Event-Driven Architecture in the Cloud

DevUp
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Event-Driven Architecture in the Cloud

Director of Software Development
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Preamble
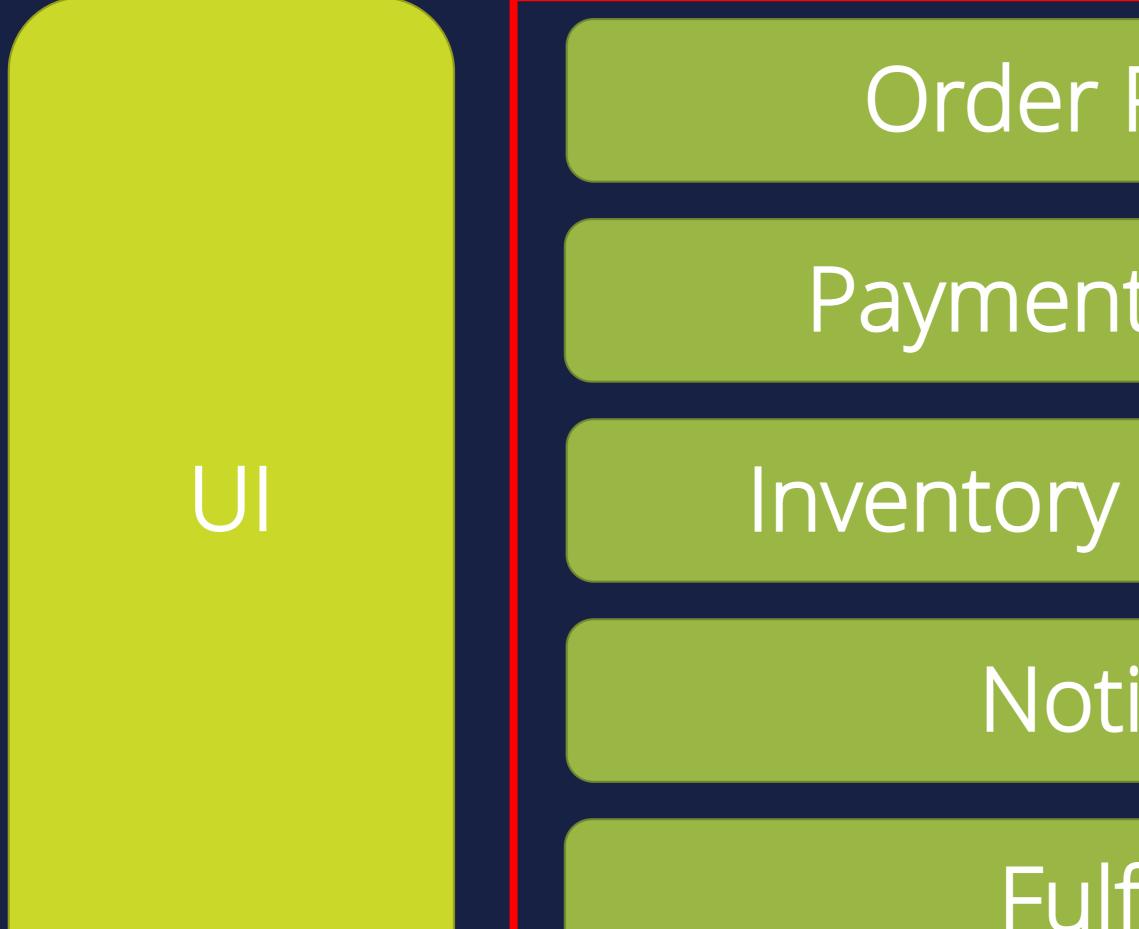## Event-Driven Architecture in the Cloud

Enterprise Architecture

"

———————   ""   ———————

Enterprise architecture applies architecture principles and practices to guide organizations through the business, information, process, and technology changes necessary to execute their strategies.

—————————————————

- Wikipedia -

Monolith
Enterprise Architecture

UI

Order Processing

Payment Processing

Inventory Management

Notification
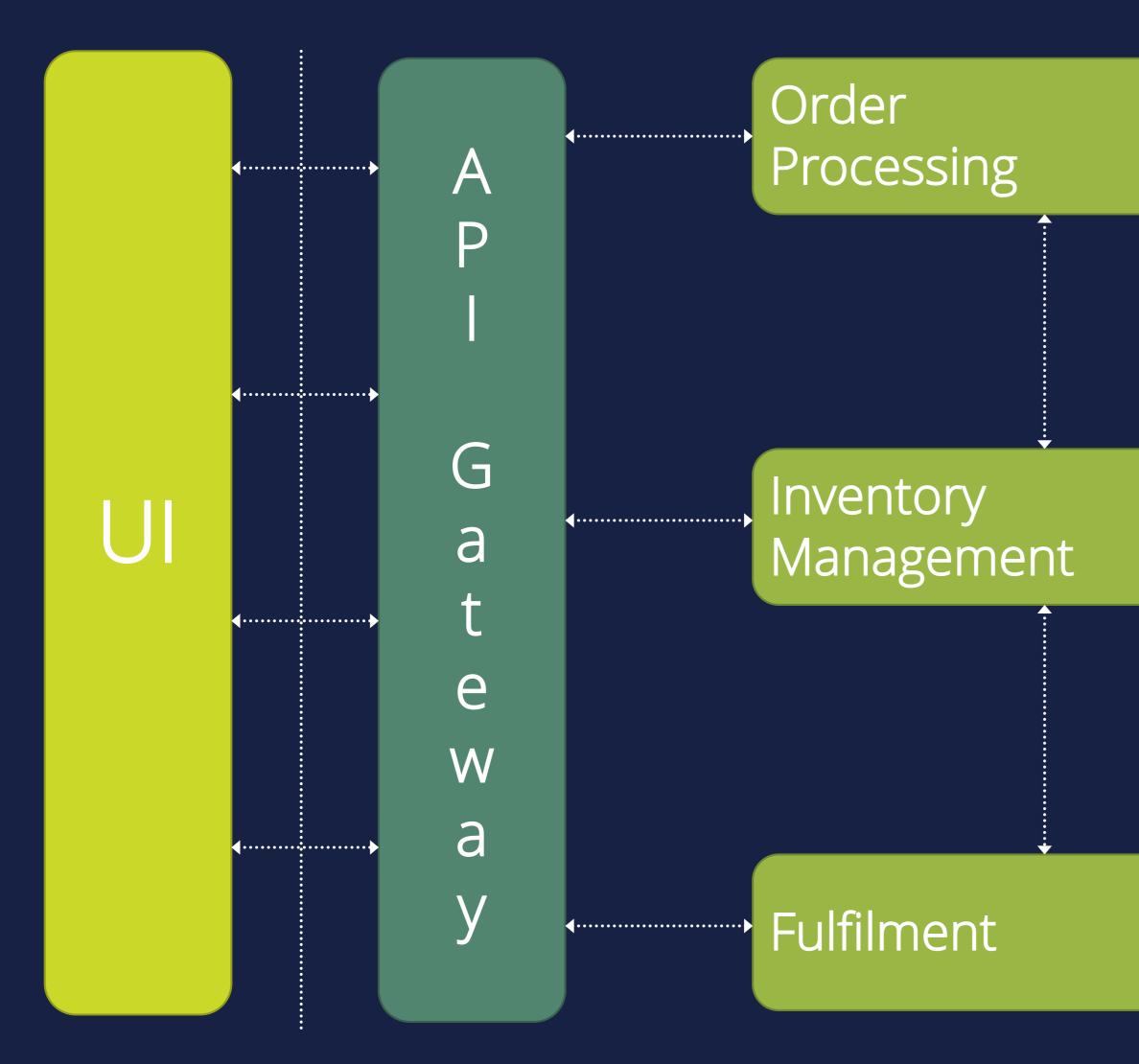
Fulfillment

Database

Microservices
Enterprise Architecture

Process Flow
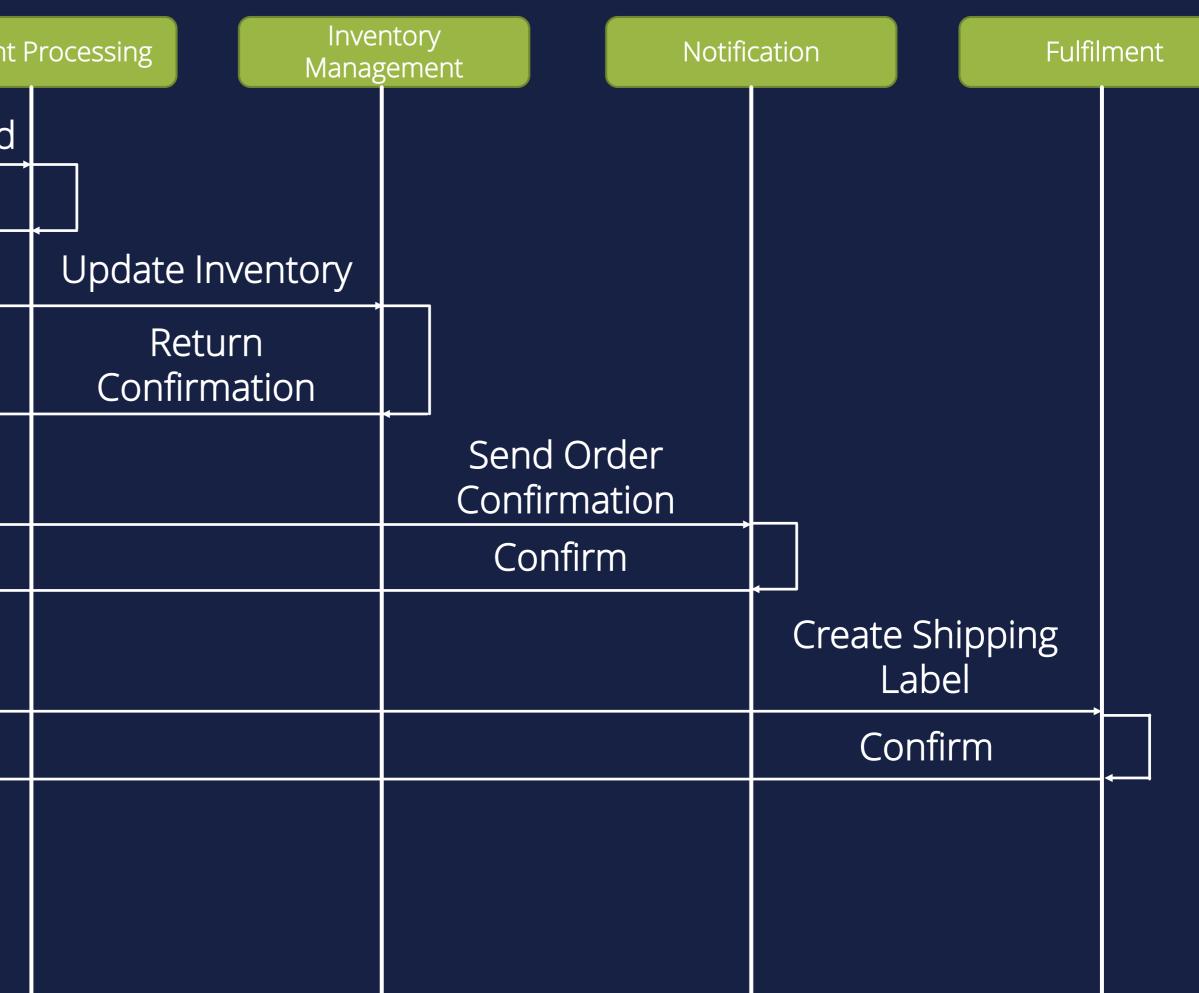Microservices

Event-Driven Architecture

"

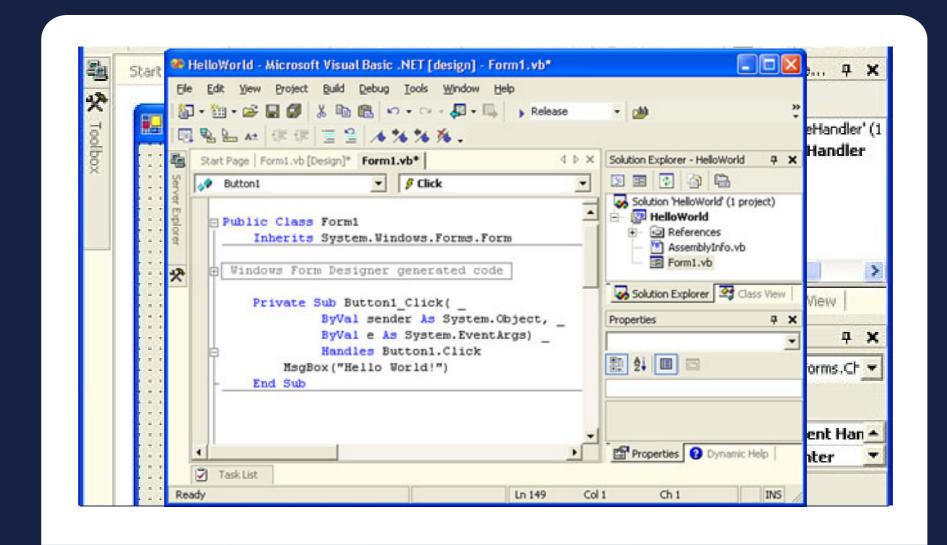A software architecture pattern promoting the production, detection, consumption of, and reaction to events.

- Wikipedia -

Event-Driven Architecture

Event-Driven Architecture

Event-Driven Architecture

"

Event-driven architecture (EDA) is a design paradigm in which a software component executes in response to receiving one or more event notifications.
EDA is more loosely coupled than the client/server paradigm because the component that sends the notification doesn't know the identity of the receiving components at the time of compiling.

- Gartner -

Event-Driven Architecture

```
Event Producer ────────▶ Event Ingestion ──────▶ Event Consumer
                                         ──────▶ Event Consumer
                                         ──────▶ Event Consumer
```

Microservices
Enterprise Architecture

UI	API Gateway	Order Processing	Payment Processing	Inventory Management	Notification	Fulfilment

Place Order → Place Order → Charge Credit Card

Return Conf Num

Update Inventory

Return Confirmation

Send Order Confirmation

Confirm

Create Shipping Label

Confirm

Return Confirmation ← Return Confirmation
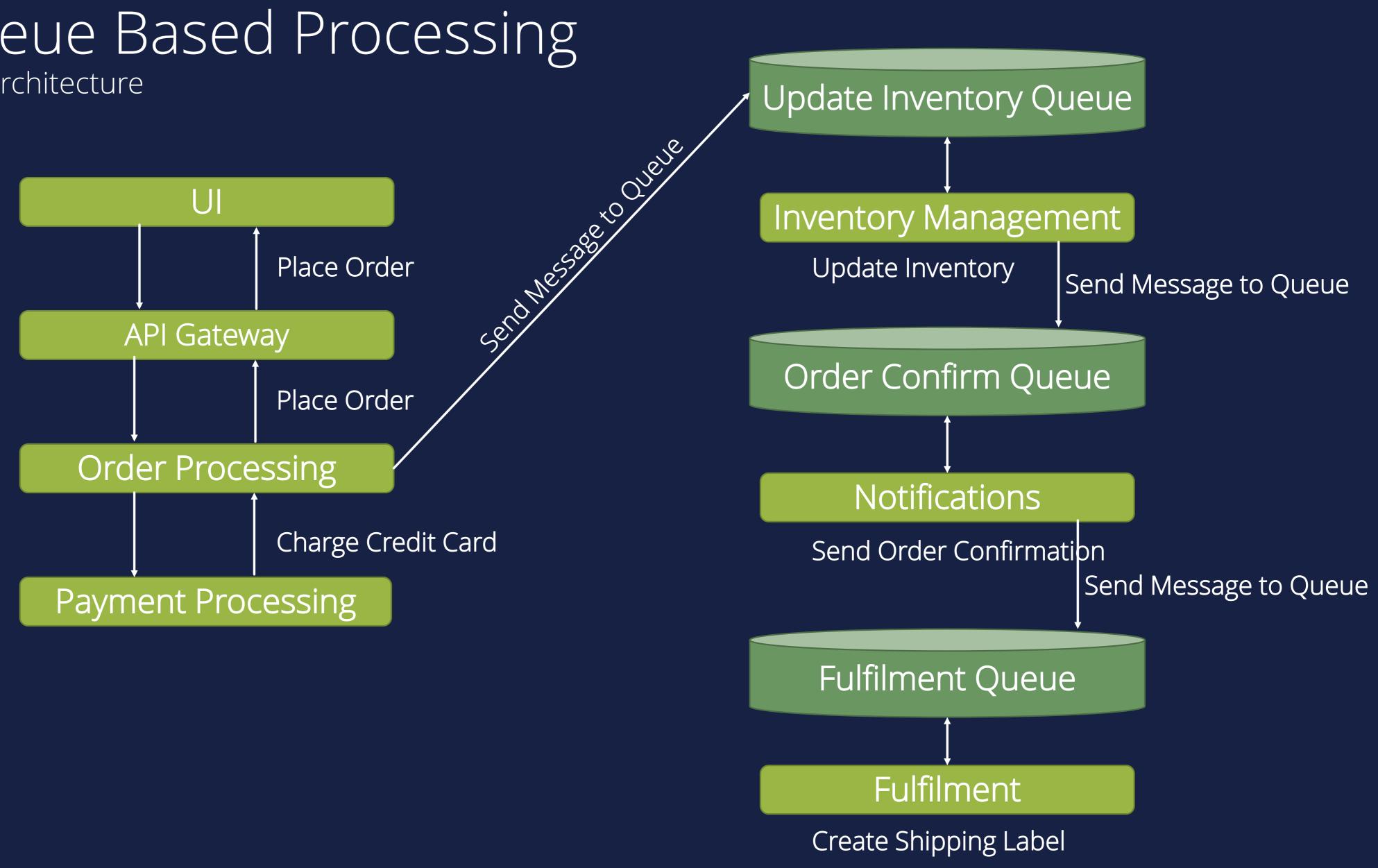
Process Flow
Event-Driven Architecture

Event-Driven Architecture in the Cloud

Not Queue Based Processing
Event-Driven Architecture

Update Inventory Queue

Inventory Management

Update Inventory

Send Message to Queue

UI

Place Order

API Gateway

Place Order

Send Message to Queue

Order Processing

Charge Credit Card

Payment Processing

Order Confirm Queue

Notifications

Send Order Confirmation

Send Message to Queue

Fulfilment Queue

Fulfilment

Create Shipping Label

Event Consumption Models
Event-Driven Architecture

Pub/Sub

Event Streaming

Event Producer → Event Ingestion

Event Consumer

Event Consumer

Event Consumer

Consumer Processing Variations
Event-Driven Architecture

Event Producer → Event Ingestion

- Simple Event Processing
- Complex Event Processing
- Event Stream Processing

External Event Sources
Event-Driven Architecture

Event Producer → Event Ingestion → Event Consumer / Event Consumer / Event Consumer

Multiple Consumer Instances
Event-Driven Architecture

When to use this architecture
Event-Driven Architecture

Multiple Subsystems

Multiple subsystems must process the same events.

Real-Time Processing

Real-time processing with minimum time lag.

Complex Event Processing

Complex event processing, such as pattern matching or aggregation over time windows.

High Volume/Velocity Data

High volume and high velocity of data, such as IoT.

Benefits
Event-Driven Architecture

Decoupling

Encapsulation

Responsive

Scalable/Distributed
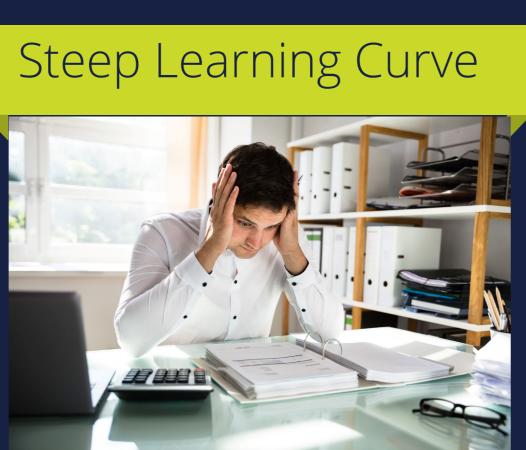
Independence

Drawbacks
Event-Driven Architecture

Steep Learning Curve

Complexity
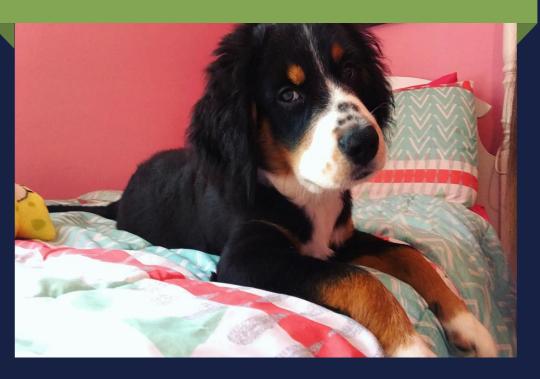
Loss of Transactionality

Lineage

Challenges
Event-Driven Architecture

Guaranteed Delivery

Sequencing

Implementation Options
Event-Driven Architecture in the Cloud

Implementation Options

PieSync

TIBCO Spotfire

Amazon Kinesis

Amazon Elasticsearch Service

Google Cloud Pub/Sub

StreamSets

PubNub Data Stream

The PI System

The PI System

Confluent

HVR

Antiunity Replicate

SQLstream

IBM Streaming Analytics

Astronomer

Striim

Azure Service Bus

IoT Hubs

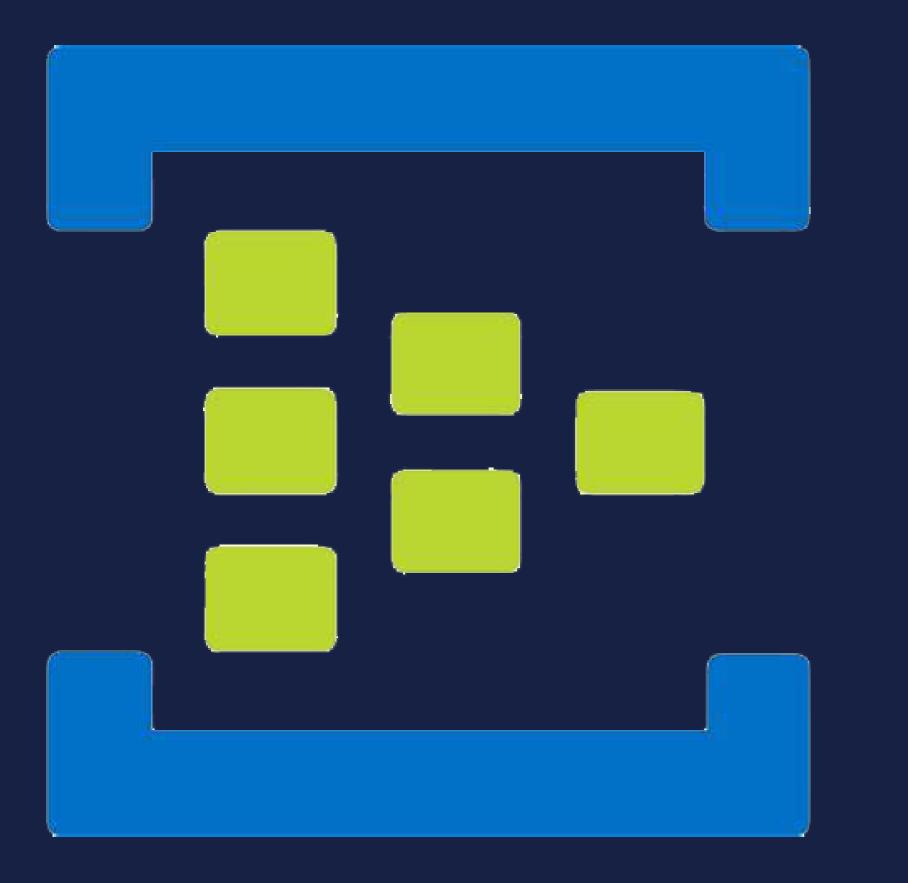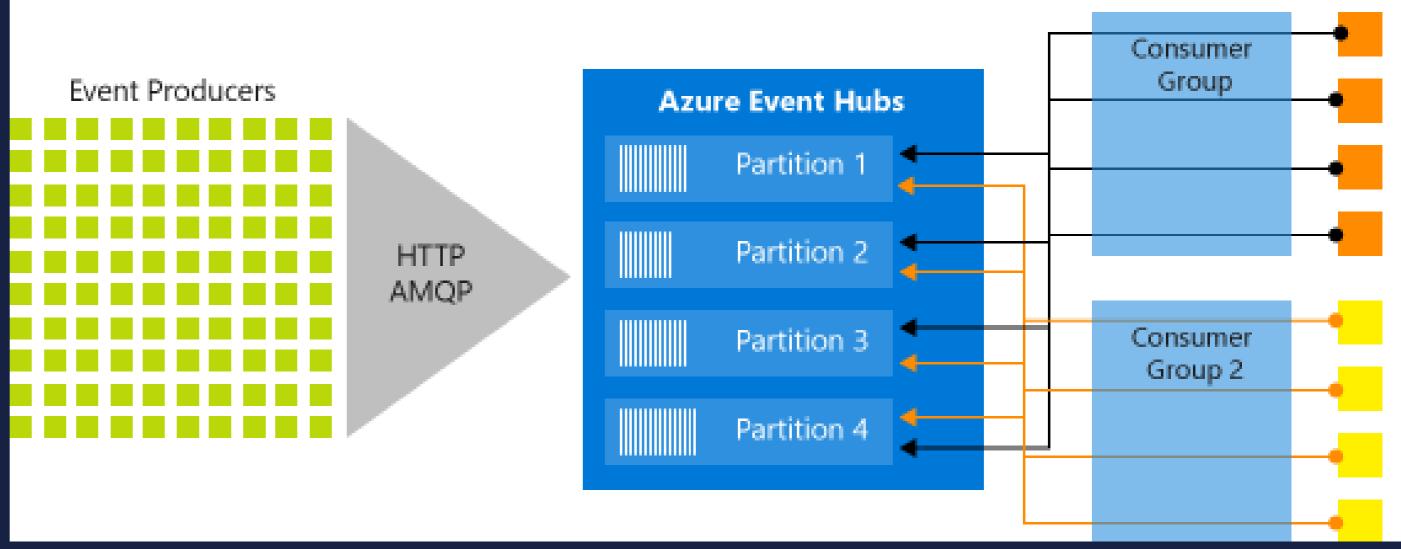Azure Event Hubs

Event-Driven Architecture in the Cloud

Implementation Options
Azure Event Hubs

Simple, secure, and scalable real-time data ingestion

PieSync   TiBCO Spotfire   Amazon Kinesis   Amazon Elasticsearch Service   Google Cloud Pub/Sub   StreamSets   PubNub Data Stream

Fully managed, real-time data ingestion service that is simple, trusted, and scalable.

The PI System   The PI System   Confluent   HVR   Antiunity Replicate   SQLstream   IBM Streaming Analytics
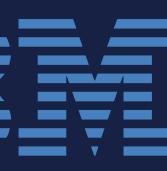
Astronomer   Striim   Azure Service Bus   IoT Hubs   Azure Event Hubs

Why choose Event Hubs?
Azure Event Hubs
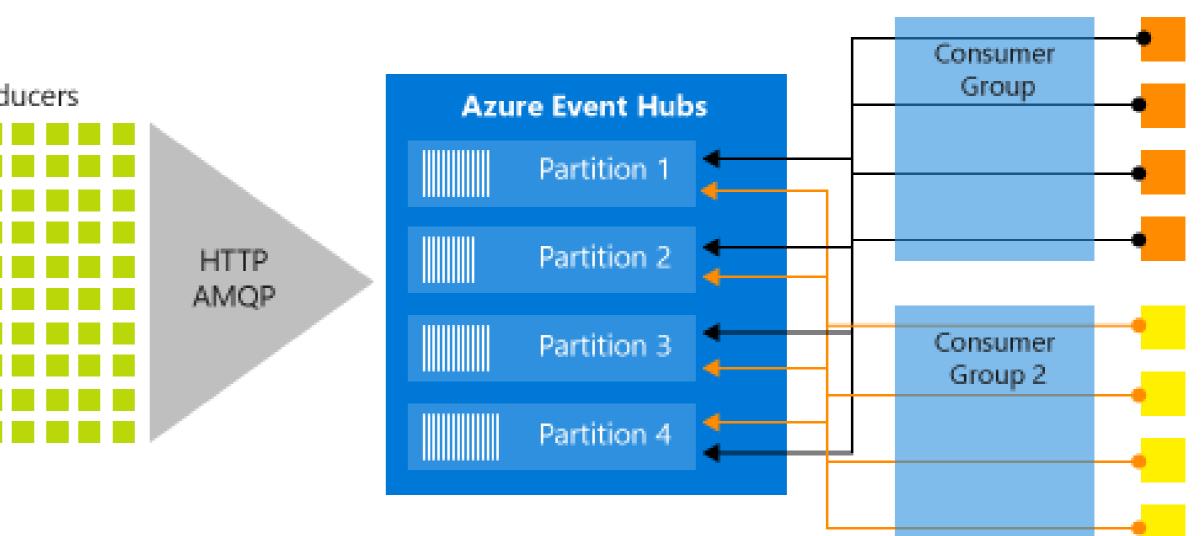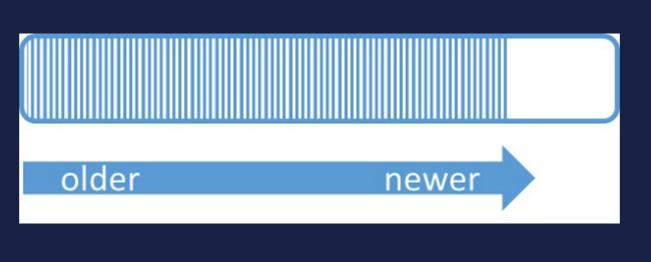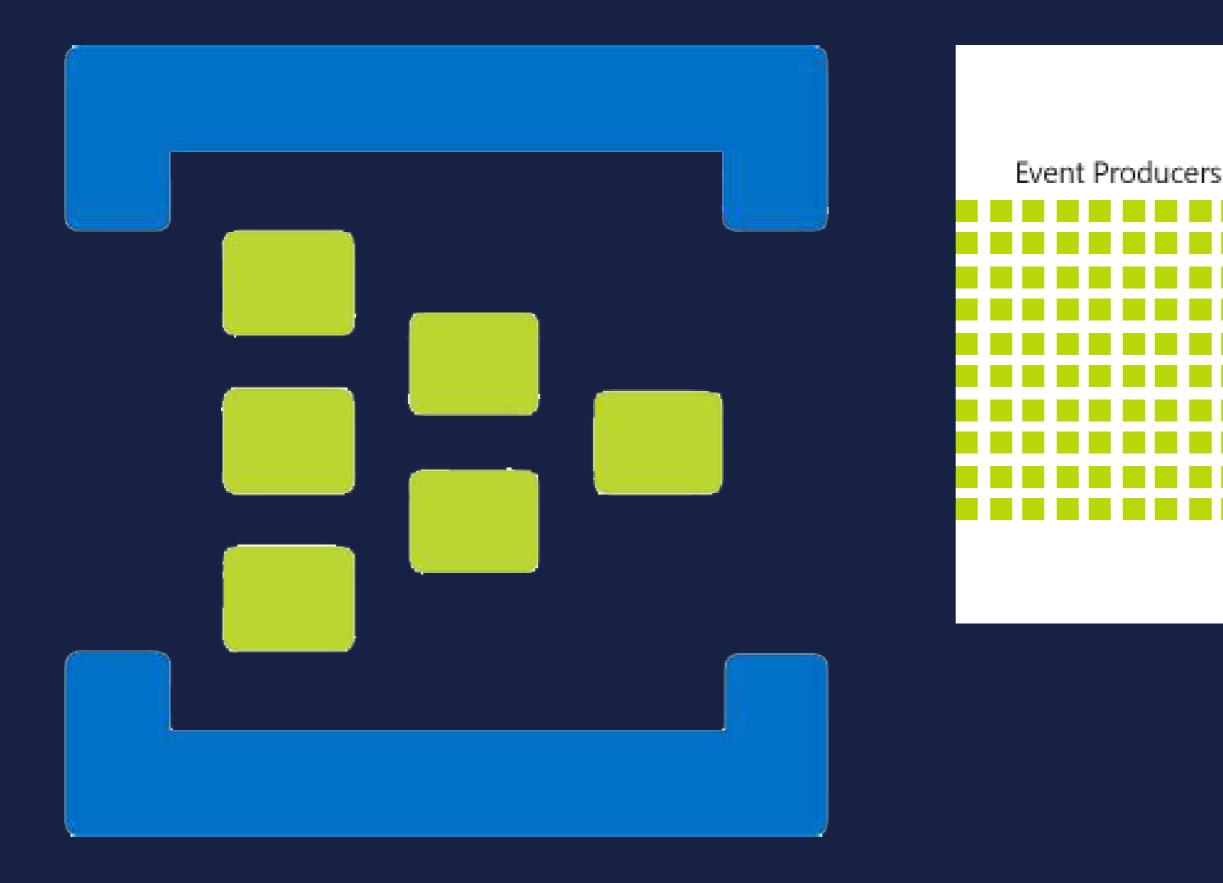
Simple

Secure

Scalable

Open

Key Architecture Components
Azure Event Hubs

Event Producers

Key Architecture Components
Azure Event Hubs

Partitions

Key Architecture Components
Azure Event Hubs

Consumer Groups

Key Architecture Components
Azure Event Hubs

Throughput Units

Key Architecture Components
Azure Event Hubs

Event Receivers
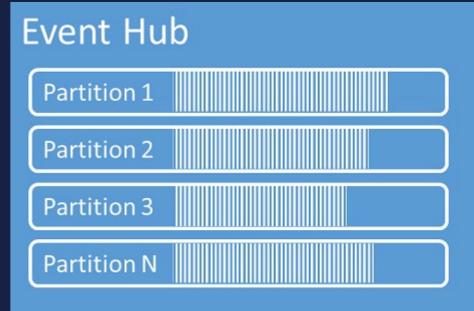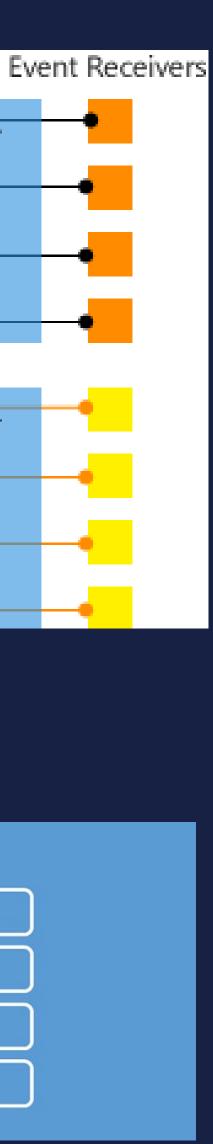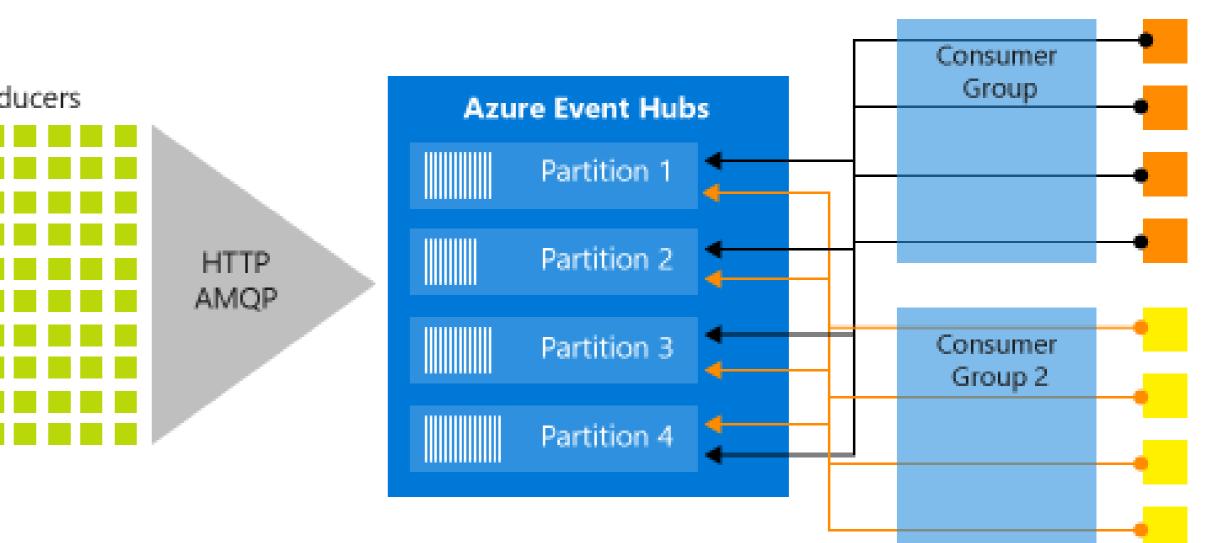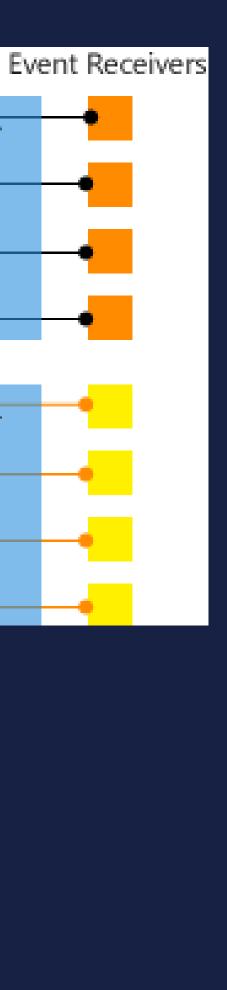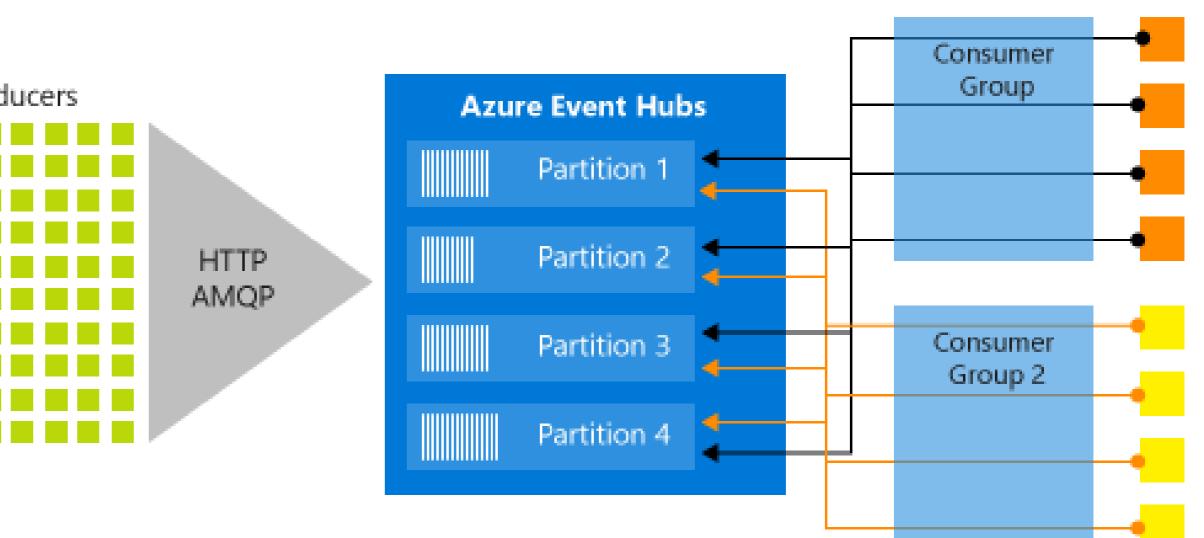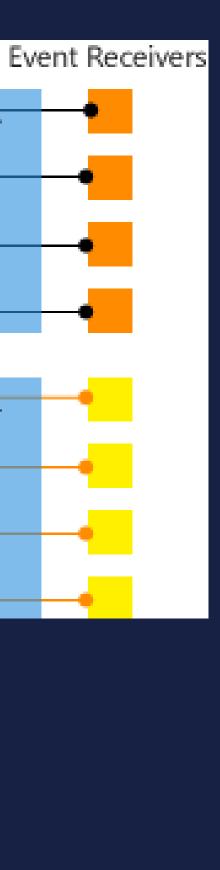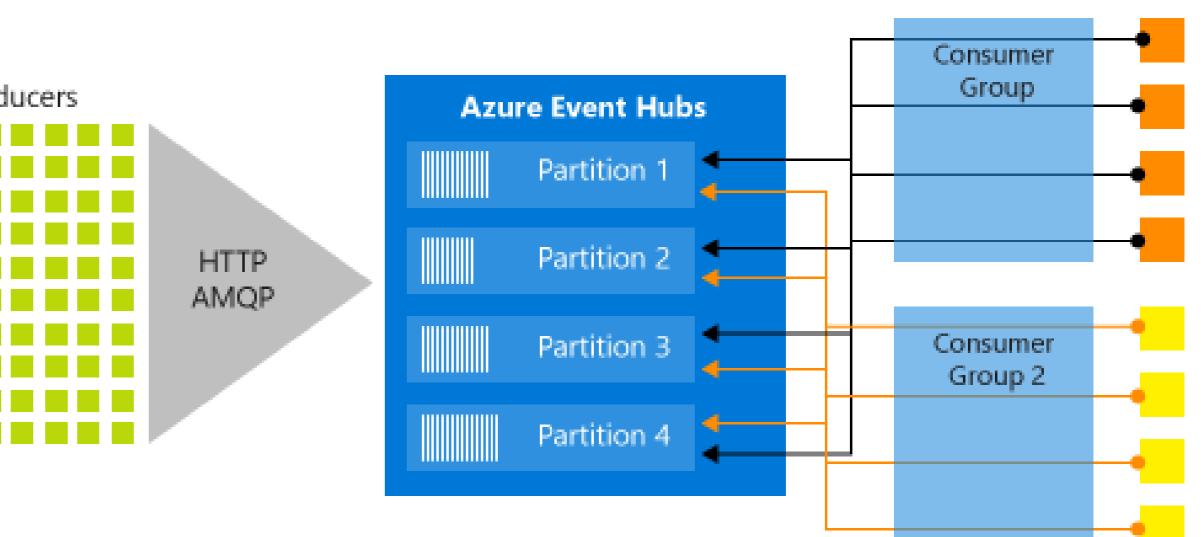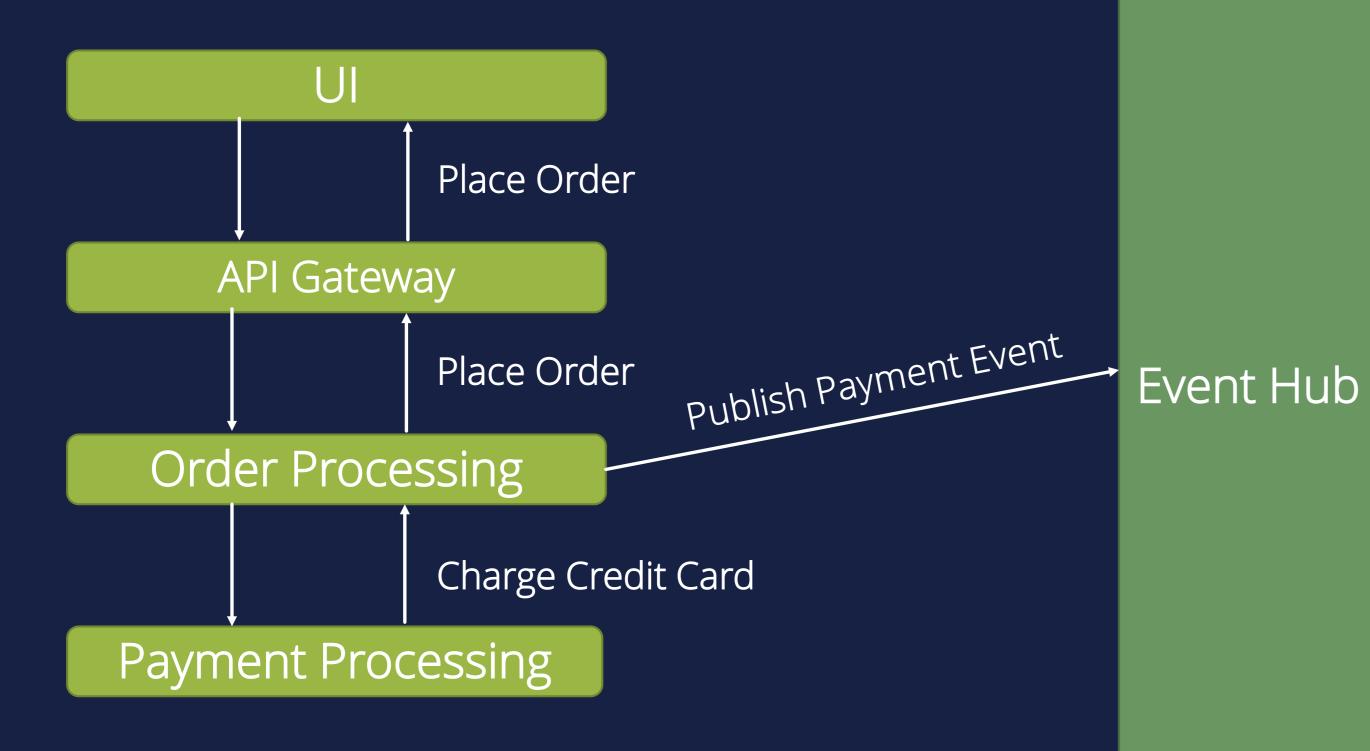
Demonstration
Event-Driven Architecture in the Cloud

Scenario
Demonstration

UI

API Gateway

Place Order

Place Order

Order Processing

Charge Credit Card

Payment Processing

Publish Payment Event

Event Hub

Notify Subscribers

Inventory Management

Update Inventory

Notifications

Send Order Confirmation

Fulfilment

Create Shipping Label

Scenario
Demonstration

UI

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Summary
Event-Driven Architecture in the Cloud

Event-Driven Architecture
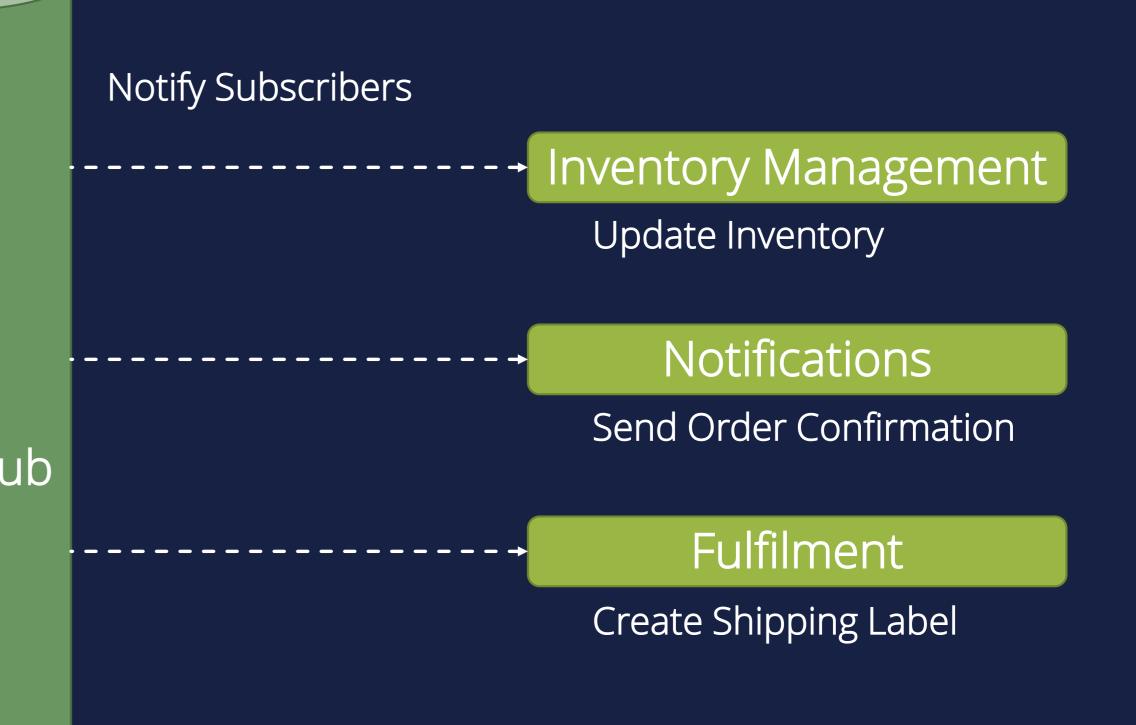
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- Gartner -

Strengths

- Decoupling
- Encapsulation
- Responsive
- Scalable / Distributed
- Independence

Weaknesses

- Steep Learning Curve
- Complexity
- Loss of Transactionality
- Lineage

Opportunities

- Multiple Subsystems
- Real-Time Processing
- Complex Event Processing
- High Volume / Velocity Data

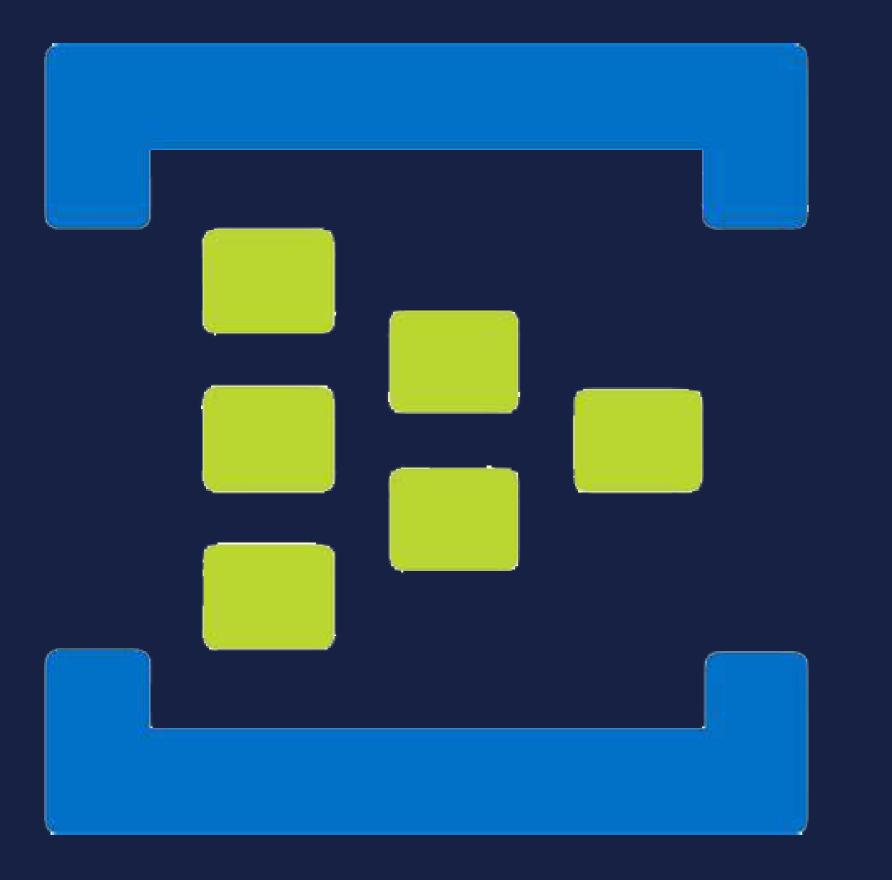# Threats

- No Guaranteed Delivery
- Potential Sequencing Issues

Event-Driven Architecture
Summary

Azure Event Hubs
Summary

Fully managed, real-time data ingestion service that is simple, trusted, and scalable.

Simple | Secure | Scalable | Open

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