Microsoft Azure

Digital Feedback Loops

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In this session

- Connectivity, Eventing, Messaging, Streaming, Analytics, and AI

  The present and future of real-time information pipelines and event-driven apps

- Encodings, Metadata, Schemas, and Stream Catalogs

  Moving from raw data pipes to „formatted“ communication links

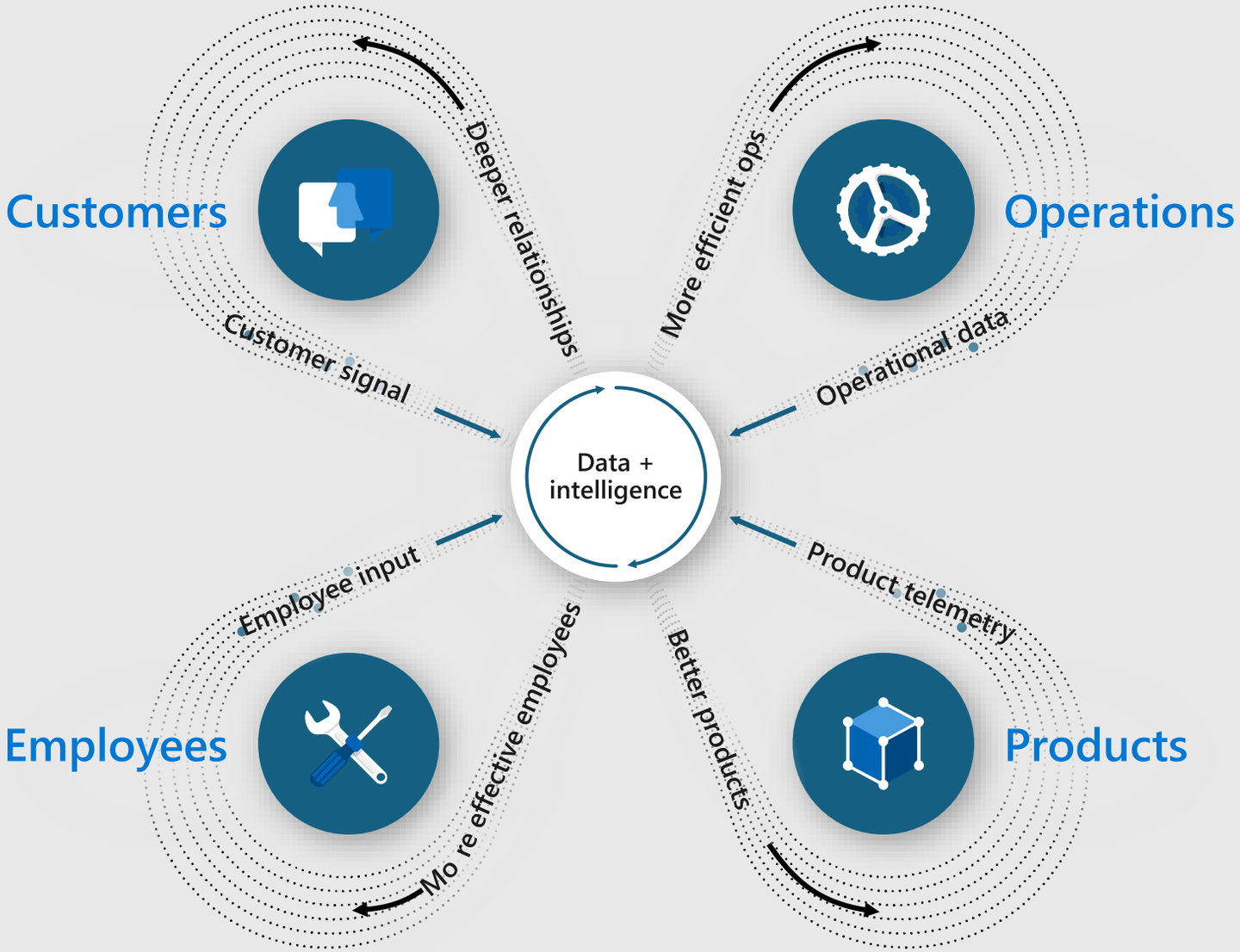
- Azure Messaging, Stream Processing, and Real-Time Analytics

  A look at what‘s new and an outlook to what‘s coming

* All that not necessarily in this order

The digital feedback loop

1. Data: Capture digital signal across business
2. Insight: Connect and synthesize data
3. Action: Improve business outcomes



Energy Grid and Natural Resources

Renewable energy driving real-time information flow requirements.

Electricity Market Roles & Information flows

NORD POOL

Electricity Market Operators

Consumer

Meter data

Citizen Energy Community

Balance Service Provider (BSP)

Distribution

Energy Supplier

Production demand & supply data

Network Company (DSO)

Producer

Ad-hoc balancing exchange

Energinet(TSO)

High voltage transmissions

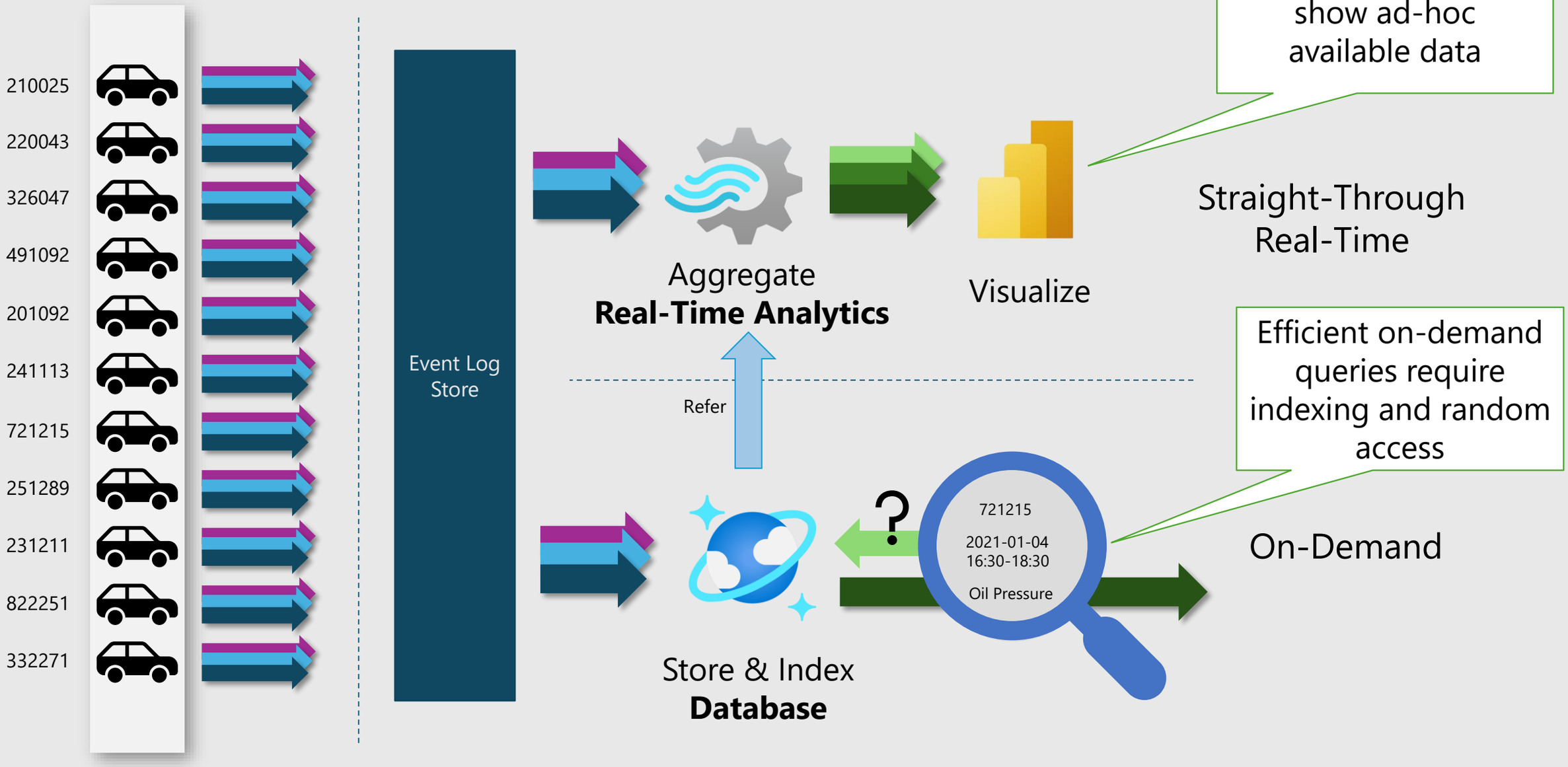
Exchange

Aggregator

ENERGINET

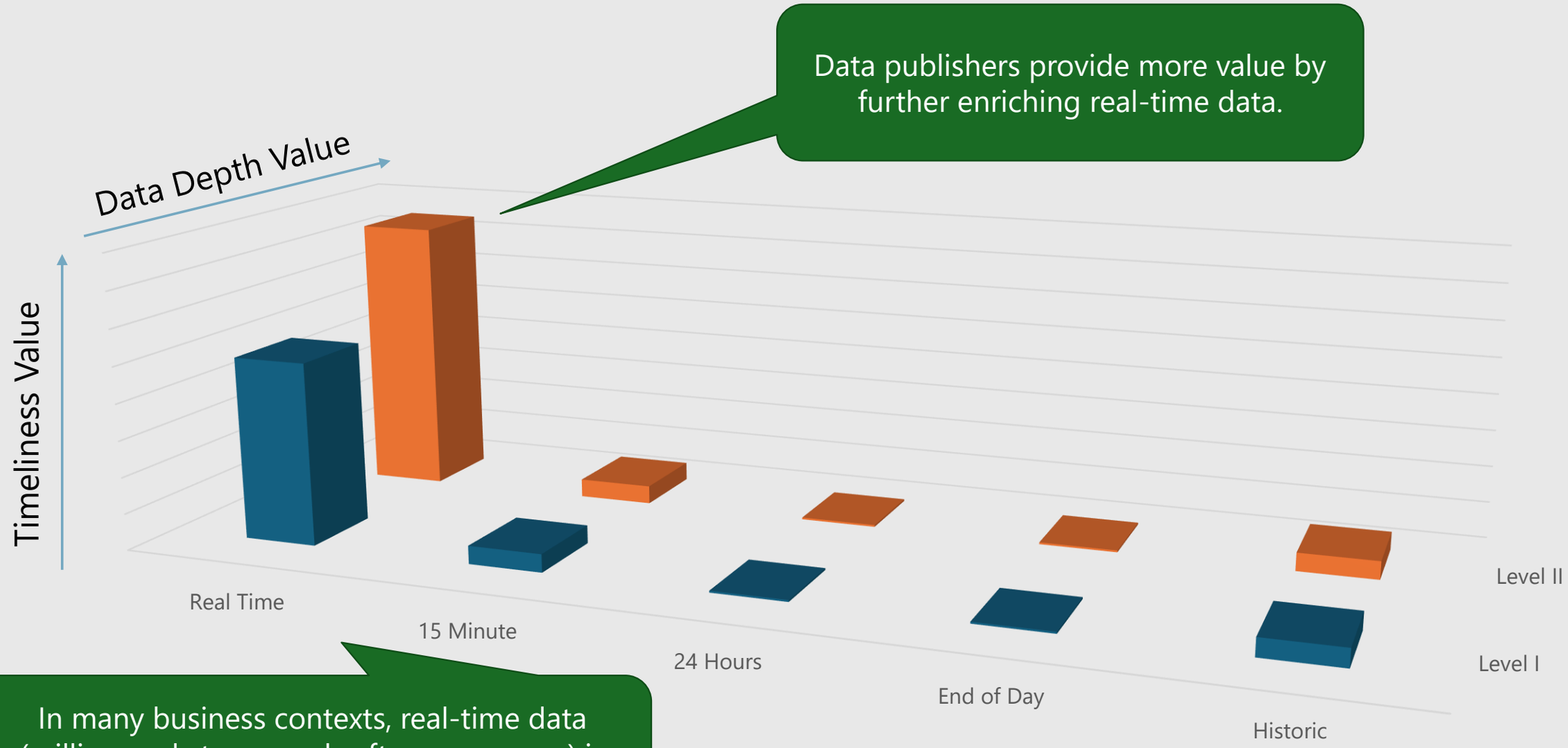
Intelligent Mobility and Connected Car

Event Streams and Context

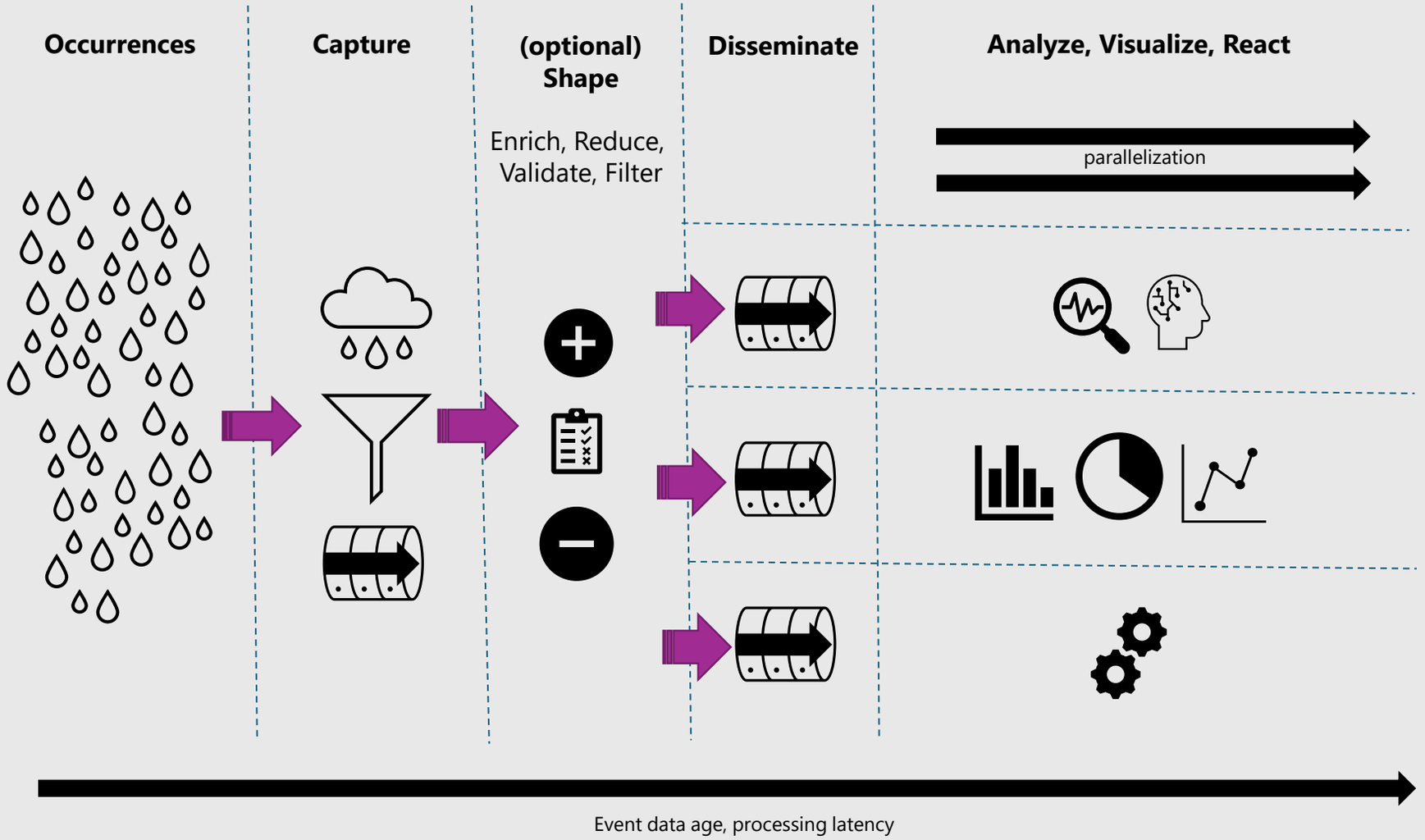



Financial Services

Event Data Value – Securities Markets



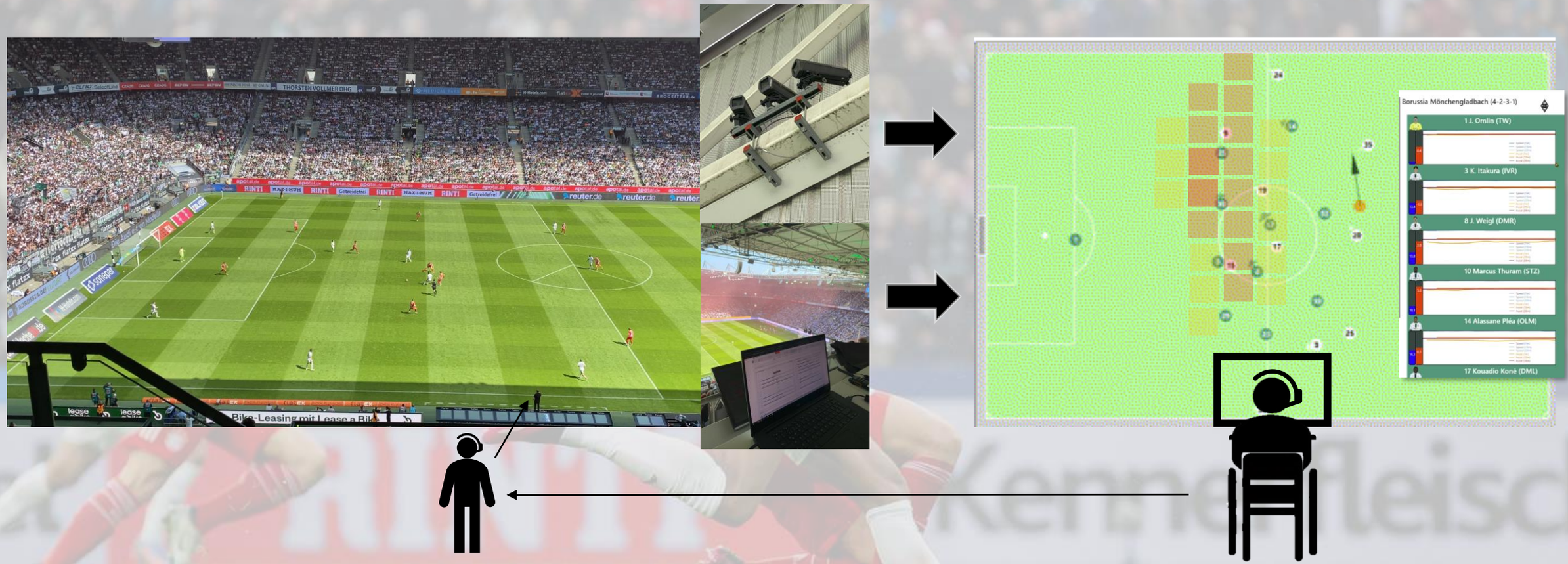
Velocity Matters ➔ Parallelization Matters




Sports
PLEA
14
Kennerfleisch

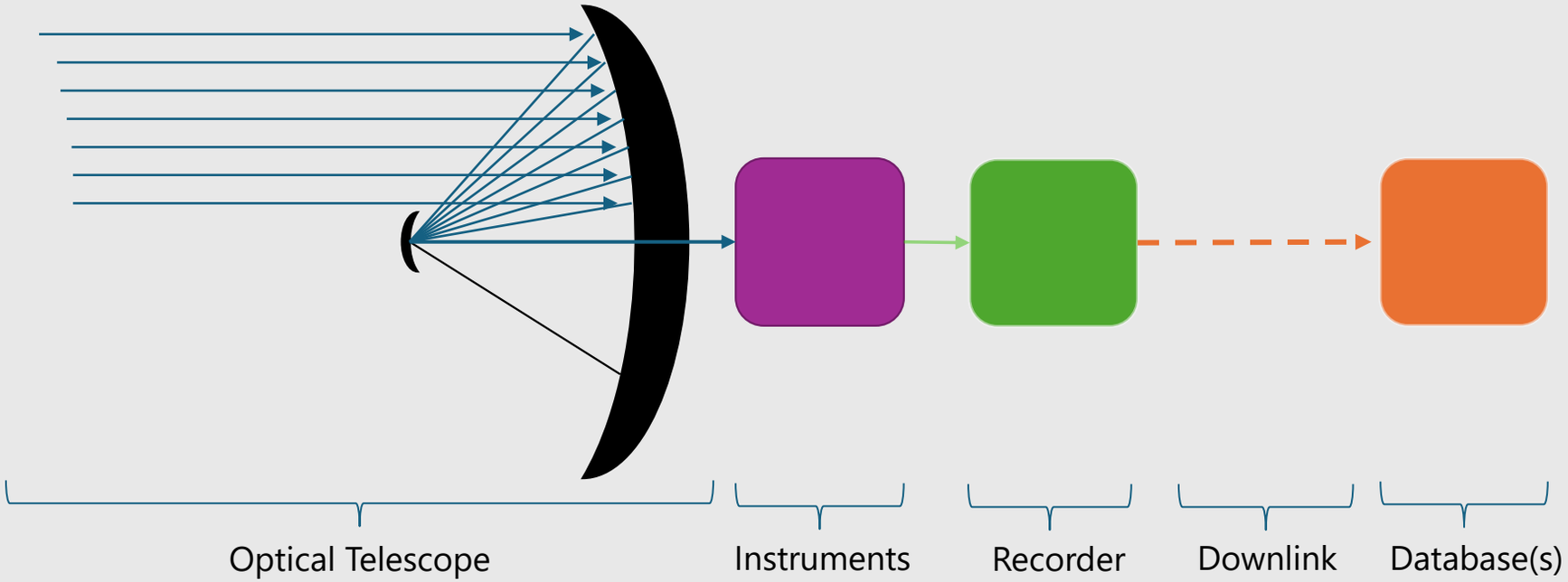
Staying competitive without selling out

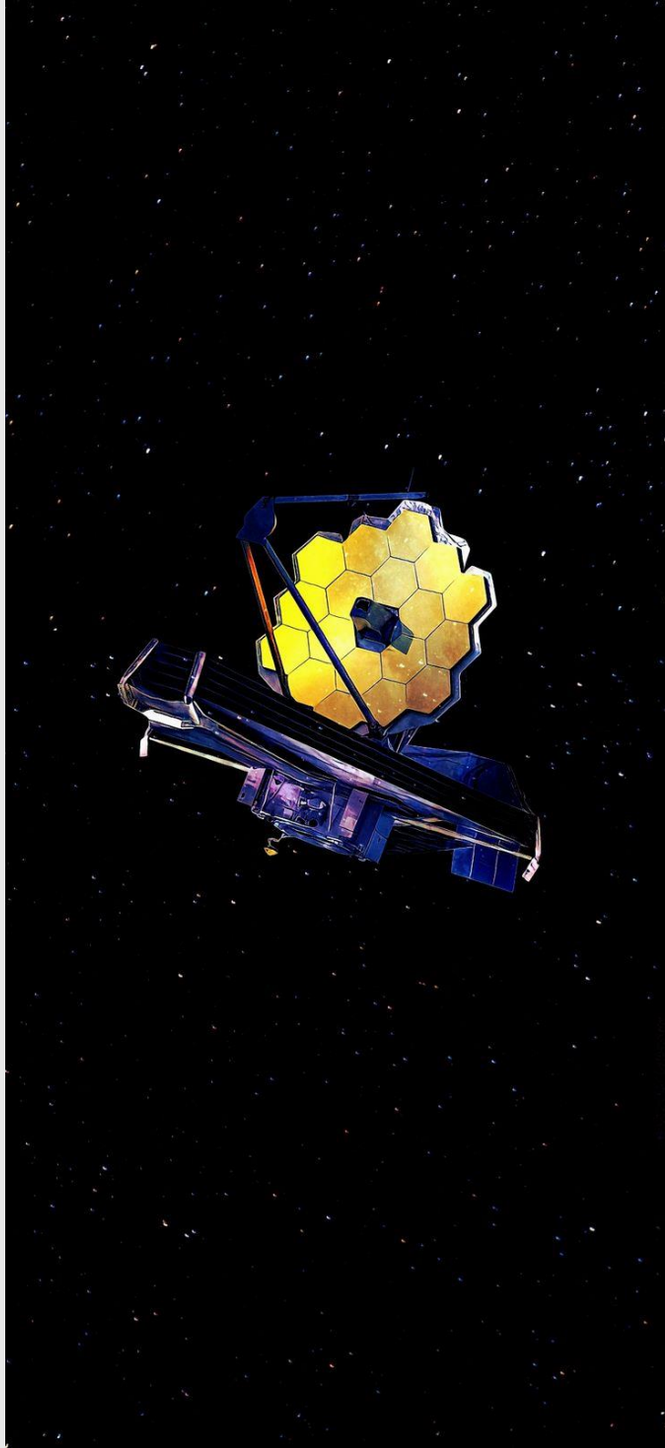
Real-time analytics driving live strategy and tactics in professional football (soccer)




Space
Science

James Webb Space Telescope





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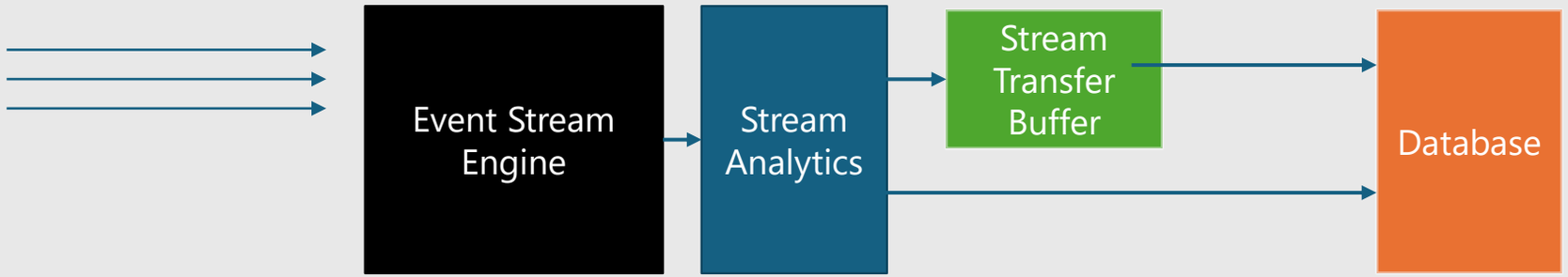
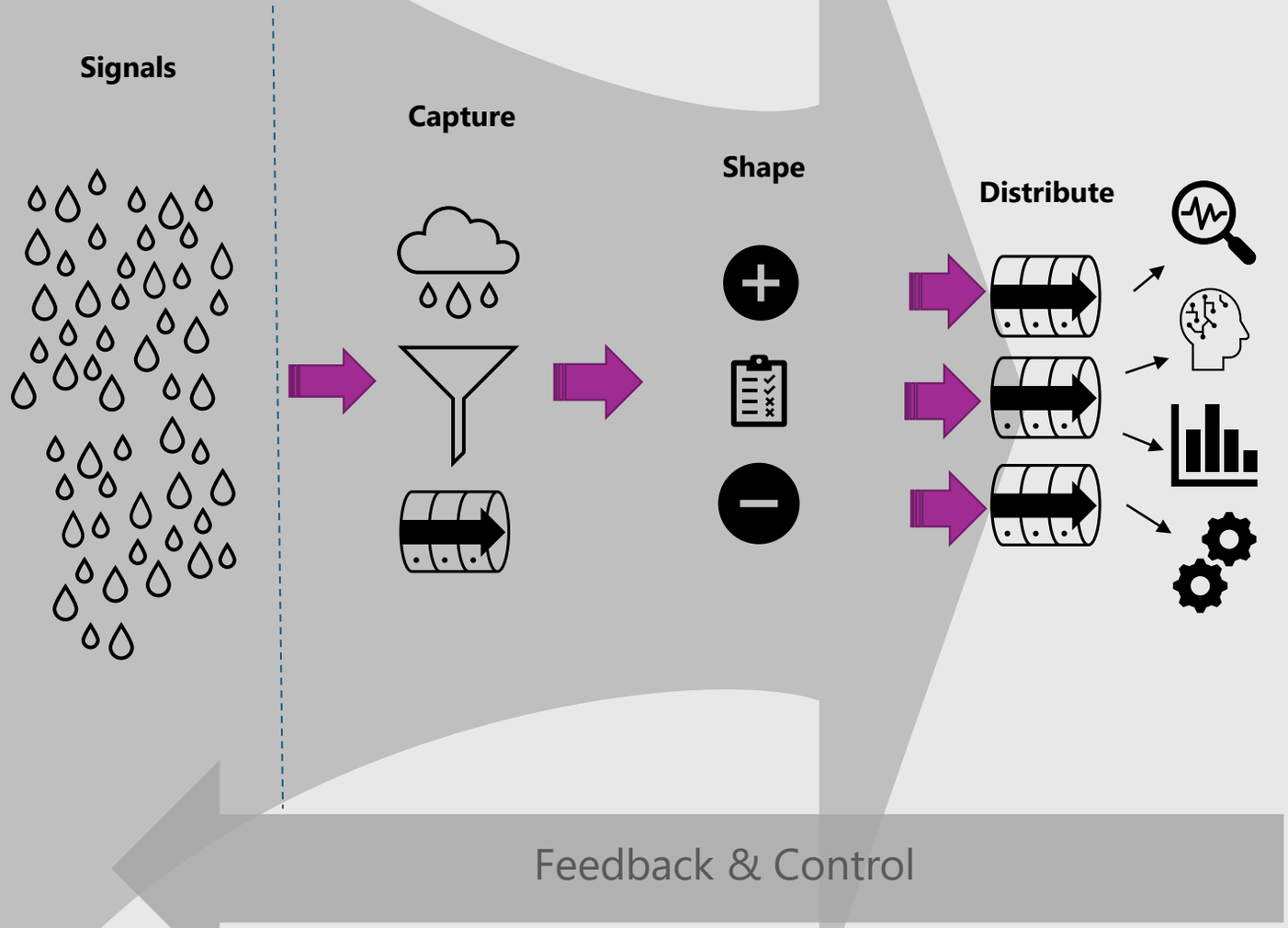


Real-Time Event Flows



Real-Time Data Scenarios

- Analyze and visualize conditions and trends to understand the behavior of a system and its parts
- Compare current behavior against recorded behavioral patterns and their outcomes
- Diagnose and correct unexpected system behaviors or failures
- Compute predictions of condition changes to preempt failures
- Inform decisions on modifying the configuration of a system
- Action decisions through feedback
- Monitor and audit action outcomes
- Replay real-time data into simulation environments
- …

What do you need?

Connectivity & Interop

Scalable and reliable communication paths using protocol options that fit the use-case scenario.

- Lightweight protocols for constrained devices and limited bandwidth links
- Multiplexing async protocols for high throughput data links
- Protocol options with ubiquitous reach for integrating with everything
- Standards-based communication for broad ecosystem integration

MQTT

AMQP

kafka

HTTP

JMS

cloudevents

Encoding & Validation

Efficient data encodings for fast data transfers, schemas describing payload data shapes, and flexible data transformations.

- Compact encodings for low bandwidth or very large structured data sets
- Schema registry for sharing metadata for validation and encoding
- Standards-based encoding options with ubiquitous reach for integrating with everything

AVRO

Parquet

Protobuf

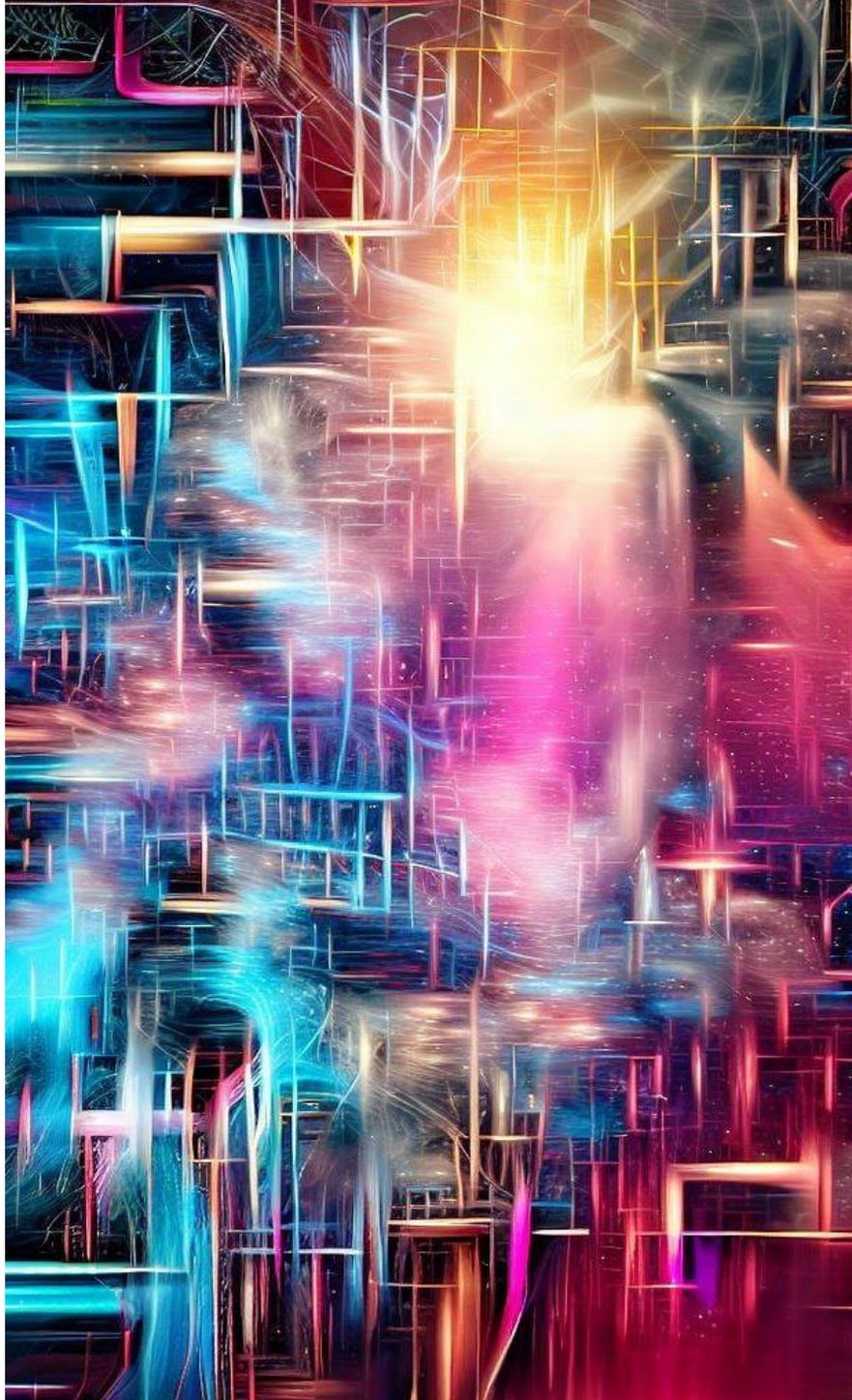
{JSON}

<xml />

Enrichment, Aggregation, Transformation & Routing

Real-time, in-the-loop processing and transformation of streaming data.

- Enrichment of streams with context and reference data
- Data filtering and aggregation to reduce bandwidth comsumption and accelerate transfers and provide on-the-fly insights into trends and performance metrics
- Inside-the-stream computation of derivative signals and signal fusion
- Transformations and recoding for targeting different stream destinations



Storage & Indexing

Efficient short-term and long-term storage of raw and aggregated event data

- Projection into indexed, relational and non-relational databases and time-series stores
- Event capture into stable, standardized flat file formats for limitless long-term archival
- Partitioning and batching for efficient parallel processing in batch-oriented compute pipelines

Visualization & Exploration

Find sections of stored event streams and correlate with other data. Detect trends and patterns, find anomalies and defects.

- Ad-hoc, interactive queries over stored data with integrated visualization capabilities.
- Composite dashboards with multiple charts and real-time updates

App & Device Integration

Capture signals and telemetry data from apps and devices at vast scale, and provide notification, data and control channels in the reverse direction

- Bi-directional communication capabilities for large fleets of devices or field systems (cars, ships, equipment, but also consumer gadgets)
- Fast, low-latency ingestion of telemetry data streams
- Selective re-distribution of data streams to broad audiences

What we‘ve got

Azure Messaging Platform

cloudevents AMQP MQTT kafka JMS

>75% of S500 customers use 2 or more of our messaging services

Message Queue Broker

Azure Service Bus

Connect apps on an enterprise message queueing and pub-sub platform using open protocols including JMS 2.0

Elastic Pub-Sub Broker

Azure Event Grid

Publish and subscribe MQTT messages and HTTP push and pull for delivery of discrete events

Event Stream Engine

Azure Event Hubs

Cloud-scale, low latency streaming platform supporting Apache Kafka and AMQP clients and services

Event Stream Processor

Azure Stream Analytics

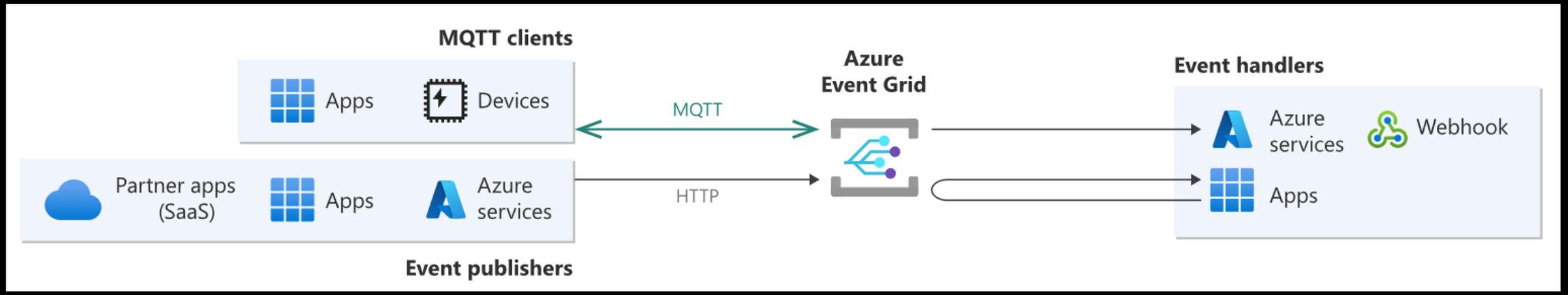
Real-time stream processing and analytics engine with rich development tools and low/no-code editor experiences

Microsoft

NEW! Azure Event Grid | HTTP & MQTT

Azure Event Grid is a *Pub/Sub message broker* that supports **diverse messaging patterns** and **multiple protocols.** In addition to existing push delivery support, Azure Event Grid now supports:

- **HTTP event pull delivery**
- HTTP high throughput of **20MB/s ingress**
- **MQTT** v3.1.1 and v5 support
- **Routing MQTT data to Azure services** for further processing



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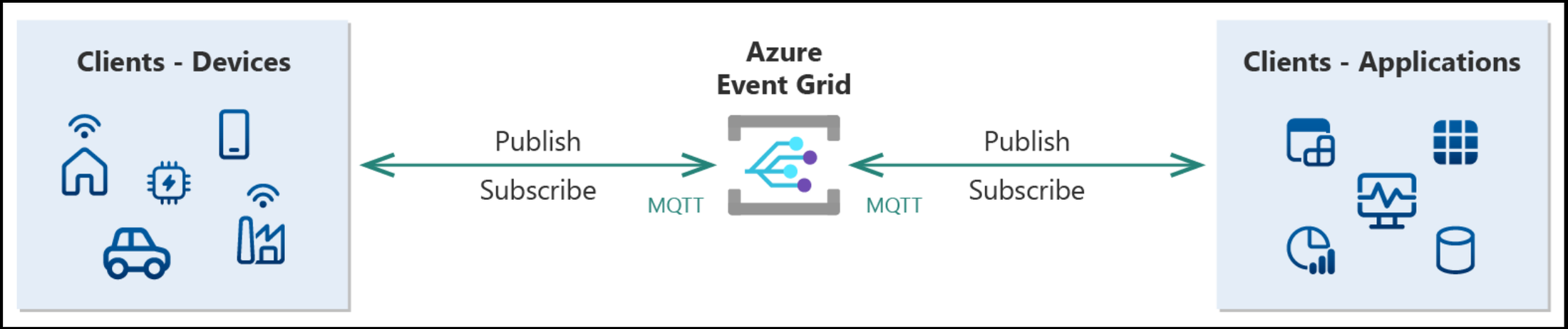
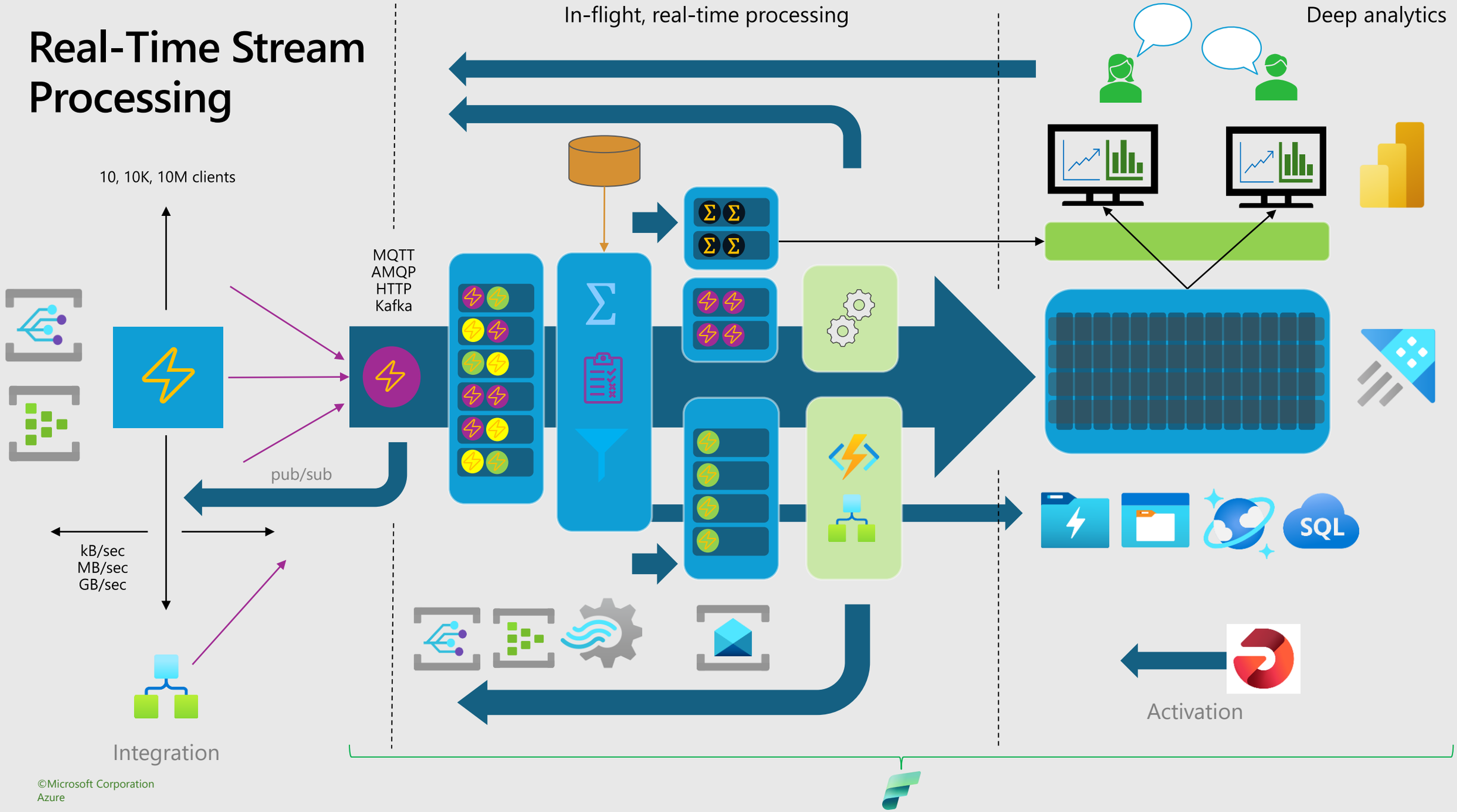
Azure Event Grid | MQTT Support

Enable your clients to communicate on custom MQTT topics, using a pub/sub communication model.

- MQTT v3.1.1 and v5 support
- Custom topics with wildcards support
- Pub/Sub messaging model
- 1-1(D2D),1-many (C2D), many-1(D2C)
- Flexible and fine-grained access control model
- Routing to Azure Services and custom webhooks
- Persistent sessions, QoS 0,1
- X.509 Certificate Authentication

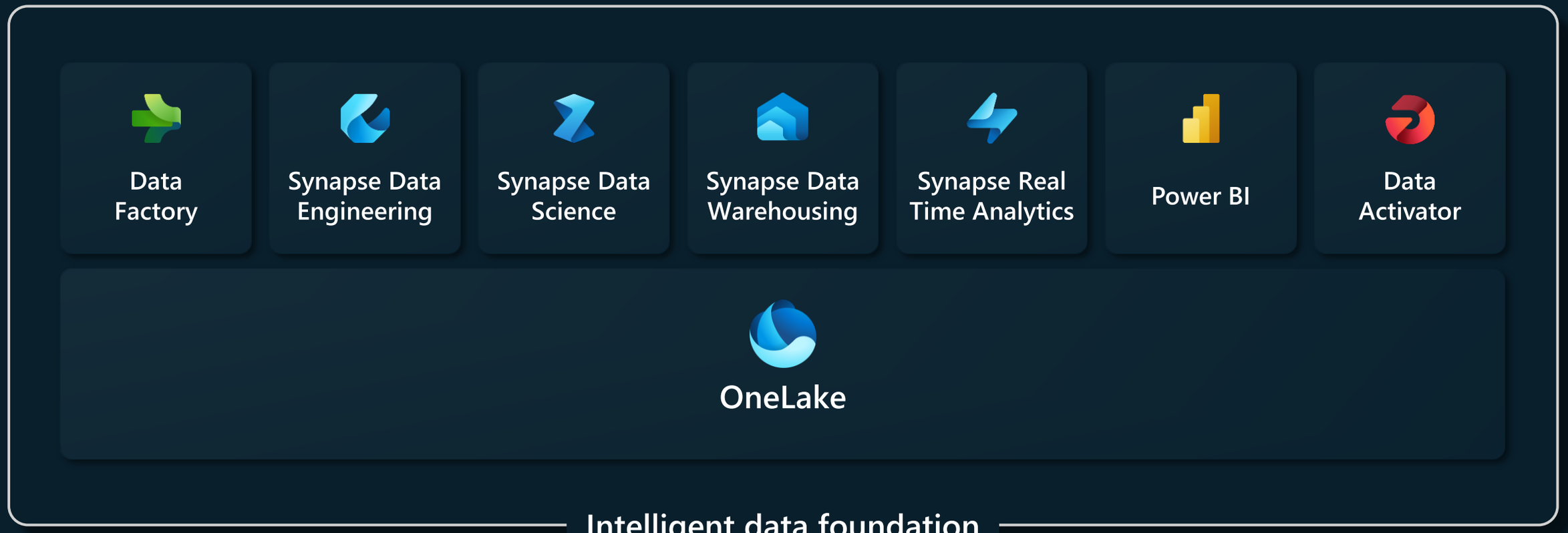


Real-Time Stream Processing



Microsoft Fabric

The data platform for the era of AI



Microsoft Fabric event streams

One stop to capture, transform, and route real-time event stream data to destinations in Microsoft Fabric with a no-code experience

Centralized place for event streams

Source for event data

Scalable infrastructure

Event capturing, transforming, routing

Ingest from streaming sources

Custom producers:
- AMQP, Kafka, …

Azure sources:
- Event Hubs, IoT Hub

Sample data

And more…

No-code experience

Drag and drop experience

Familiar and Intuitive

End to end data visibility

Event routing to Trident entities

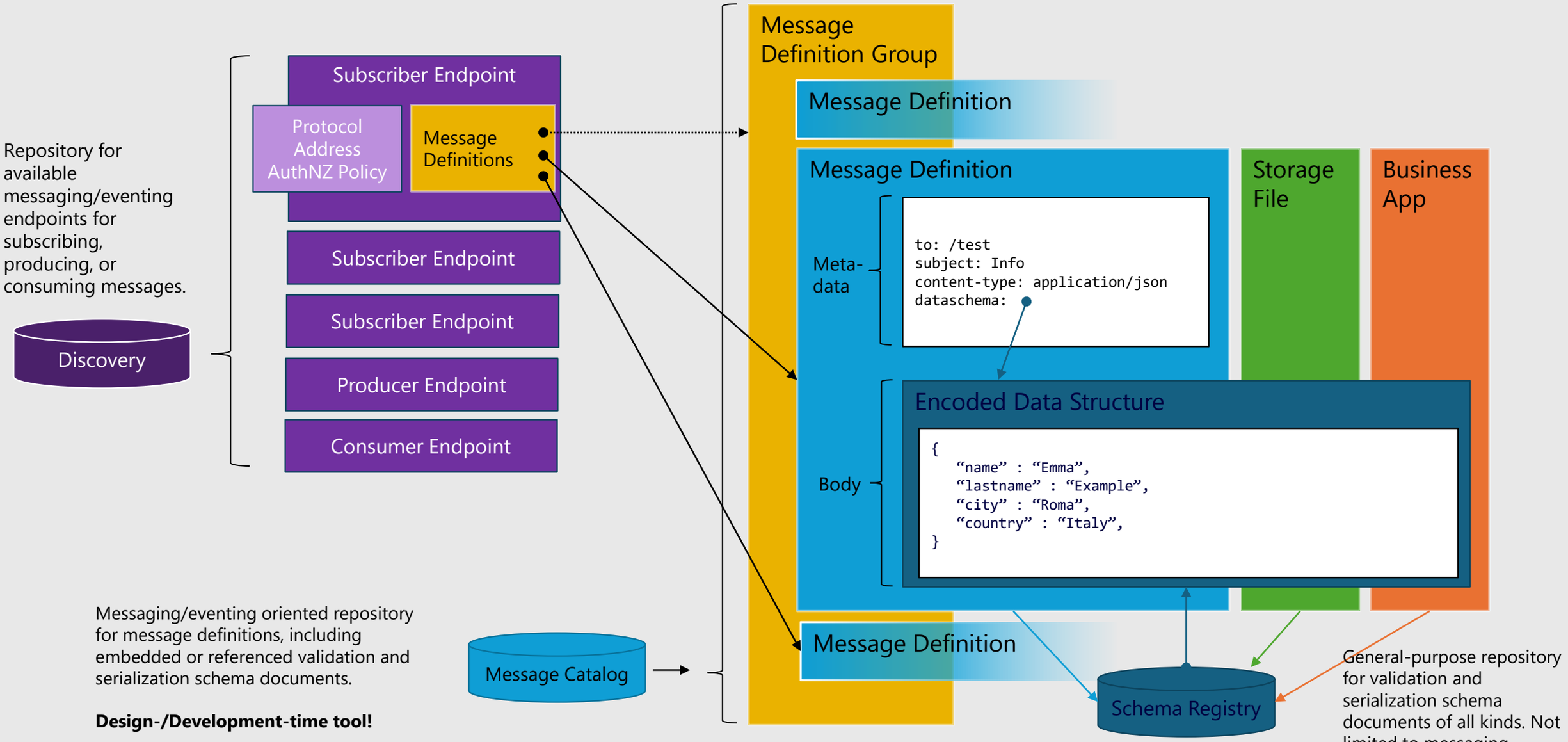
KQL database

Lakehouse for DW analysis

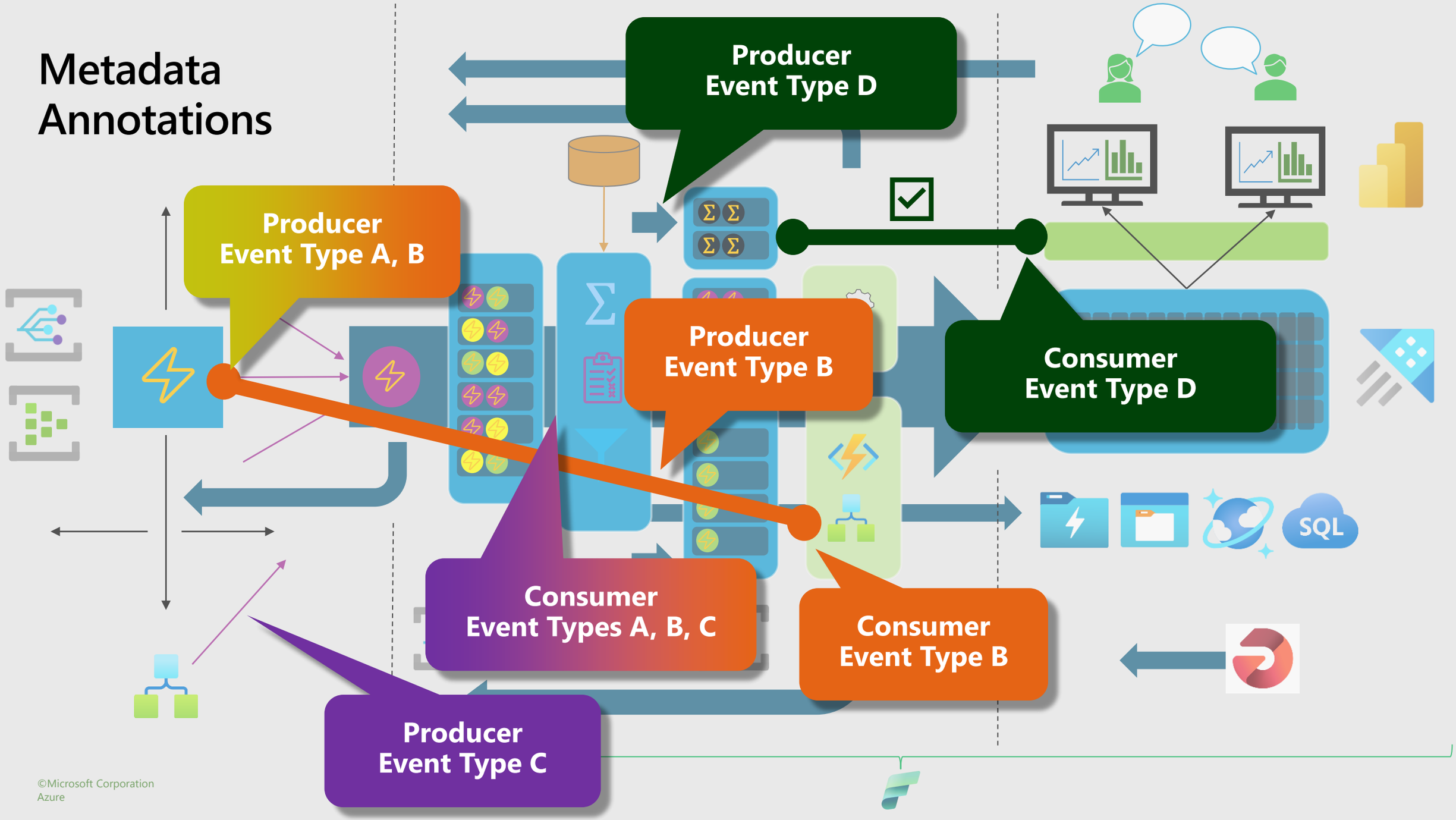
Custom consumers
- AMQP, Kafka, …

And more…

Standards Work: CNCF xRegistry (formerly CloudEvents Discovery)



Metadata Annotations



Microsoft Azure

Invent with purpose.