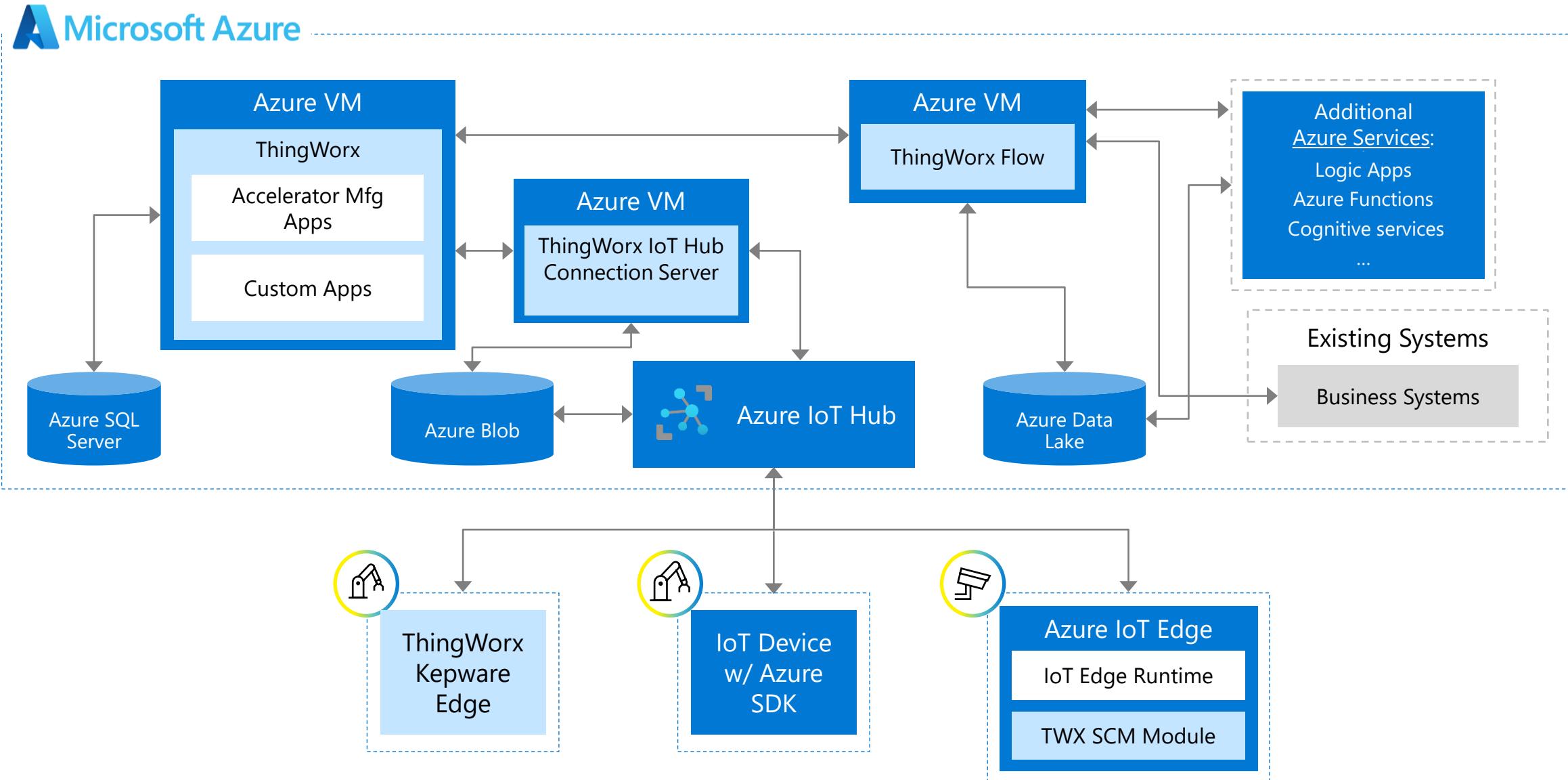


PTC Reference Architecture for Connected Products

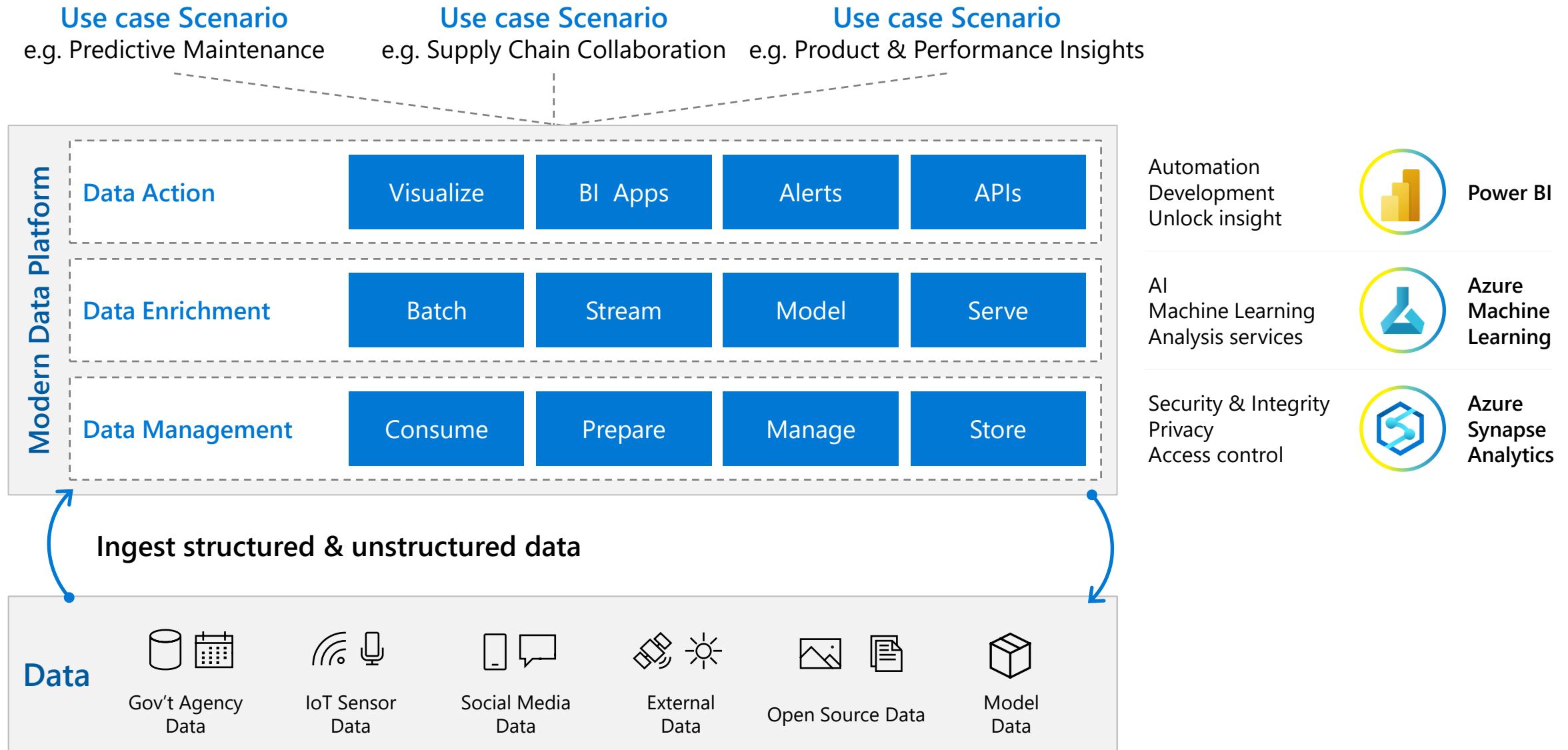
Machine builders and connectivity



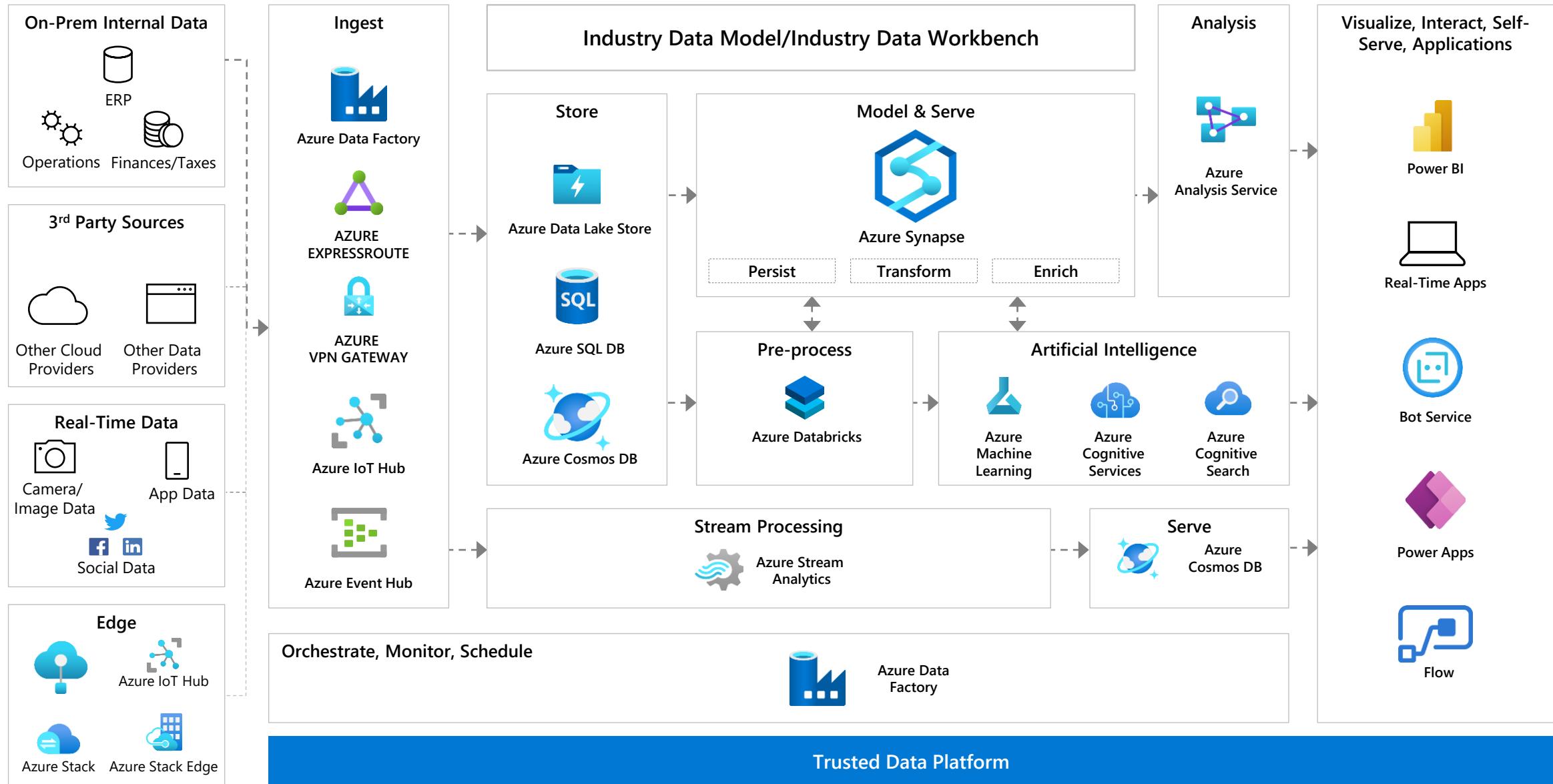
Product & Service visibility detailed view



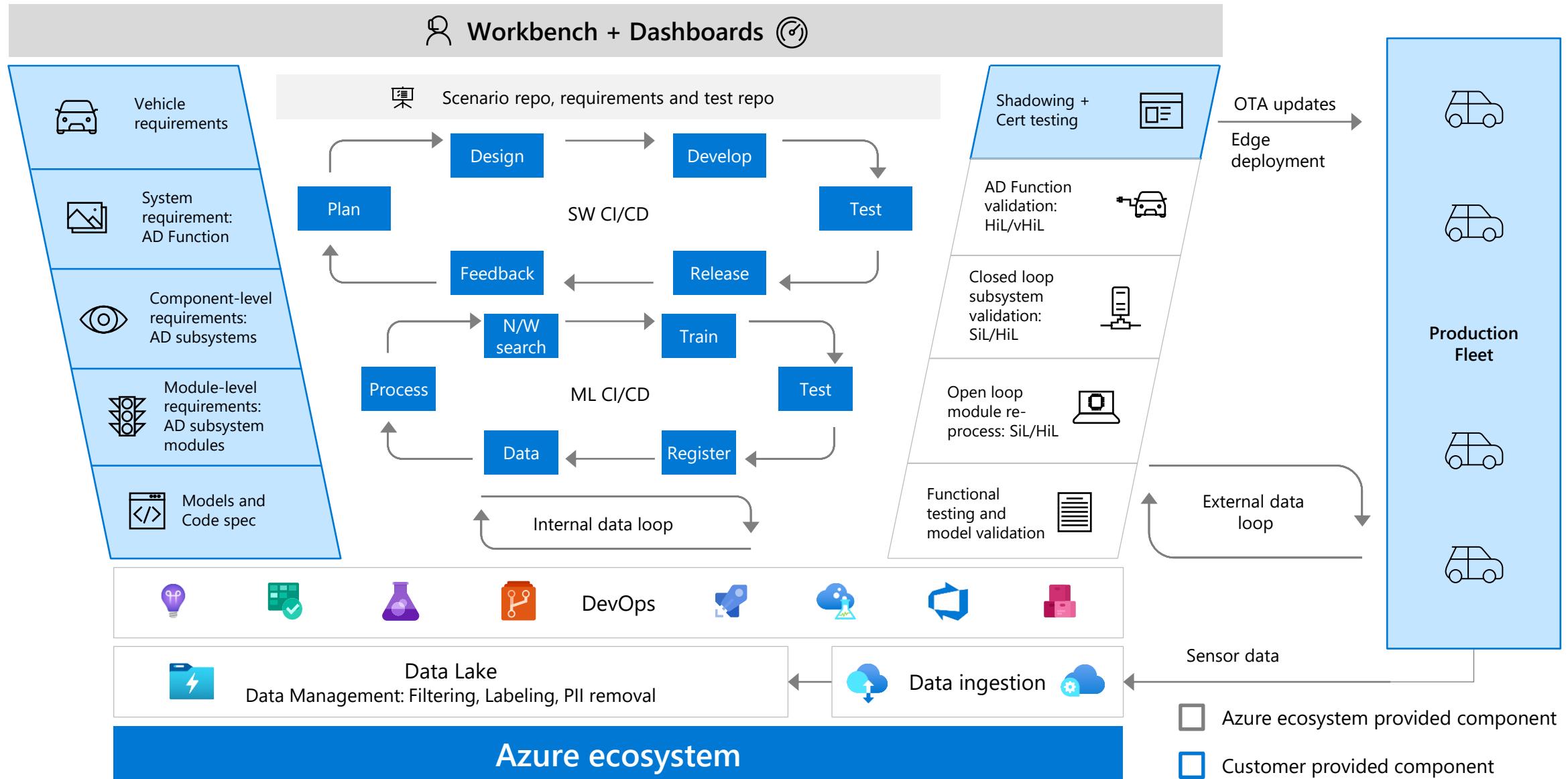
Executive Architecture – Modern Data Platform



Solution Architecture: Modern Data Platform



MLOps enables Autonomous Dev/Test on Azure



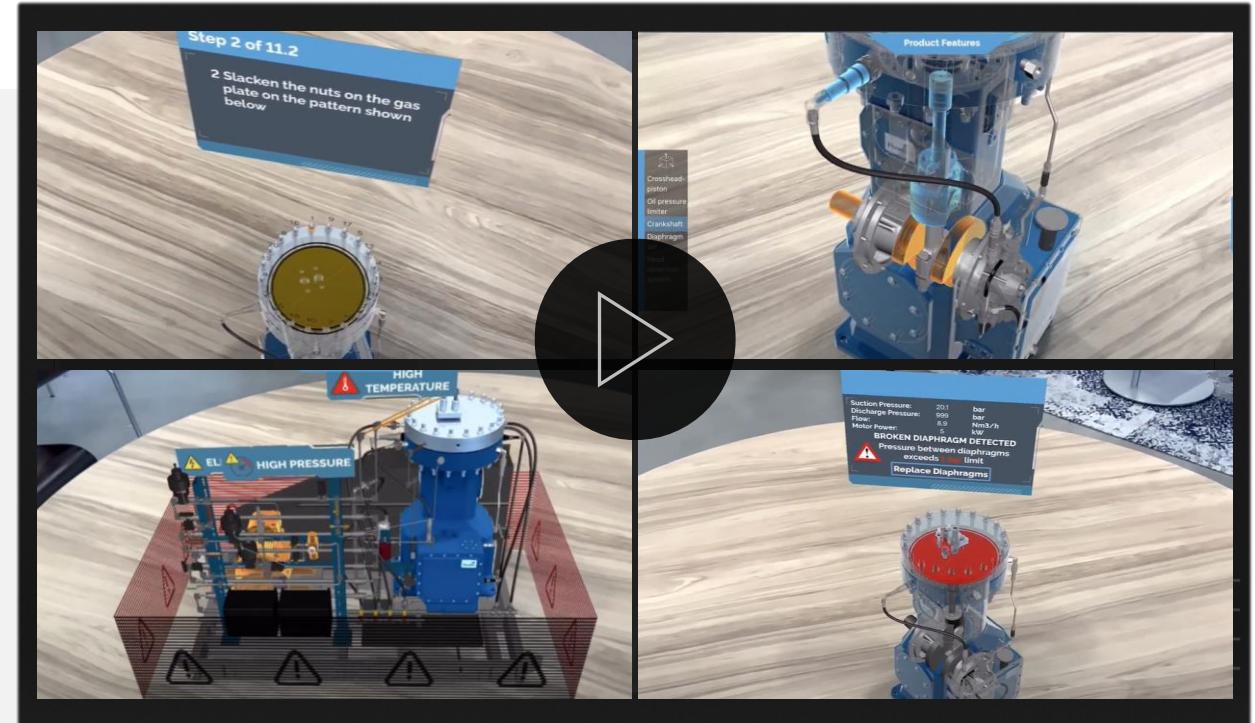


Demos & POCs

Digital Twin Demo



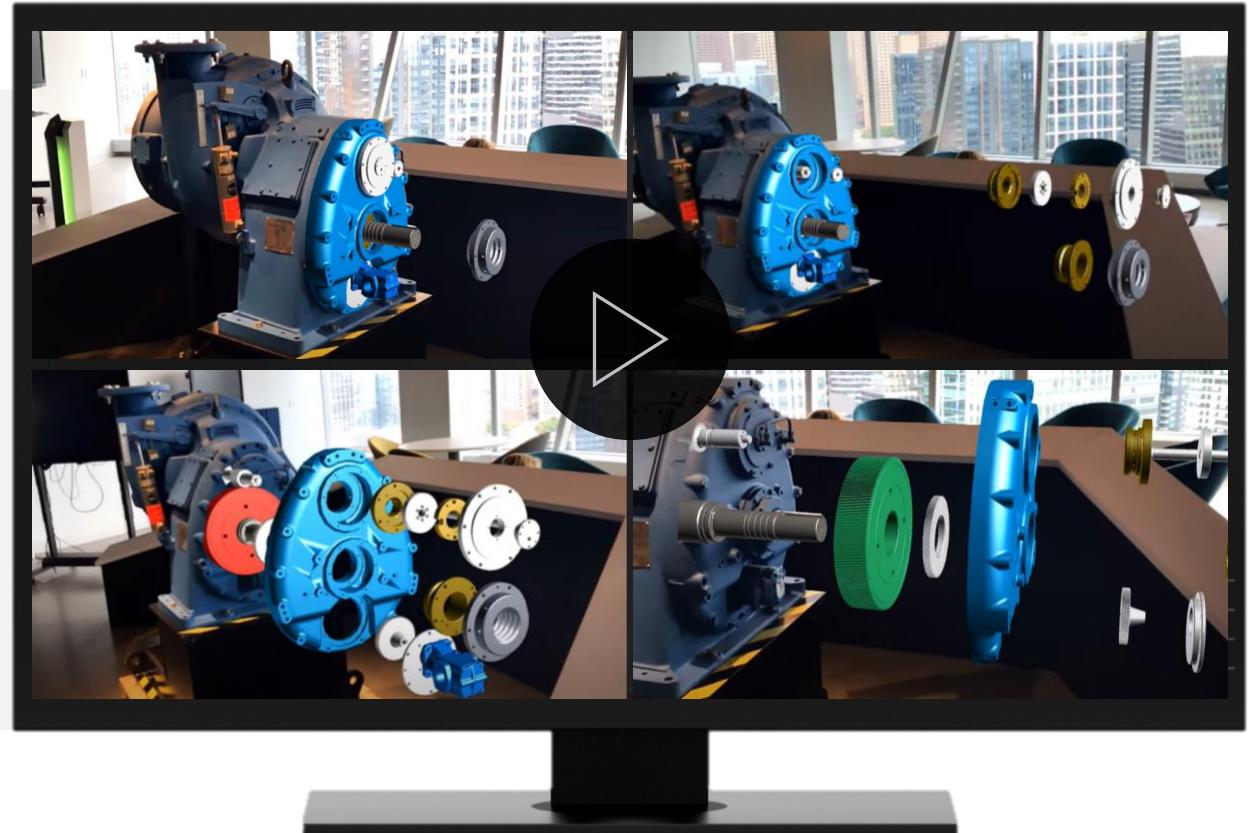
Howden uses Augmented Reality & IIoT



Howden AR Demo



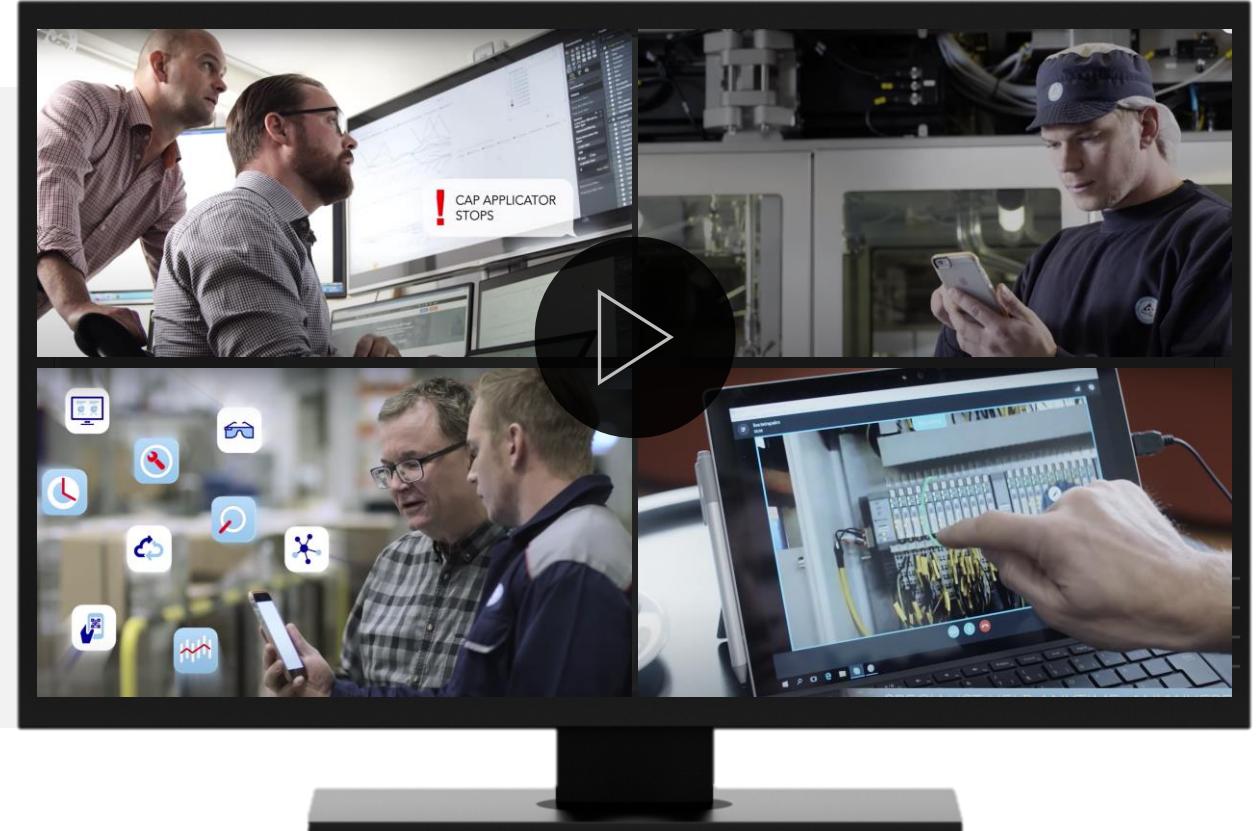
Demonstration of Howden
AR experience



Tetra Pak: Digitalization of Services



Tetra Pak's Connected Service Machine Sensors

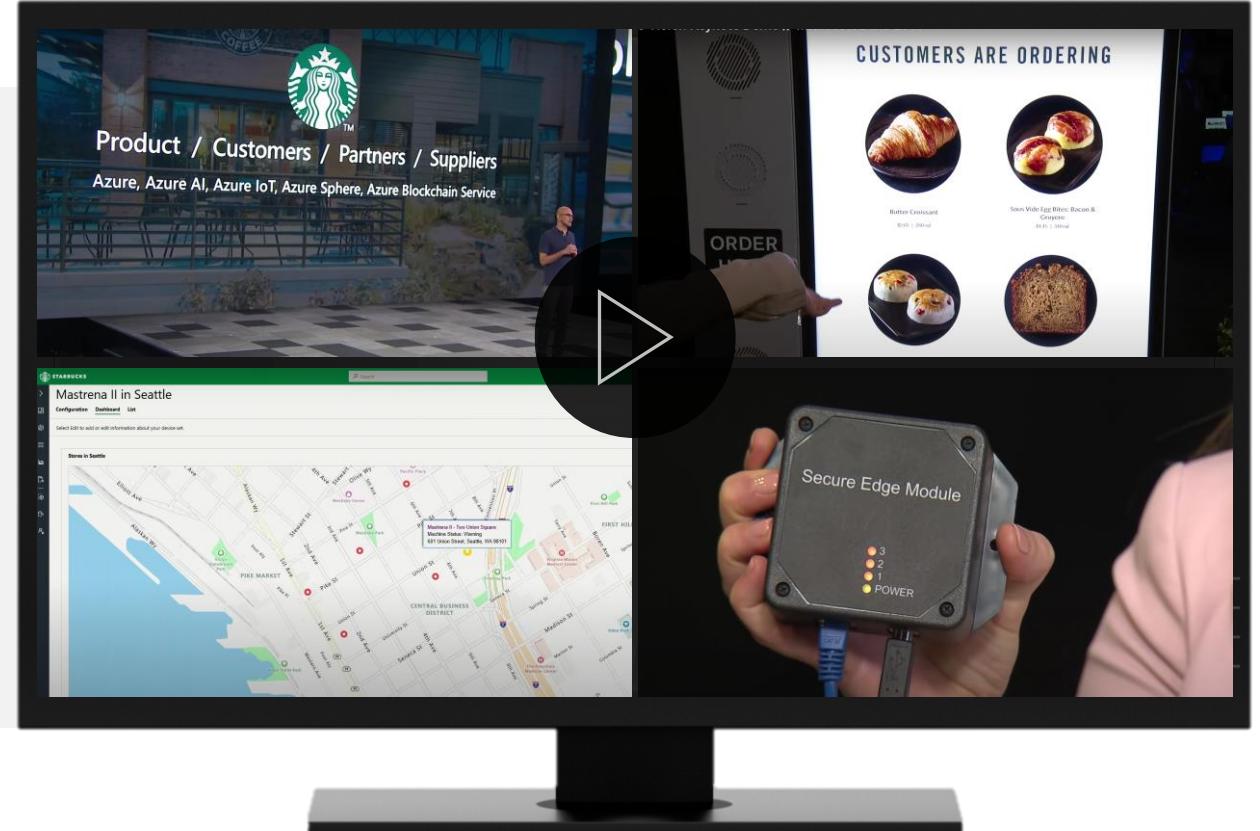


Starbucks Vision Keynote Demo



Azure, Azure AI, Azure IoT,
Azure Sphere & Azure
Blockchain Service

Microsoft Built 2019



Shaping the Future of Industry X with Accenture Labs



How technology can impact
the value chain



Sandvik Edge Demo



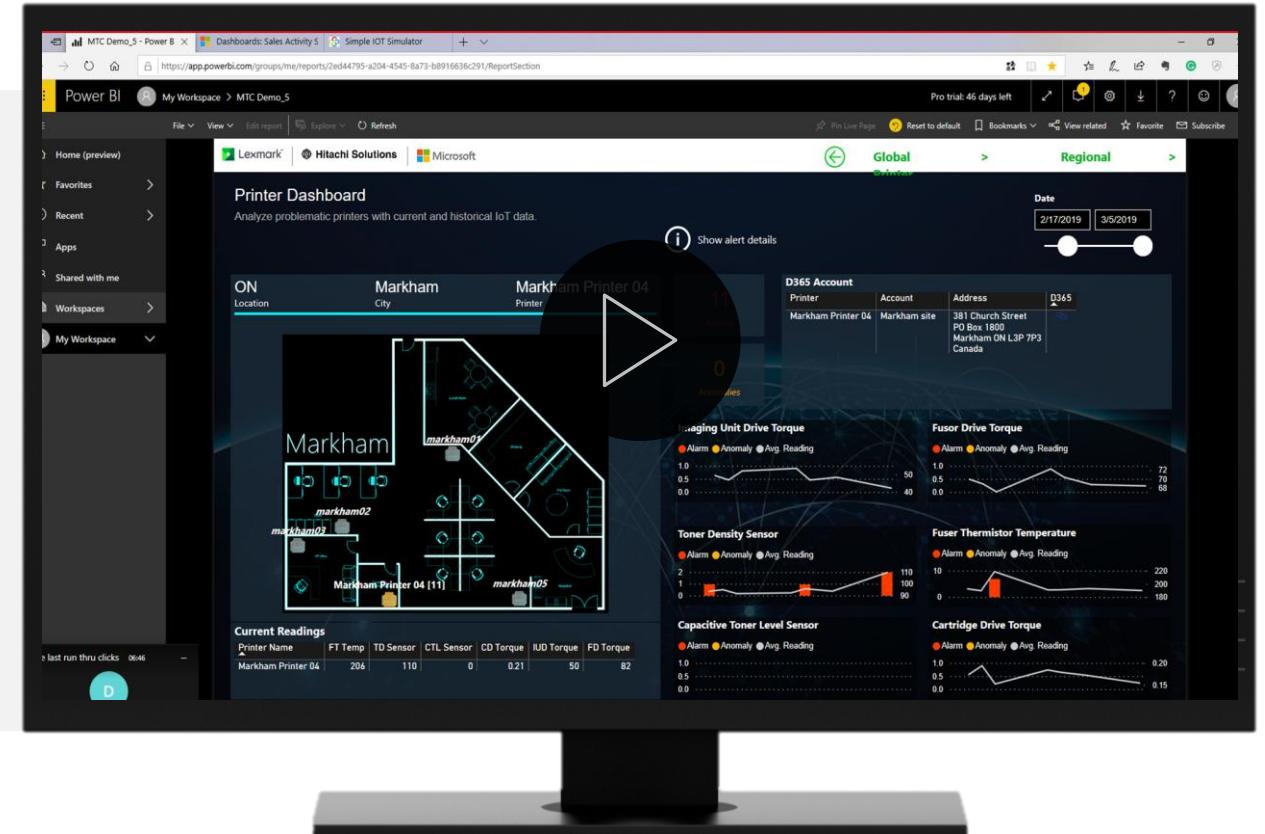
Azure IoT & Azure Edge



Connected Field Service Demo



Manufacturing sales demo





Customer Engagement Model & Delivery Approach

Conditions for successful pilot and at-scale implementation



Business case and executive sponsorship and central project office

- Clear business case and stakeholder sign-off from on path to value and investments along the way – critical to tie impact from project to overall business imperatives for the company
- Executive sponsorship and communication to reinforce effort as top priority across for all relevant teams



Central project office and commitment of resources

- Central project office to provide support for domain teams and coordinate project execution
- Commitment of resources needed for duration of pilot and at-scale implementation
- Participation from cross-functional SMEs and access to business users for initial design workshops



Regular communications and champions

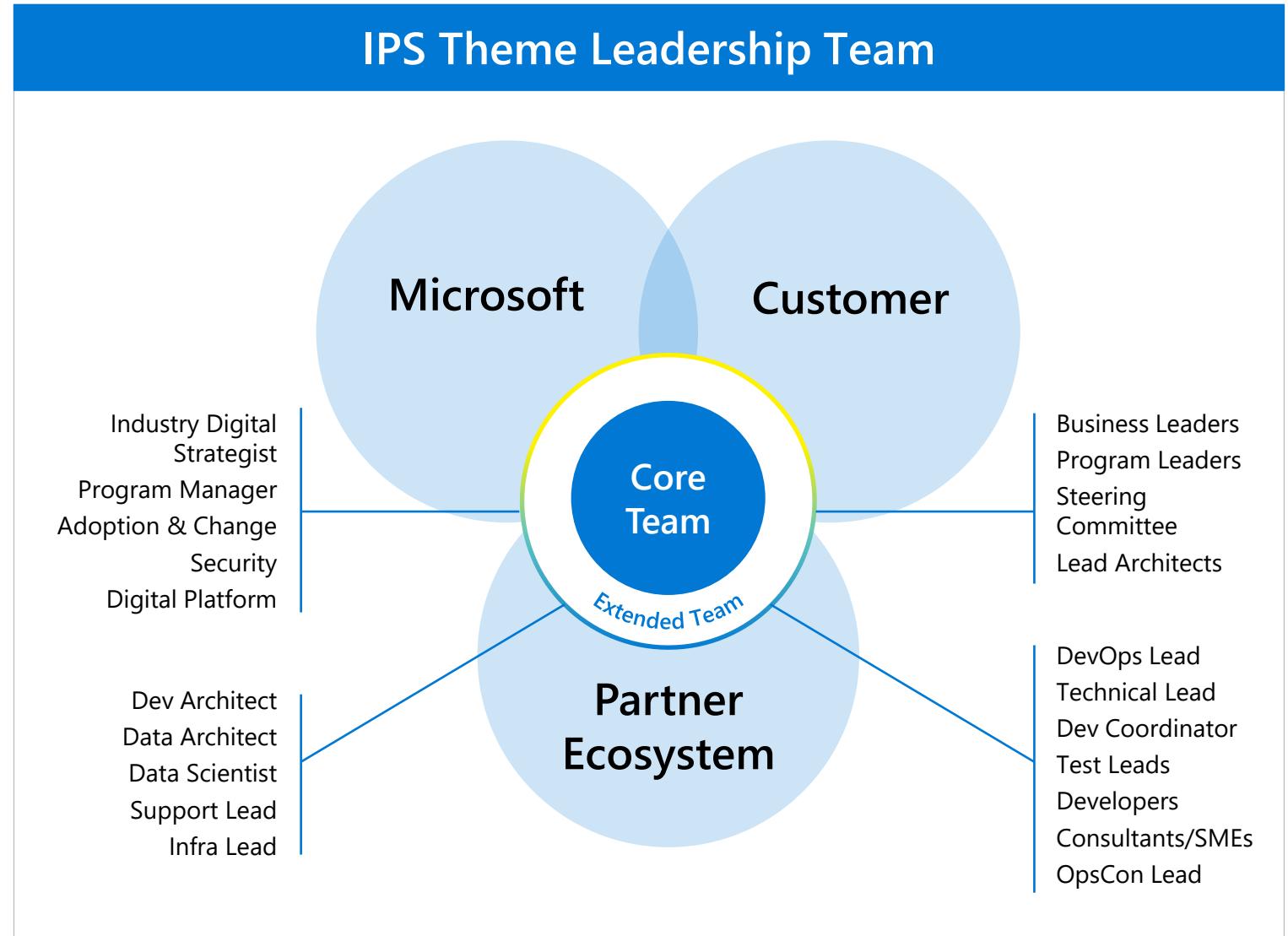
- Provide regular updates on project status and success to all relevant stakeholders and across the org
- Invest sufficient time to explain potential operating model changes to all domain teams
- Recruit and onboard champions to amplify top-down messages and assess effectiveness of communication at the front-line

How we will work with you



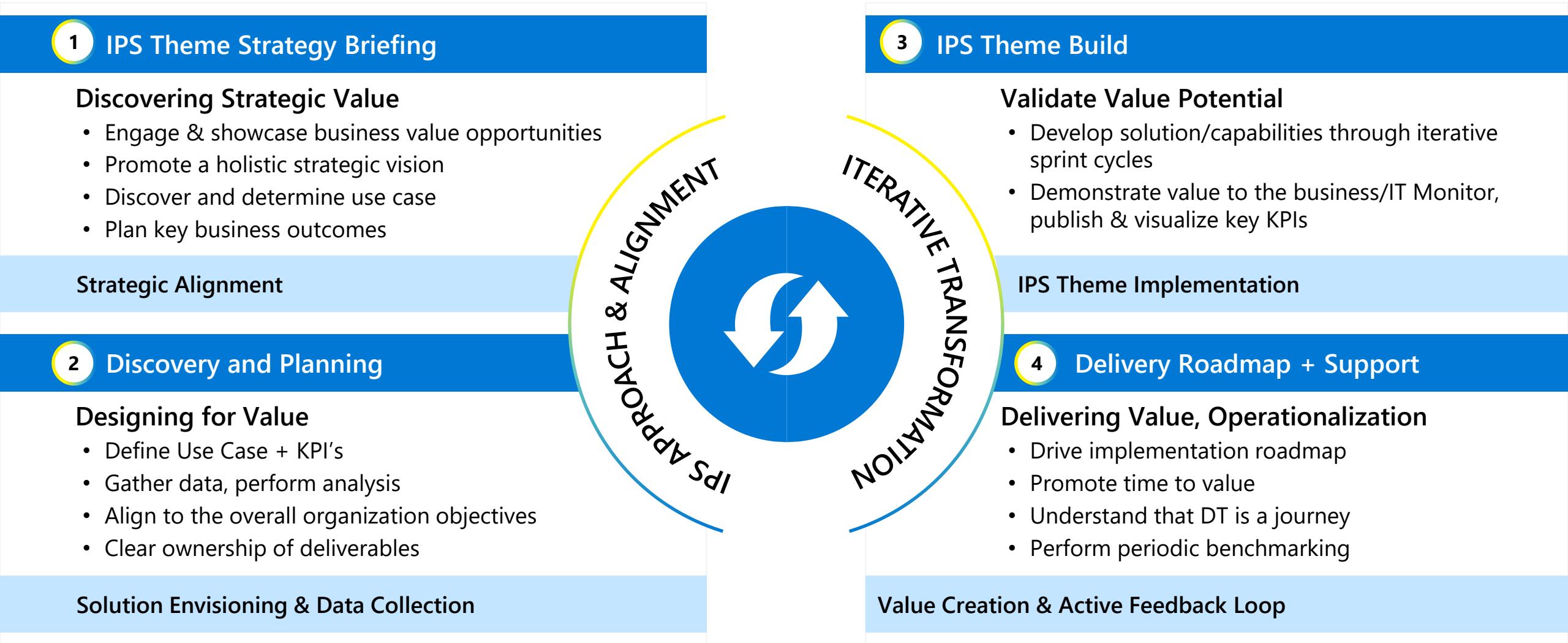
What we bring

- Full breadth of our expertise to your engagement – combining technical depth and business acumen
- Business Aligned Partnership for success
- Breadth and Experience
- Competency Development
- Prioritization for solution/capability Backlog
- Reduced Risk of Complex Transformational Projects



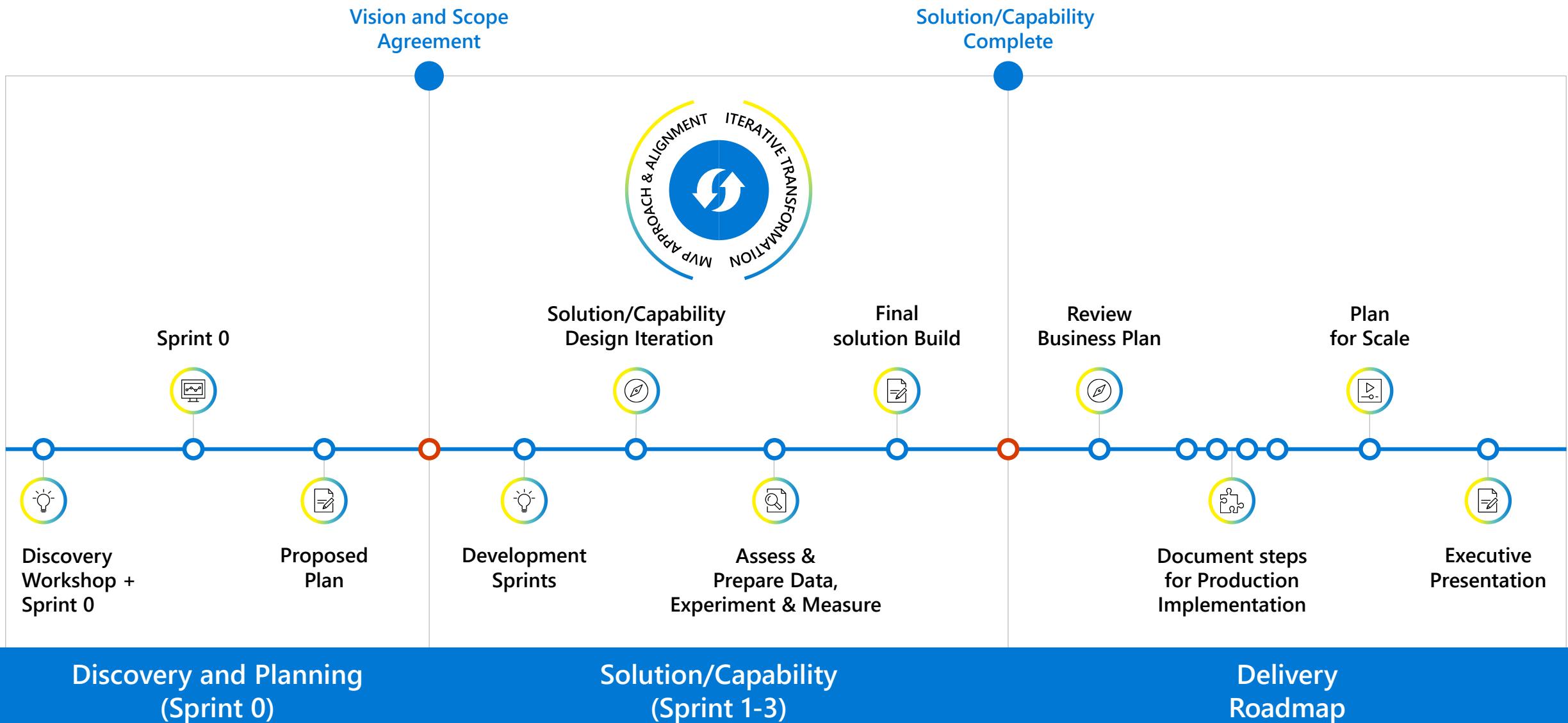
IPS Theme Path to Value

Simple, effective & repeatable approach to deliver value

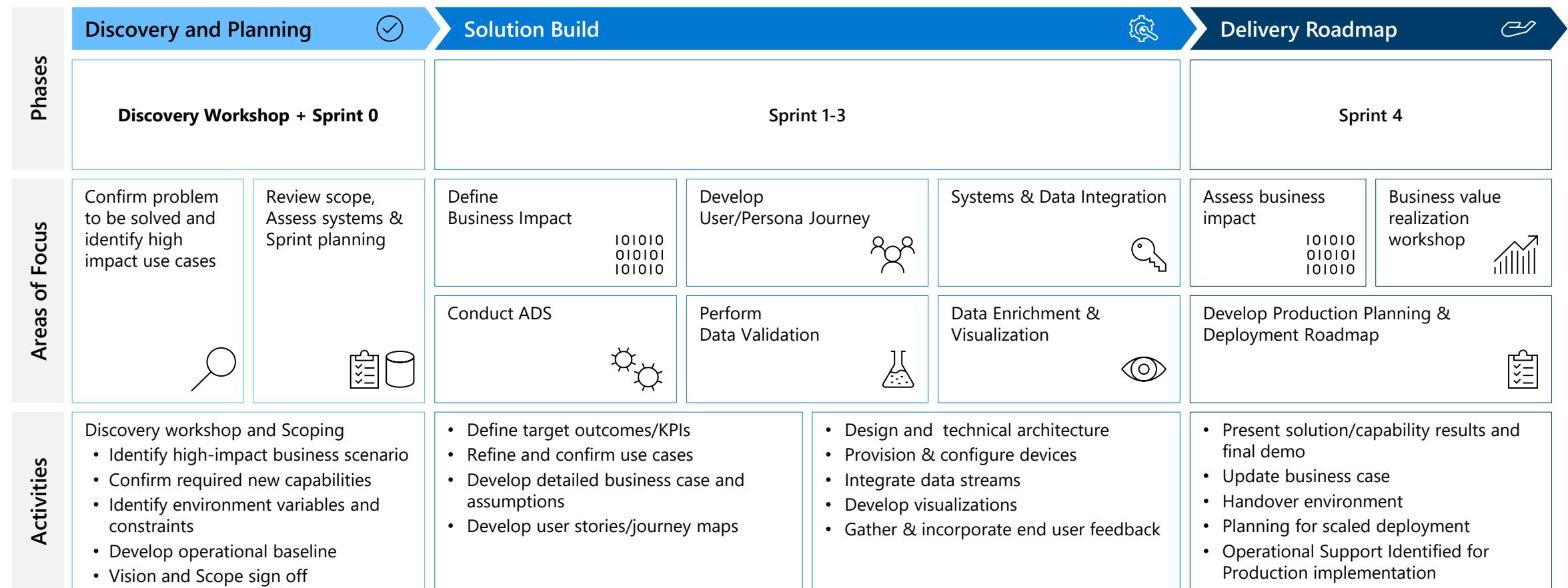


Engagement Model

Roadmap and Production Implementation Decisions

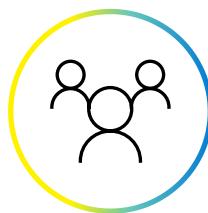


Our typical engagement begins with Discovery + Planning to validate the potential business value to be unlocked



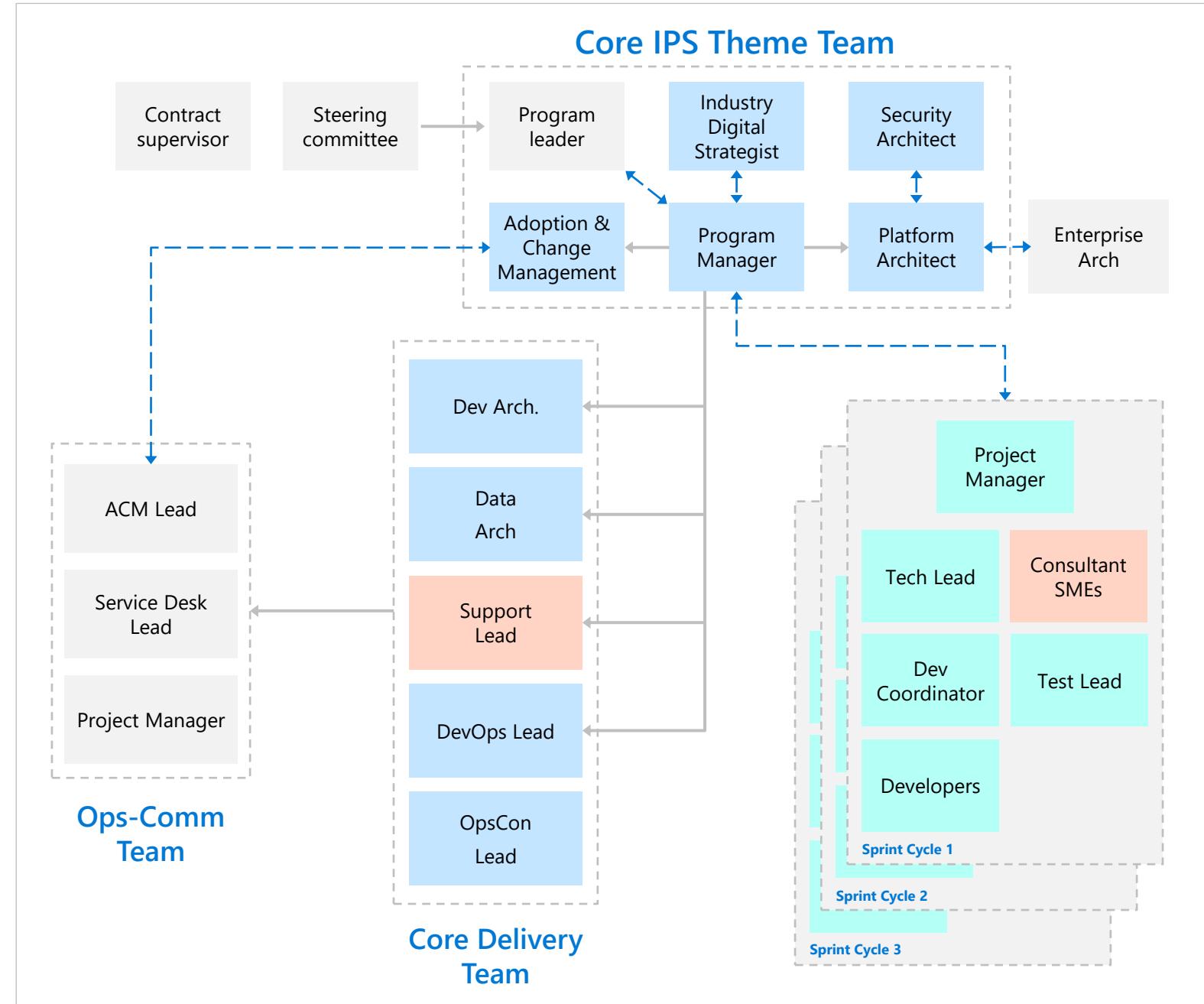
Discovery & Planning provides the right starting point to prove value & enable quick pilot deployment

IPS Theme Team



KEY

- Customer
- Microsoft
- Microsoft/Partner SME
- Microsoft and/or Customer
- Methodological supervision
- Direct supervision



Proposed meeting cadence for delivery

[To be customized as needed]



Activities	Cadence	Owner	Participants	Goals
Sponsor report out & alignment	Bi-weekly	Executive sponsor	Microsoft, partner, and customer executive sponsors	Report out to executive sponsors, highlight urgent issues and resource requirement
Project owner check-in	Weekly	Project manager	Microsoft, partner, and customer representative	Project owner check in, progress update
Workstream progress check-in	Weekly	Workstream leaders	Microsoft and partner	WS specific alignment and problem solving
Progress check-in	Daily	Project coordinator	Microsoft and partner	Resolve daily issues and align priority

Microsoft's commitments and what we need from you



Microsoft engagement commitments

- Named Engineering Program Manager who will be single point-of-contact throughout the project duration and who will be your advocate within relevant product groups at Microsoft
- Dedicated execution support for committed, prioritized use cases
- Executive sponsorship
- Validation of design/architecture before implementation
- Rhythm of Business: Periodic business and executive reviews; periodic or ad-hoc program sync (as mutually agreed upon)
- Customer questions/requests/bugs tracking through to resolution
- "Signing" of the jointly created strategy document



Customer engagement commitments

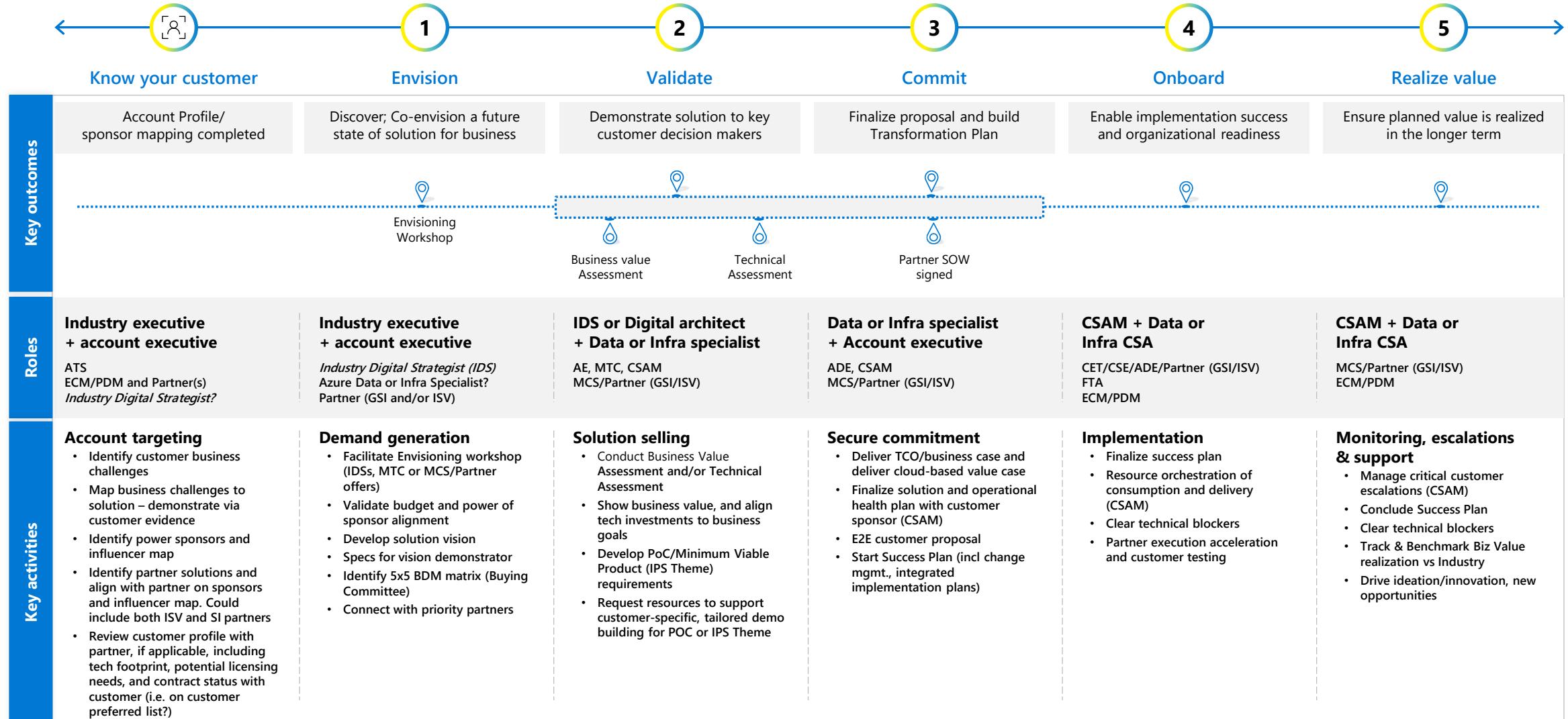
- Dedicated program management resources
- Dedicated resource as advocate for Microsoft within your organization
- Executive sponsorship
- Share, agree on project schedules, deliverables and proposed architectures before implementation
- Commitment to communicate program status to internal stakeholders
- Rhythm of Business: Periodic business and executive reviews; periodic or ad-hoc program sync (as mutually agreed upon)
- Customer commitment regarding public reference (options: case study, video, press release)
- "Signing" of the jointly created strategy document

The background image shows a modern architectural structure with a curved, perforated facade made of white panels. A road leads towards the structure, curving to the right. The sky is clear and blue.

Microsoft Orchestration

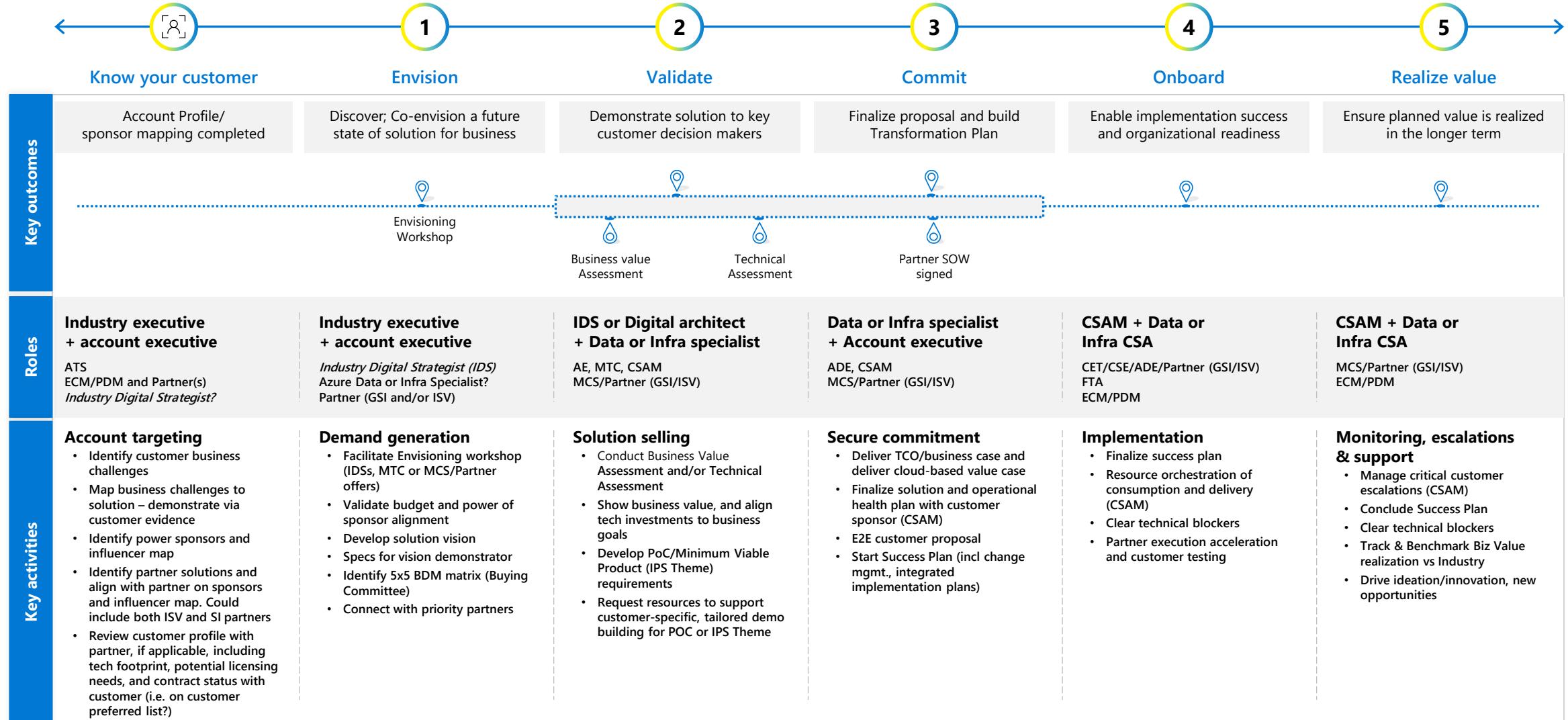
Unlocking Innovation – Digital Twin Customer Flow

Microsoft consumption process



Unlocking Innovation – Connected Product customer flow

Microsoft consumption process





A blurred, high-angle view of a city street at night. The street is marked with yellow crosswalk stripes. Numerous people are walking across the street, their figures blurred due to motion, creating a sense of constant activity and diversity. The overall atmosphere is dynamic and urban.

Overview: Success Stories & Customer Testimonials

Index of Customer Success Stories

Digital Twins

Company	Application/Services	KPIs
	Ansys Twin Builder	<ul style="list-style-type: none">Simulation and validation of battery electrical and thermal properties
 Invented for life	Azure Cosmos DB, Azure IoT Hub, Azure Kubernetes Service, Azure Machine Learning, Azure Stack HCI, Dynamics 365, Dynamics 365 Remote Assist, HoloLens 2, Microsoft Defender for IoT, Microsoft Teams, Power Apps	<ul style="list-style-type: none">Usage Patterns, Identify issues, Preventative MaintenanceUptime
	Azure IoT Hub, Azure App Service, Azure Cognitive Search, Azure Cosmos DB, Azure Data Catalog	<ul style="list-style-type: none">Product PerformanceBusiness Model
	Bentley Systems iTwin, Azure Digital Twins, Azure IoT Hub, Azure Timeseries Insights	<ul style="list-style-type: none">Design & Development, Maintenance, Operations
	PTC ThingWorx, Azure IoT	<ul style="list-style-type: none">Remote troubleshooting, create predictive simulation models, reduce downtime
	Azure Digital Twins, Azure Cognitive Services, Azure Cognitive Search, Azure Synapse Analytics	<ul style="list-style-type: none">Increase efficiency, reduce costs & minimize unplanned downtime
	Willow Twin, Azure Digital Twins, Azure IoT	<ul style="list-style-type: none">Usage Patterns, Identify issues, Preventative Maintenance

Index of Customer Success Stories

Digital Thread

Company	Application	KPIs
 Lexmark™	Azure, Dynamics 365, Azure Data Lake, Data Lake Analytics, Cognitive Services, Machine Learning	<ul style="list-style-type: none">• On-time delivery of parts and consumables
	Azure, Azure SQL Database, Azure Functions	<ul style="list-style-type: none">• Configuration control from a single source
	Azure, Azure IoT Central, PowerBI PTC Thingworx	<ul style="list-style-type: none">• Planned interventions• CAPEX Reallocation• New Business Model differentiator• Product Upsell/Crossell insights

Index of Customer Success Stories

Connected Product

Company	Application	KPIs
 CELLI group The sustainable drinking experience	Azure, Azure IoT Central, Power BI PTC Thingworx	<ul style="list-style-type: none">Planned interventionsCAPEX ReallocationNew Business Model differentiatorProduct Upsell/Crossell insights
	LumoVision real-time identification	<ul style="list-style-type: none">Amount of healthy grain that gets wasted to less than 5%
	Cloud-based IIoT Platform	<ul style="list-style-type: none">Machine & Tool Efficiency; Production Optimization; New Business Models and Ecosystem
	Azure IoT, Azure Sphere, Azure AI, Azure Blockchain	<ul style="list-style-type: none">Customized customer in-app feedback
	Azure, Azure IoT	<ul style="list-style-type: none">Reduced app engineering dev time



Appendix

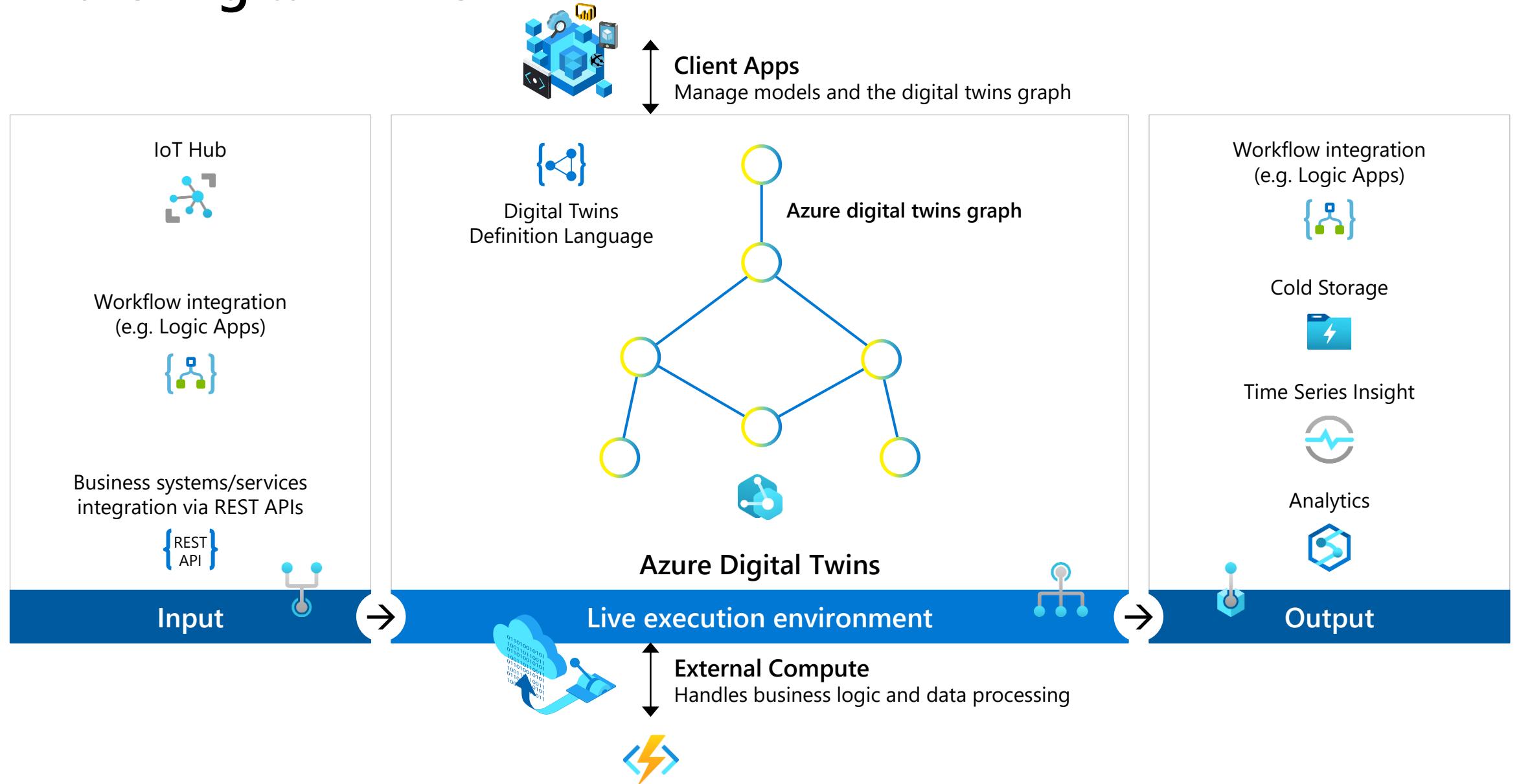
Definitions for Manufacturing

	Definition	Details	Example
Configuration Management	Configuration Management captures the bill of materials definition of a product through its entire lifecycle.	The asset acquires a serial number at some stage in production and from that point onwards, the digital representations of these assets can be serialized. We can thus weave a digital thread through the multiple BOMs across the lifecycle of an asset.	These digital representations manage as-designed, as-manufactured, as-configured, as-maintained configurations of an asset.
Asset Management	Asset Management provides live streaming telemetry from a device, asset or a product and allows you to remotely control the device or asset.	In addition to the telemetry from the IoT devices, these digital representations can be overlaid in a mixed reality environment of the asset for a more interactive experience. These twins can also update the device firmware and interact with other devices on the assets for a complete view of the asset	A set of IoT sensors on a compressor might provide visibility into the air intake speed, vibrations, temperature etc. It might also provide for a mechanism to start or stop a pump or change speed etc.
Process Control	Process Control manages the interactions between multiple digital models across a factory floor or a plant for an advanced end to end process view and control.	Process control interacts with multiple digital representations on the factory floor or a plant. They provide visibility into higher level manufacturing processes in scenarios where a twin of a machine or asset communicates with one or more other digital models. Depending on the scenario there could be requirements for communication latency across assets thereby relying on a specific type of communication protocol depending on the use case.	A sequence of robotic manufacturing operations will require the robots to communicate with each other. For efficient operations and for example to prevent accidents, these communications might have certain latency requirements.
Performance Management	Performance Management captures business performance and metrics in a broad digital sense with an ability to autonomously control business processes, if desired.	Performance management goes a step beyond the traditional business intelligence and dashboards. They can be augmented with artificial intelligence capabilities to be autonomous and self-correcting/self-healing to manage various aspects of the business.	Performance management can be applied to model the production schedules, S&OP plans, operator efficiencies, supply chain and financial risks etc.
Simulation Modeling	Simulation Modeling can create a digital representation of an asset even before the physical assets are made, by using a library of simulation models & capabilities.	It involves creating and analyzing a digital prototype of a physical system to predict its performance. Newer applications in simulation even include an ability to generate telemetry when a physical device does not exist, like in the early stages of prototyping or where a physical sensor cannot be placed.	Simulation modeling of physical sensors are used where a physical sensor cannot be placed E.g. at the center of a molten steel flow or the exhaust of a jet engine where high temperatures make it difficult to place any sensors.

Key outcomes enabled by Digital Twin applications

	Configuration Management	Asset Management	Process Control	Performance Management	Simulation Modeling
Challenges	<ul style="list-style-type: none">Digital ThreadVisibility to the install baseAccessory/Upgrade Compatibility	<ul style="list-style-type: none">Telemetry from devicesAsset health monitoring	<ul style="list-style-type: none">Orchestration across factory floorIntegration across supply chain	<ul style="list-style-type: none">Real time visibility of business KPIsVisibility into computed metrics (e.g. OEE, OLE)	<ul style="list-style-type: none">Inability to place a sensor at certain placesReal telemetry too late to make changes
Applications	<ul style="list-style-type: none">Serialized asset trackingDigital ThreadRUL estimation	<ul style="list-style-type: none">IoT based twinsHiL/SiL testingDev/Test cycles	<ul style="list-style-type: none">Remote OperationsProcess OptimizationRoot cause analysis	<ul style="list-style-type: none">Customer service level monitoringFinancial modelingRisk modeling	<ul style="list-style-type: none">Simulate sensor telemetry based on other available dataSimulate process flows for what-if analysis
Outcomes	<ul style="list-style-type: none">Better visibility into the asset configuration in the install baseAbility to upsell cross sellImproved customer satisfaction	<ul style="list-style-type: none">Autonomous Dev/TestOTA updatesPredictive maintenance	<ul style="list-style-type: none">Remote visibility and controlAbility to rewind and replayML/AI models for autonomous process control	<ul style="list-style-type: none">End to end visibility of business performanceProactive adaptation to business changes	<ul style="list-style-type: none">Ability to estimate telemetry values where sensors cannot be placedRapid what-if simulation to predict outcomes

Azure Digital Twins





Thank You

