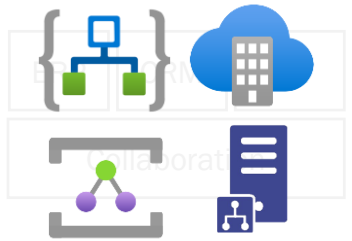
Eventing on Azure

Events, Event Streams, Analytics, and Integration

Clemens Vasters, Principal Architect, Azure Messaging
clemensv@microsoft.com

Eventing on Azure Cloud

SaaS Platform Integration



Open, Vendor-Neutral, Product-Neutral Protocols

OASIS OPEN

I E T F

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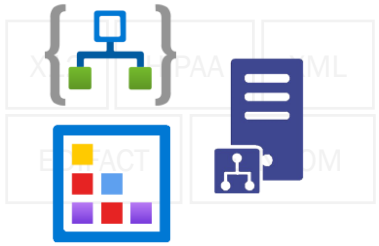
EDI Integration



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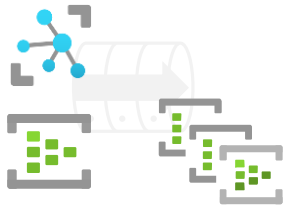

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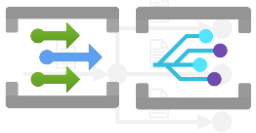

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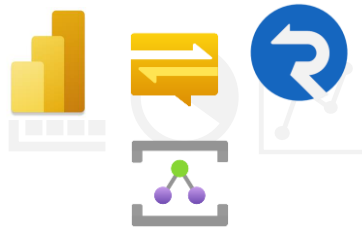
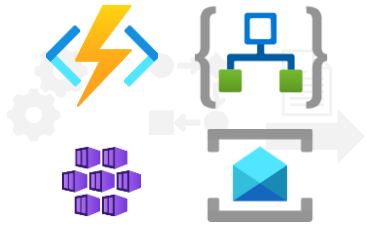


Indexed Streams and Batches

Functions, Jobs, and Workflows



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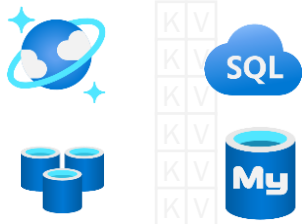
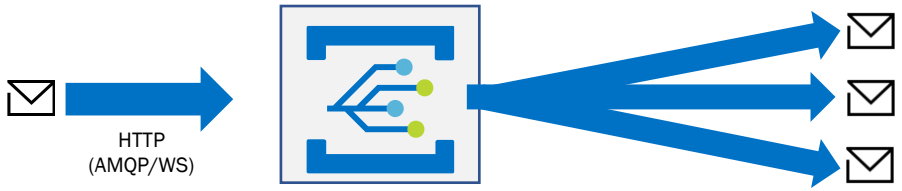


Cool/Cold Archives

Eventing and Messaging Core Services

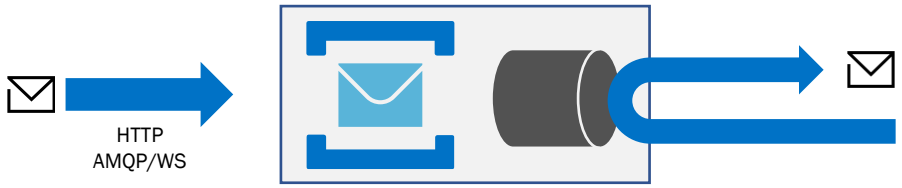
Message Oriented Services

Event Grid



Push-style distribution of discrete events to serverless workloads

Service Bus



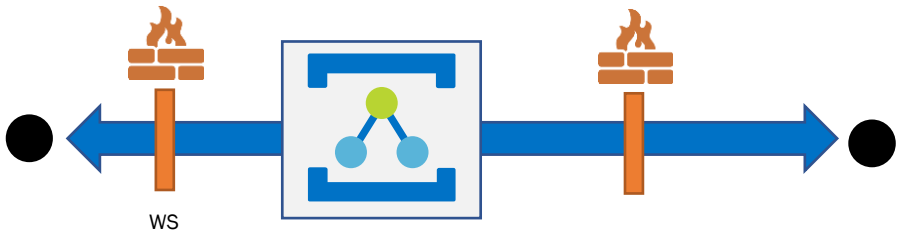
Pull-style, queue-based transfer of jobs and control via message queues and topics

Event Hubs

Partitioned, high-volume, tape-drive-style sequential recording and unlimited, pull-style re-reads of event streams.

Connectivity Services

Relay



Discovery and connectivity service for securely bridging streams across network boundaries in hybrid edge/cloud scenarios.

Agenda

- Events and Streams
- Event-Driven Applications
- Event Journeys and Patterns
- Event Platform Building Blocks
- Q&A

Events and Streams

- *Occurrence*: The capture of a statement of fact during the operation of a software system
- *Event*: A data record expressing an occurrence and its context. The context is expressed in metadata.
- *Event Stream*: A sequence of related events.

- Not an event stream: A product, a service, a broker, a log, a partition, a protocol. It’s a logical construct.

Occurrences

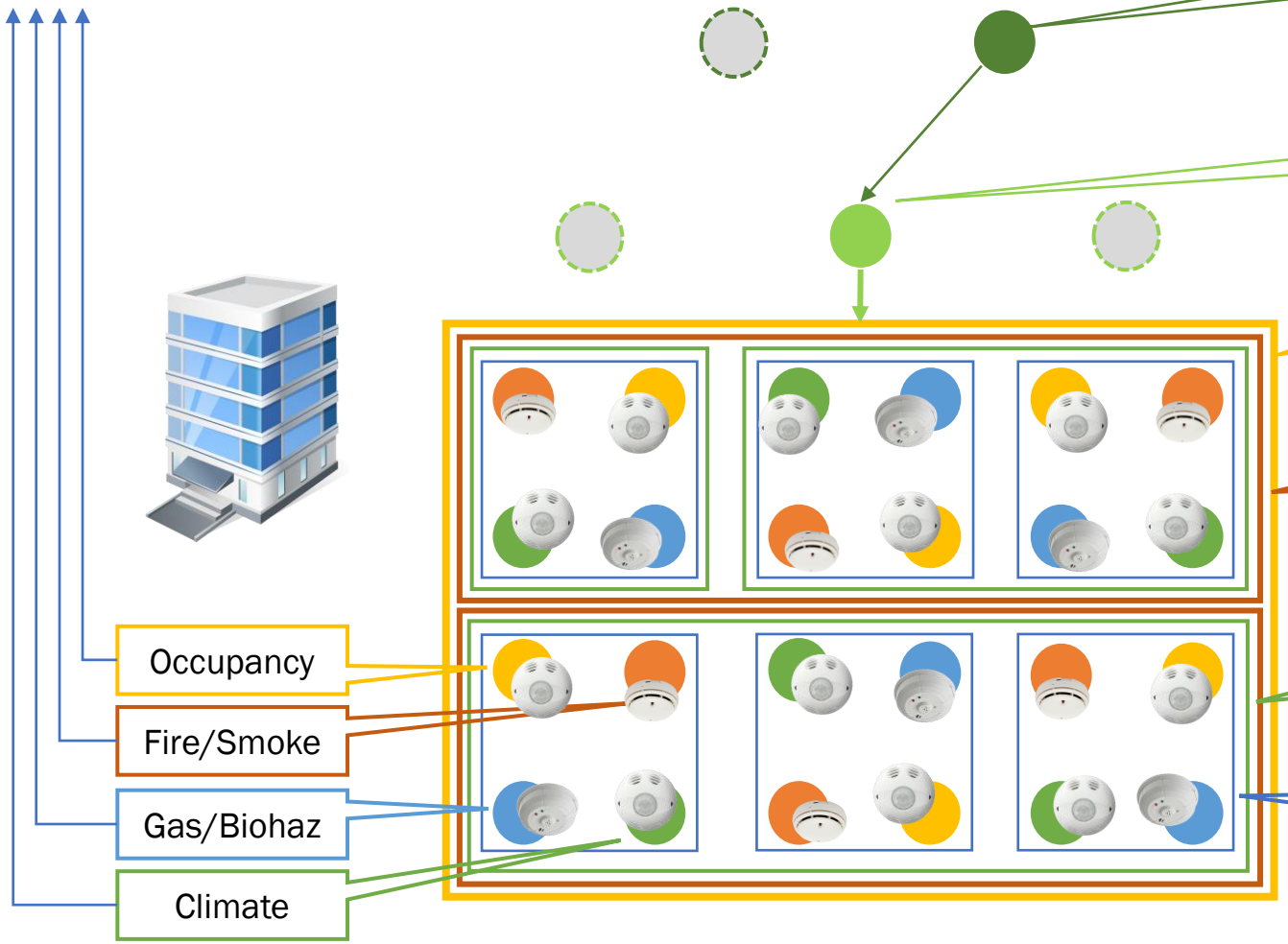
/org/contoso/site/berlin/building/41/floor/3/unit/j/room/4/sensors/occupancy

/org/contoso/site/berlin/building/41/floor/3/unit/j/room/4/sensors/fire

/org/contoso/site/berlin/building/41/floor/3/unit/j/room/4/sensors/gasbio

/org/contoso/site/berlin/building/41/floor/3/unit/j/room/4/sensors/climate

Events put occurrences into context



Org

/org/contoso/

Site

/org/contoso/site/berlin/

Building

/org/contoso/site/berlin/building/41

Floor

/org/contoso/site/berlin/building/41/floor/3

Unit

/org/contoso/site/berlin/building/41/floor/3/unit/j

Room

/org/contoso/site/berlin/building/41/floor/3/unit/j/room/4

Events enable analytic answers and reactive actions

/org/contoso/site/berlin/building/41/floor/3/unit/j/room/4/sensors/occupancy

/org/contoso/site/berlin/building/41/floor/3/unit/j/room/4/sensors/fire

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/org/contoso/site/berlin/building/41/floor/3/unit/j/room/4/sensors/climate

Occupancy

Fire/Smoke

Gas/Biohaz

Climate

Analytics Questions:

- Are there people in room 41 3J/4?
- What room is unoccupied in building 41?
- Is there a fire alarm at the site?
- How is the air quality on the lab floor?
- What's the temp in tenant unit 41 3J?

Reactive Actions:

- Signal evacuation and alert the Fire Department if any fire or gas/biohaz sensor on site goes into an alert state.
- Adjust floor HVAC when average temp on any building floor deviates by +/- 2C from 20C.
- Alert Security when unexpected occupancy is detected in Unit 41 3J.

Org

/org/contoso/

Site

/org/contoso/site/berlin/

Building

/org/contoso/site/berlin/building/41

Floor

/org/contoso/site/berlin/building/41/floor/3

Unit

/org/contoso/site/berlin/building/41/floor/3/unit/j

Room

/org/contoso/site/berlin/building/41/floor/3/unit/j/room/4

Eventing Categories

Discrete

Independent
Report State Change
Actionable

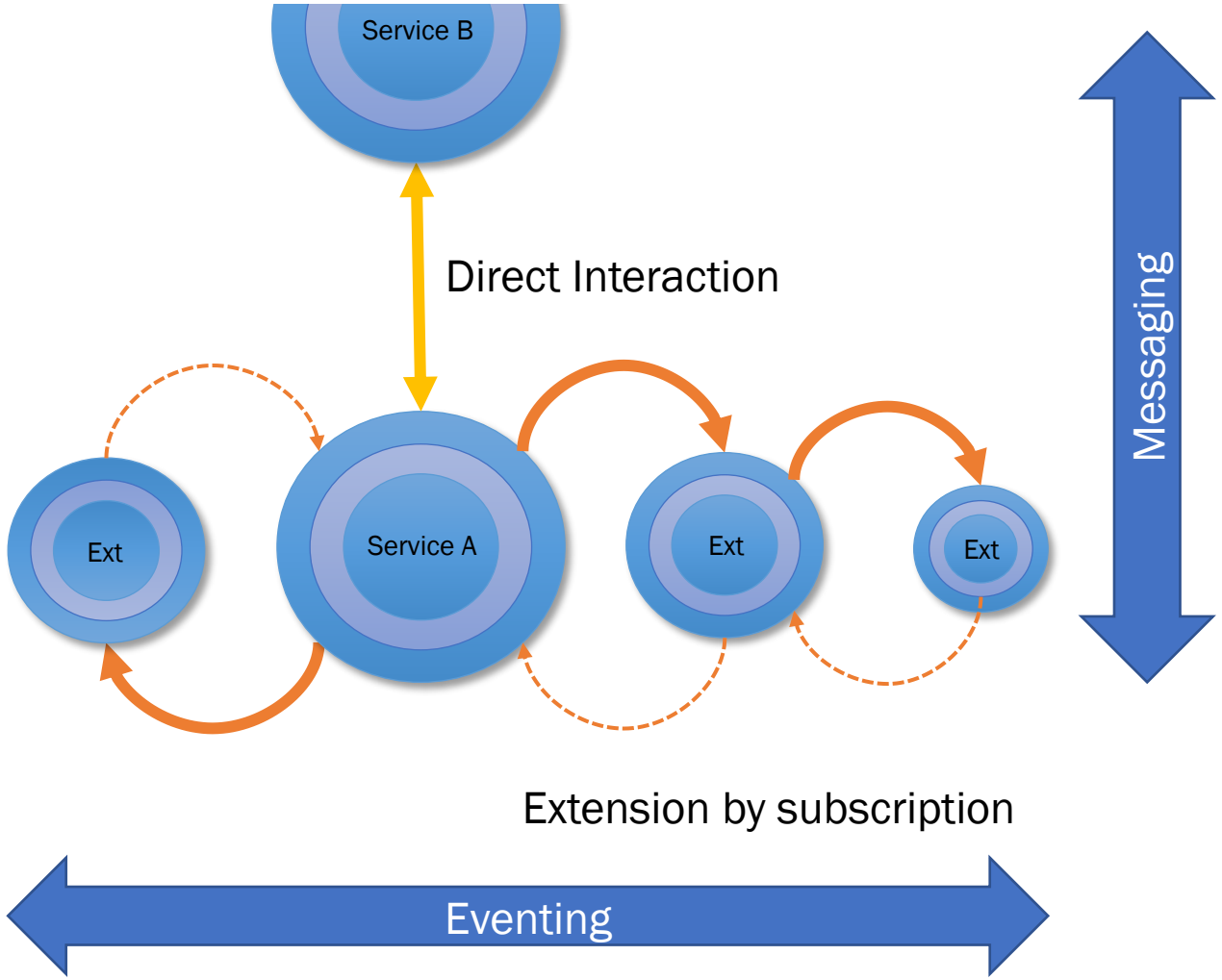
Series

Time Ordered
Context Partitioned
Report Condition
Analyzable

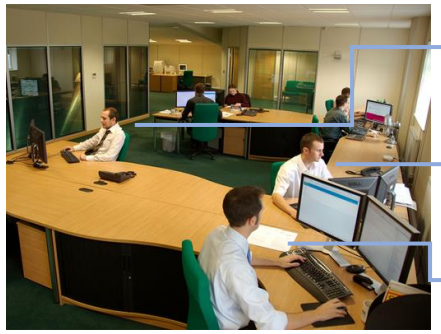
Discrete Events

Service Cores + Event-Driven Extensions

- “Core” functions of services are built to satisfy previously known use-cases and often behaviorally coupled:
  - Async command flow, RPC calls, contract dependencies
- Reporting occurrences as events allows extensions to react and provide extra value, strategically and tactically.
  - Core service has no expectations of extensions and might not know of their existence



Event-Driven Photos



News Website Editorial Office (edit/publish)

New! Import?

Lightroom

Photoshop

Newsroom App

edit

republish

Check & add tags

update

Mobile (out shooting)

Cloud

photoReindexed

photoIngested

import

Index Database

aircraft, indoors, blue, white, UK, Cosford, Canon, 6D

update

"Aircraft in Service"

publishDone

sizedImageCreated

Uploads RAW and/or JPG

Update published assets

aircraft, indoors, blue, white, UK, Cosford, Canon, 6D

blobCreated

Normalize format, auto-classify, tag, move

read/delete

write

blobCreated

blobCreated
blobDeleted

Blob Container "sizedImages"

Create sized images

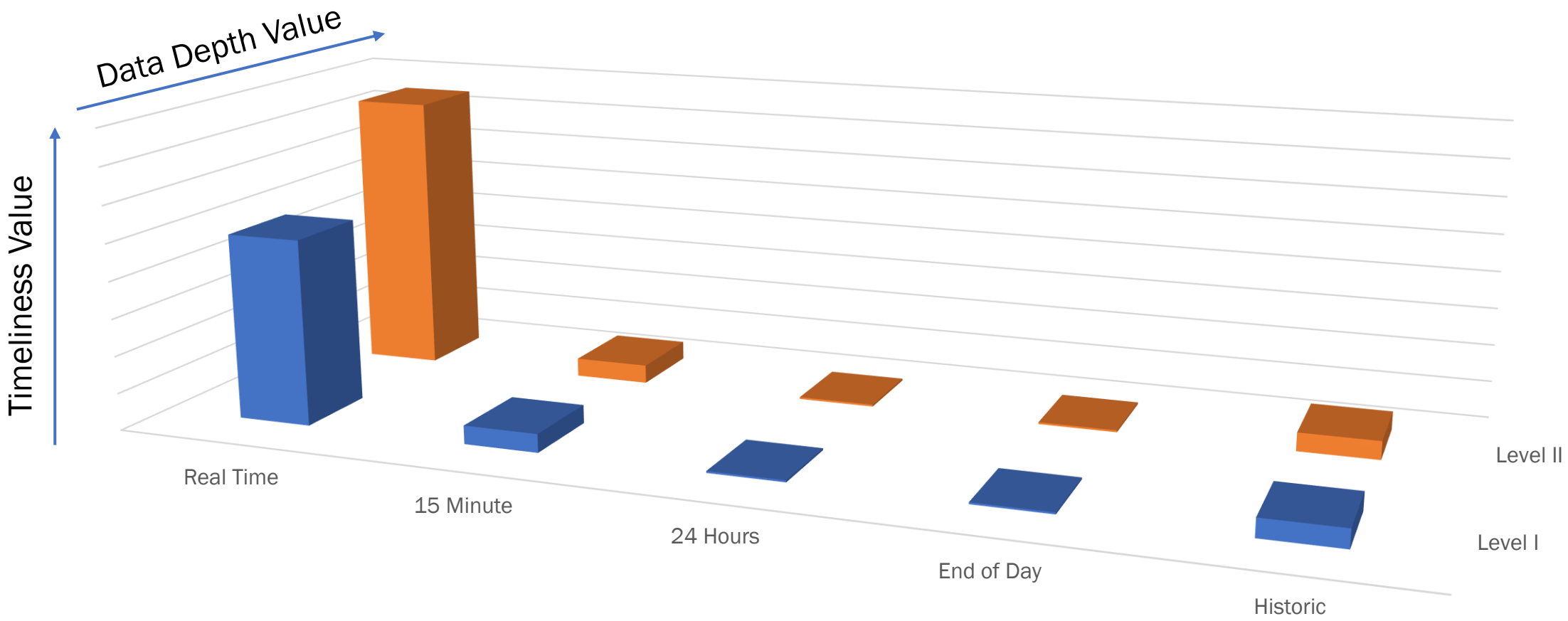
read

Blob Container "inventory"

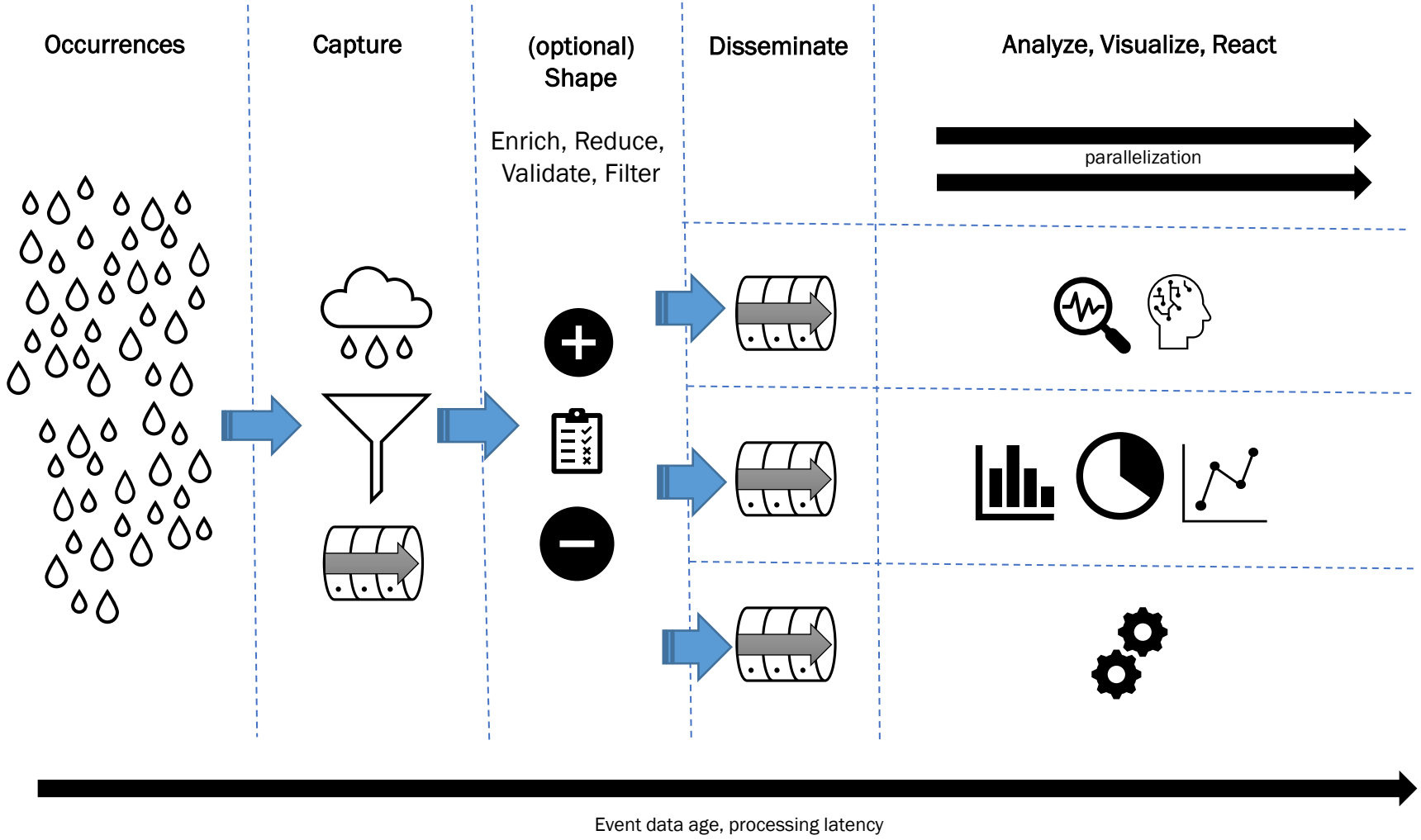
Blob Container "uploads"

Event Streams and Timeliness

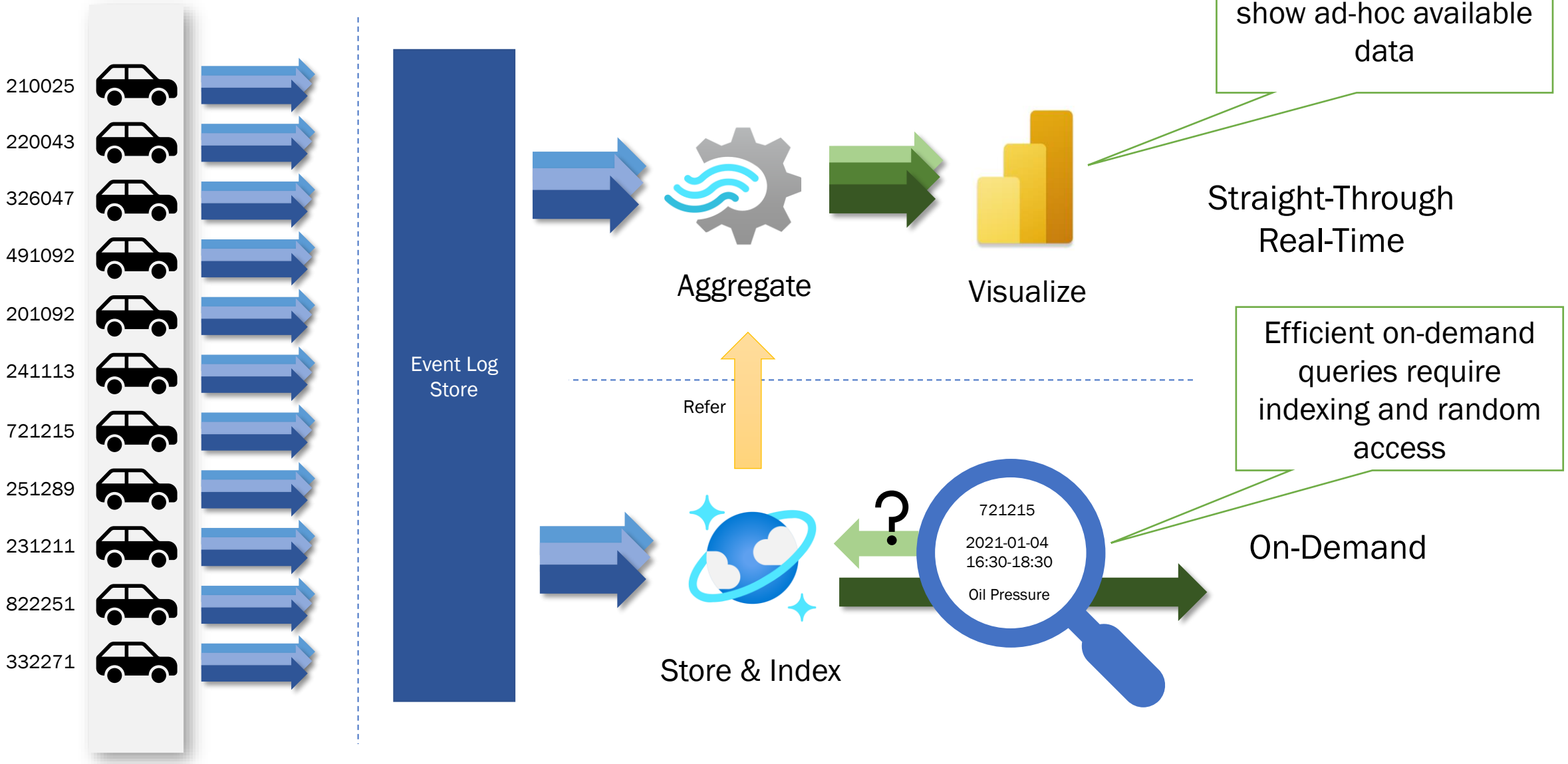
Event Data Value – Securities Markets



Velocity Matters ➔ Parallelization Matters

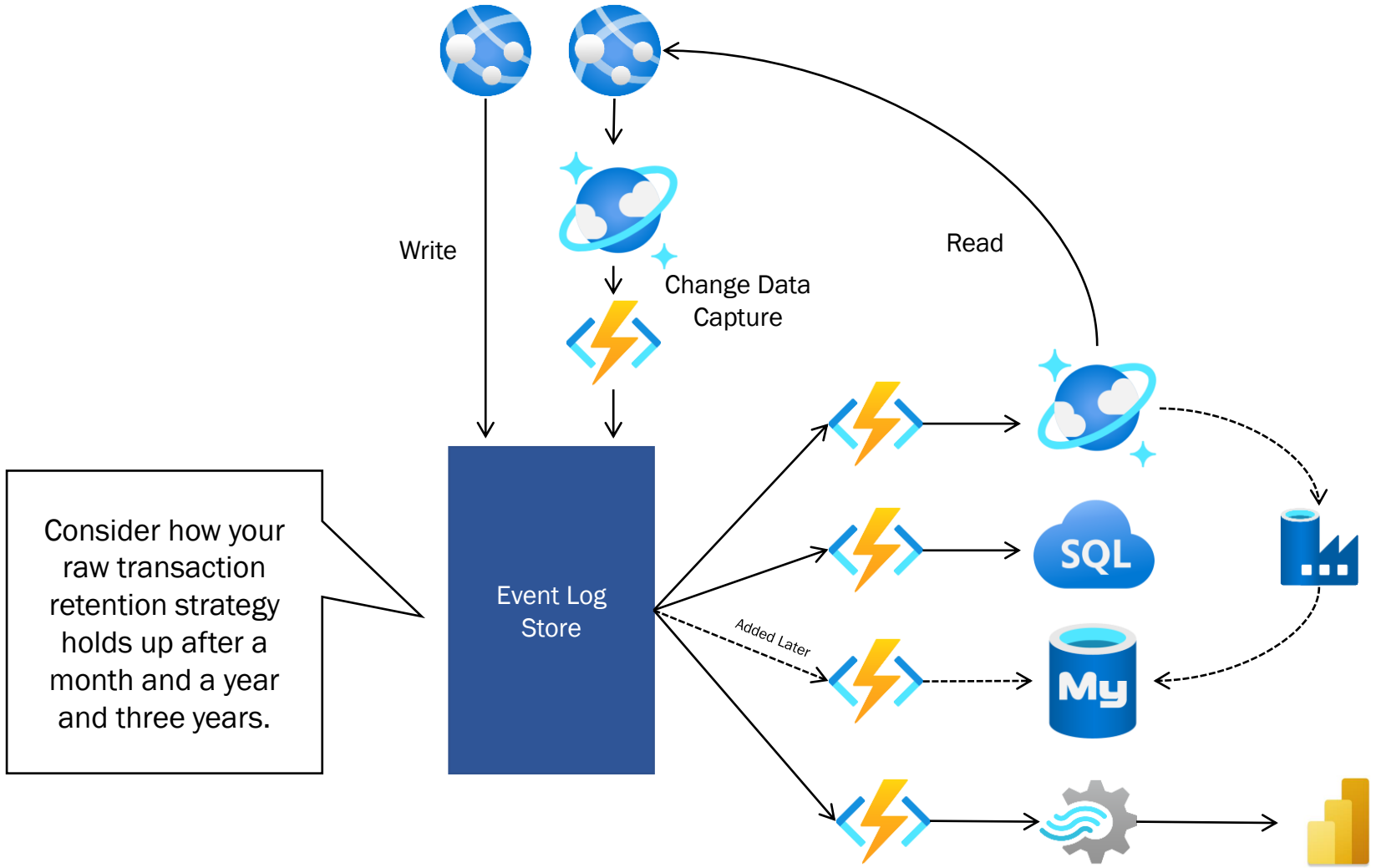


Event Streams and Context



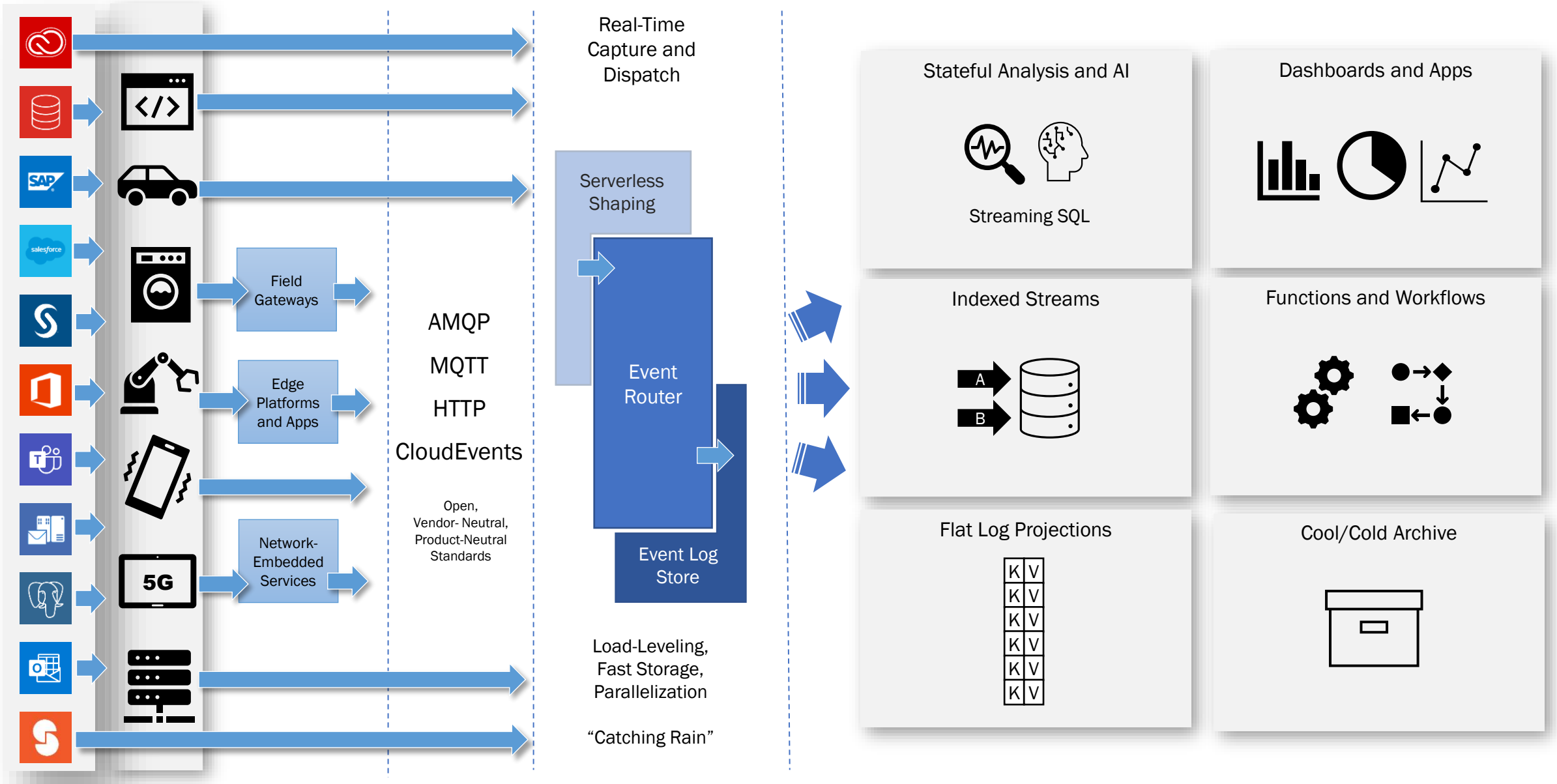
Event Sourcing

Event Sourcing and CQRS



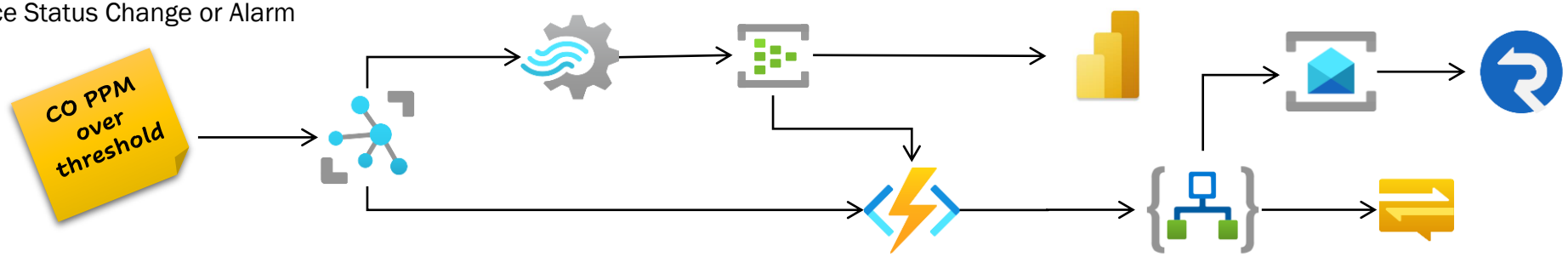
Event Journeys

Federation: Event Journeys

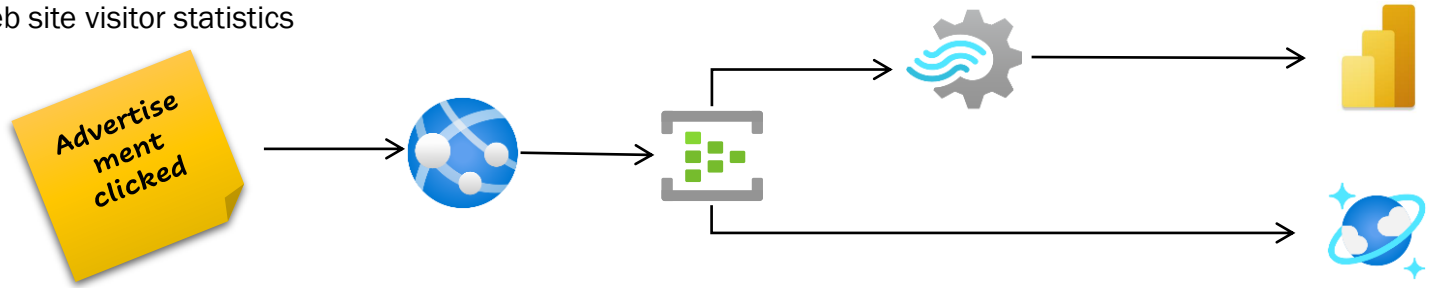


Event Journeys

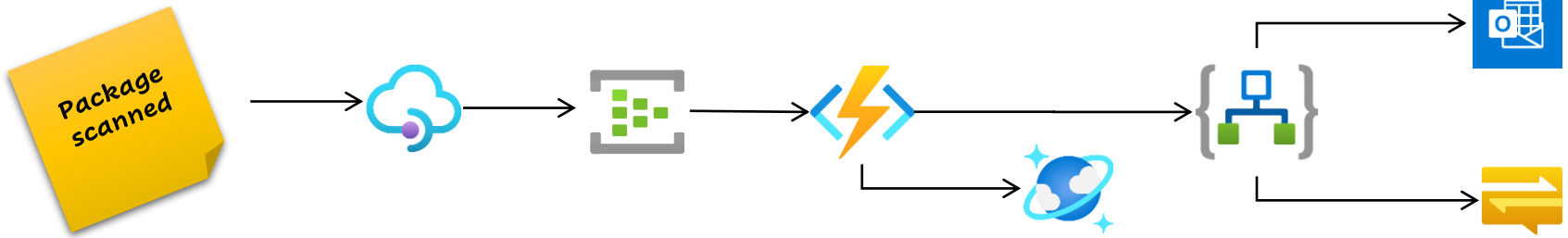
Device Status Change or Alarm



Web site visitor statistics



Package delivery



Eventing Platform Building Blocks

SaaS Platform Integration

ERP | CRM | HR

Collaboration

Open, Vendor-Neutral, Product-Neutral Protocols

AMQP | MQTT | HTTP

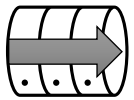
Web Sockets | CloudEvents

EDI Integration

X12 | HIPAA | XML

EDIFACT | EANCOM

Event Stream Capture and Streamed Delivery



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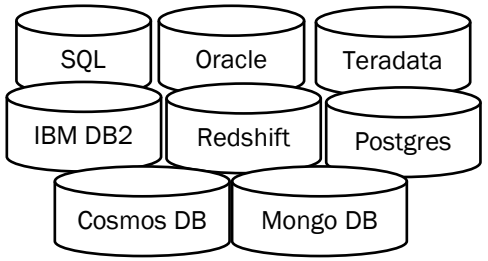

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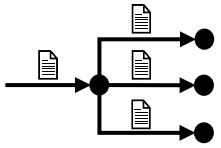


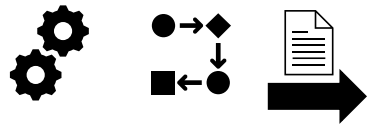
Stateful Analysis and AI

Streaming SQL

Dashboards and Apps

Indexed Streams and Batches

Functions, Jobs, and Workflows



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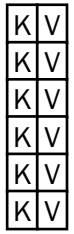

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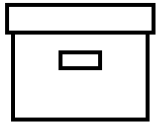

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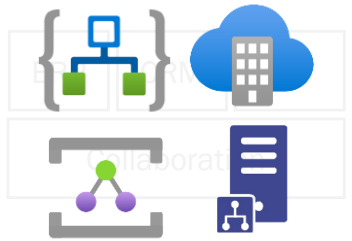

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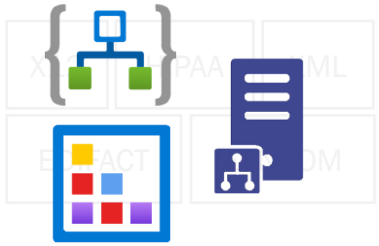

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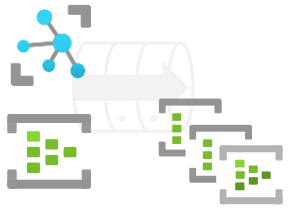

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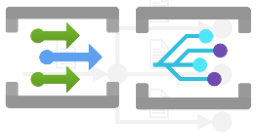

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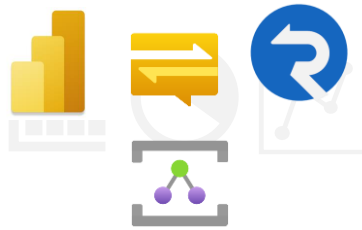

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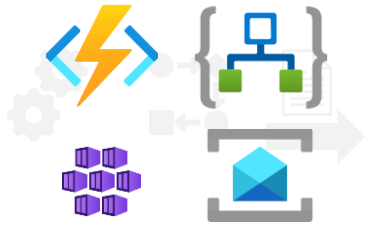

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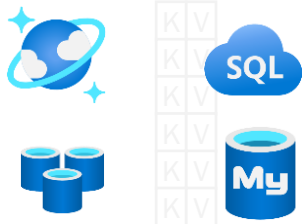

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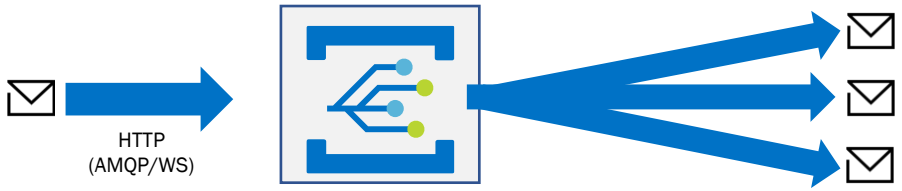

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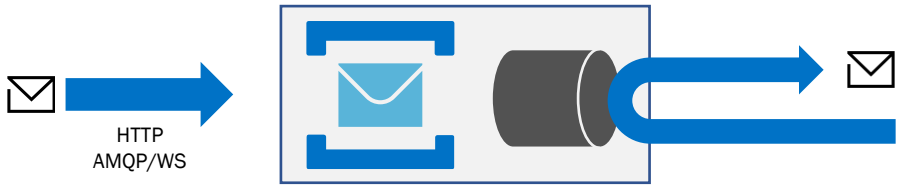

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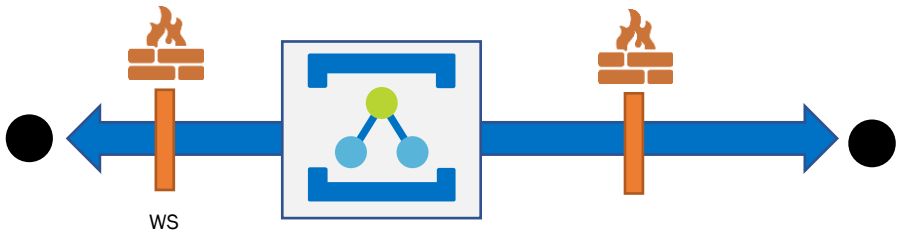

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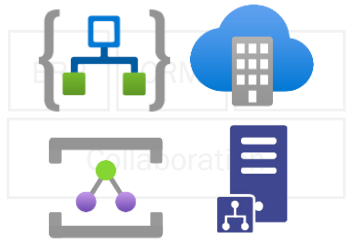

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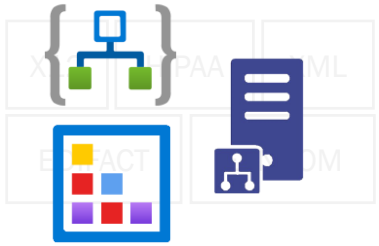
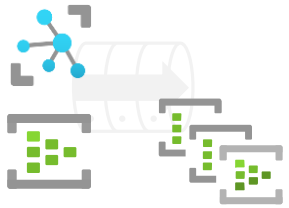
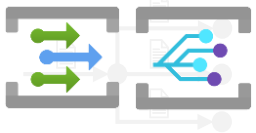


Event Stream Capture and Streamed Delivery



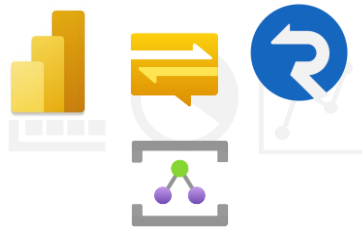
Database Change Capture

Discrete Event Capture and Subscriber Delivery



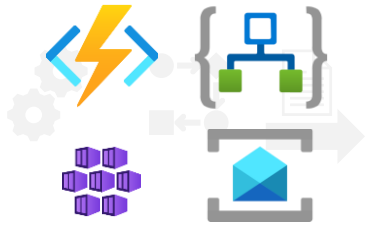
Stateful Analysis and AI

Dashboards and Apps

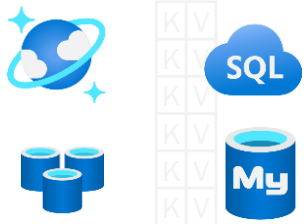


Indexed Streams and Batches

Functions, Jobs, and Workflows

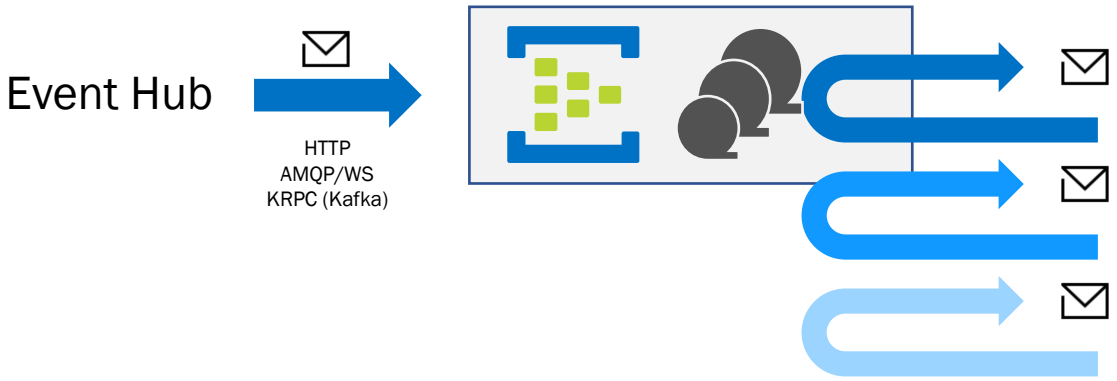


Flat Log Projections



Cool/Cold Archives

Event Hubs Architectural Patterns

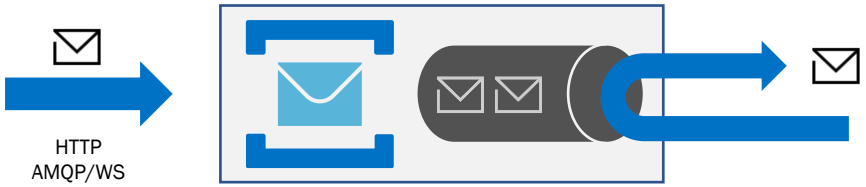


- Ingestion and storage of large event streams
  - > 2 Gigabyte per second if required
- Separation of event streams into partitions
- Client-chosen offsets into event stream allow arbitrary reads and re-reads during retention
- Retention of raw event data from 1 up to 90 days
- Automated archival into Avro containers for subsequent batch-style processing
- Publisher policies for data origin attestation and access control

Event Hubs is a high-scale, high-availability, multi-protocol event stream engine used for collecting and consolidating events for real-time analytics and other high-throughput computations

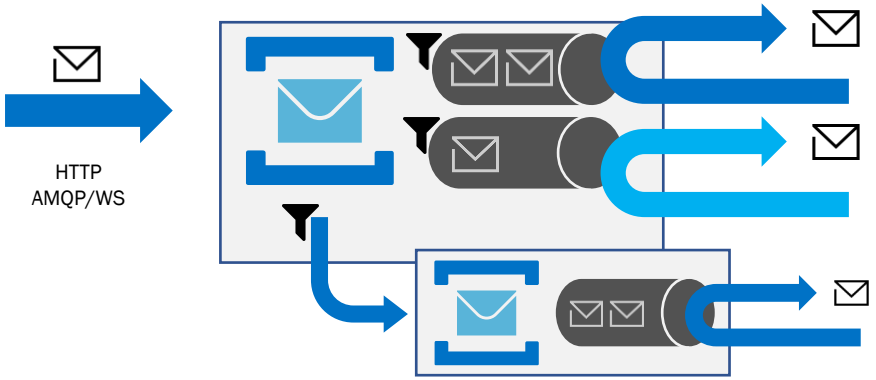
Service Bus Architectural Patterns

Queues



- Assignment of work with load-aware balancing
- Load-leveling for “spiky” workload traffic shapes
- Transactional, once-and-only-once processing
- Multiplex handling of in-order message sequences
- Deduplication, deferral, and “poison” handling

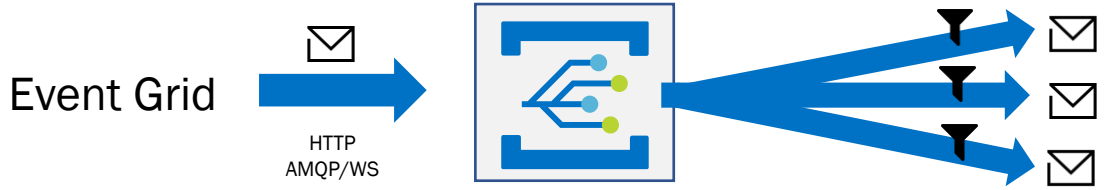
Topics



- All of the above, plus:
- Copies to 100s of concurrent subscribers
- Filter rules and message markup
- Message routing

Service Bus is a “swiss army knife” for messaging-driven workloads.

Event Grid Architectural Patterns



- Ingestion and push-style distribution of discrete events (events not correlated into streams) to interested subscribers.
- Per-subscriber application of simple and complex filters to select particular events of interest
- Abuse protection for event publishers
- Event schema mapping and support for CNCF CloudEvents 1.0 standard and bindings
- Multitenancy support for SaaS applications.
- Simple integration with a catalog of available event sources and sinks.

Event Grid is the Azure-wide eventing backplane for distributing and handling discrete events raised at the platform level, by custom applications, and by partner platforms.

Questions?

@clemensv

clemensv@microsoft.com