Event-Driven Architecture in the Cloud

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Chad Green

Little Rock Tech Fest Sponsors

Event-Driven Architecture in the Cloud

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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.
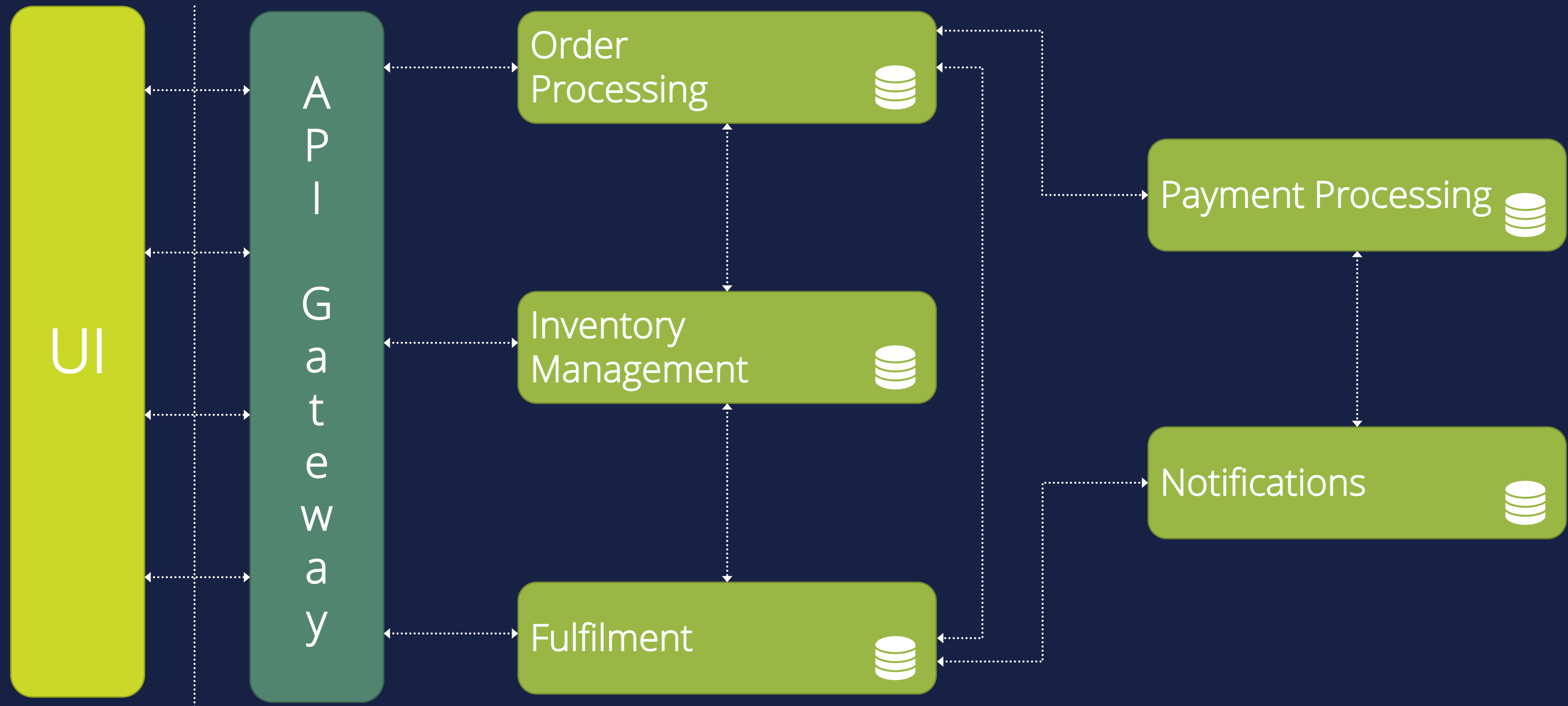
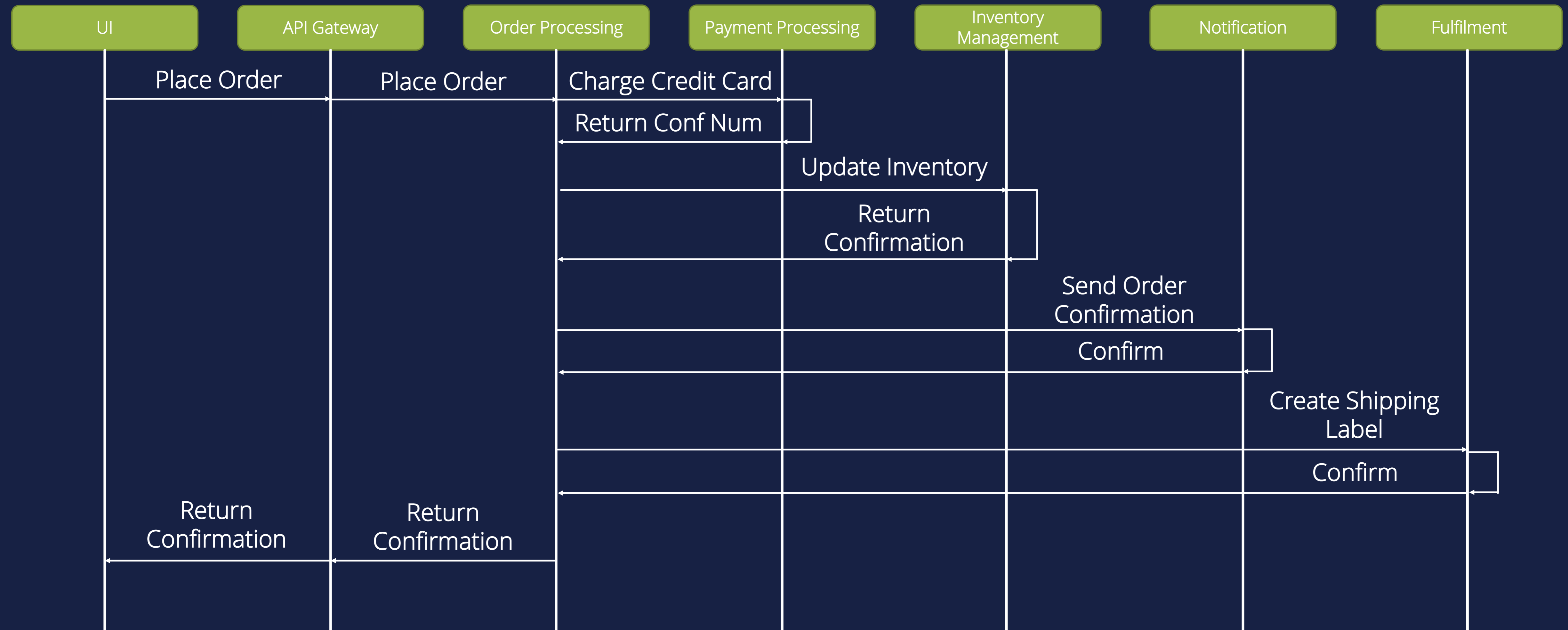- Wikipedia -

Monolith
Enterprise Architecture

UI

Order Processing

Payment Processing

Inventory Management

Notification

Fulfillment

Database

Microservices
Enterprise Architecture

UI

API Gateway

Order Processing

Inventory Management
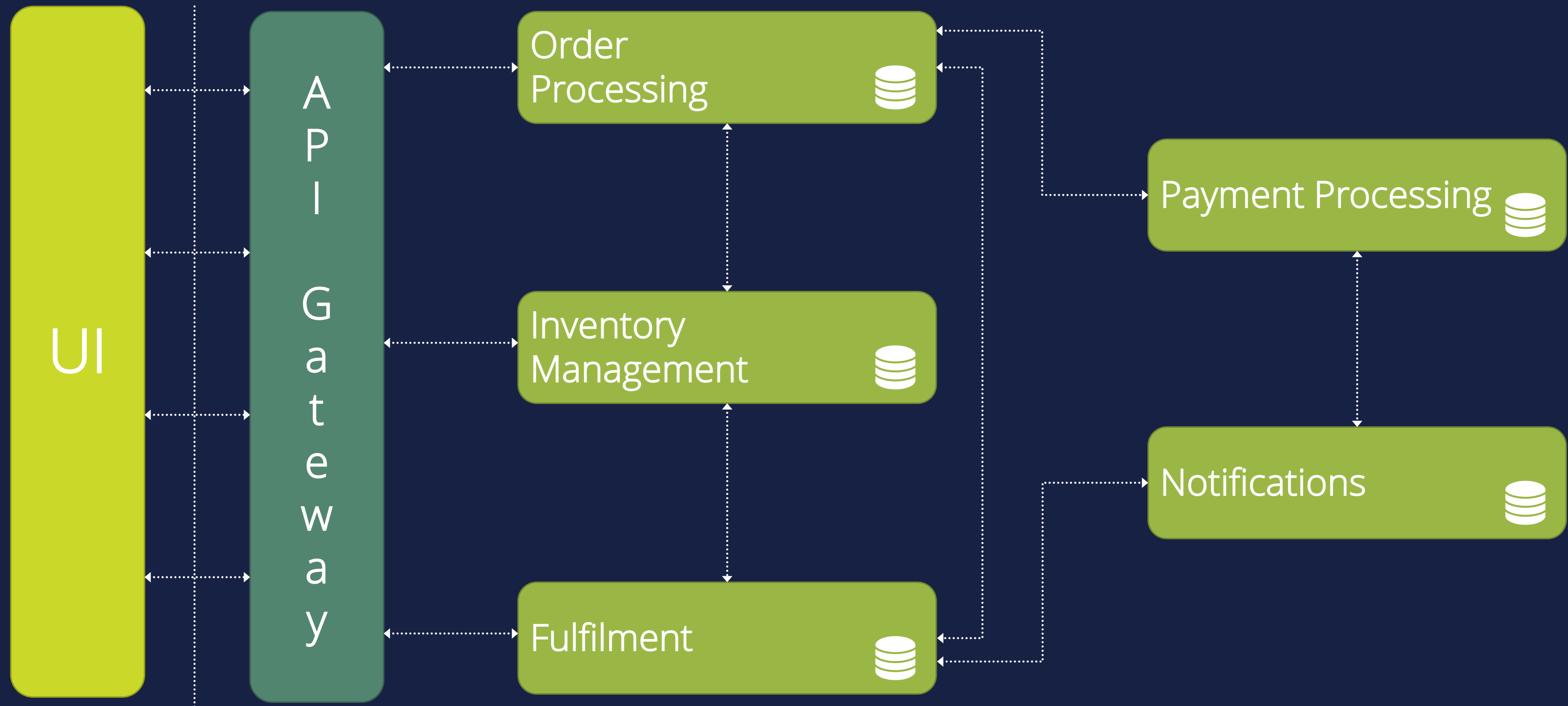
Fulfilment

Payment Processing

Notifications

Process Flow
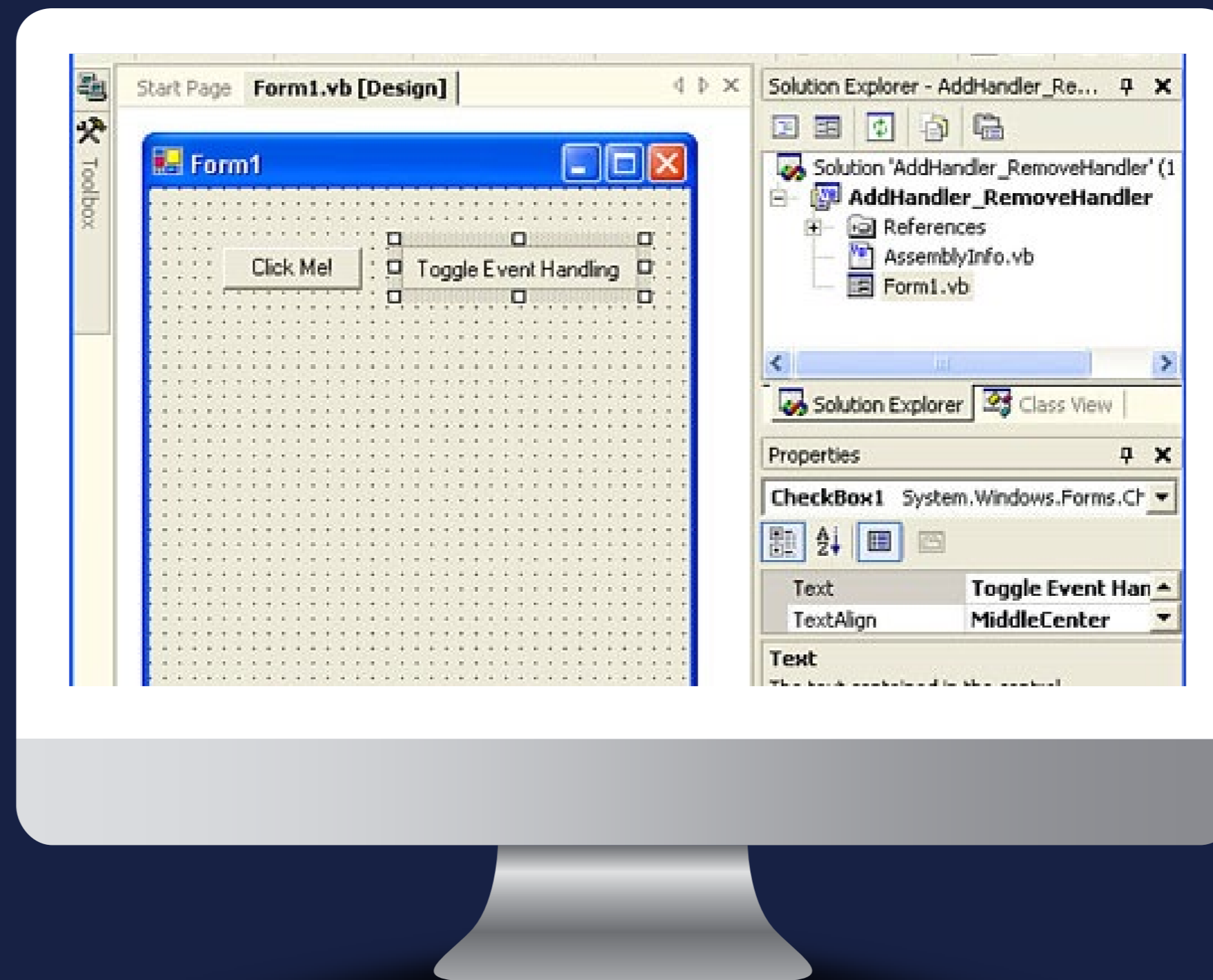Microservices

Microservices
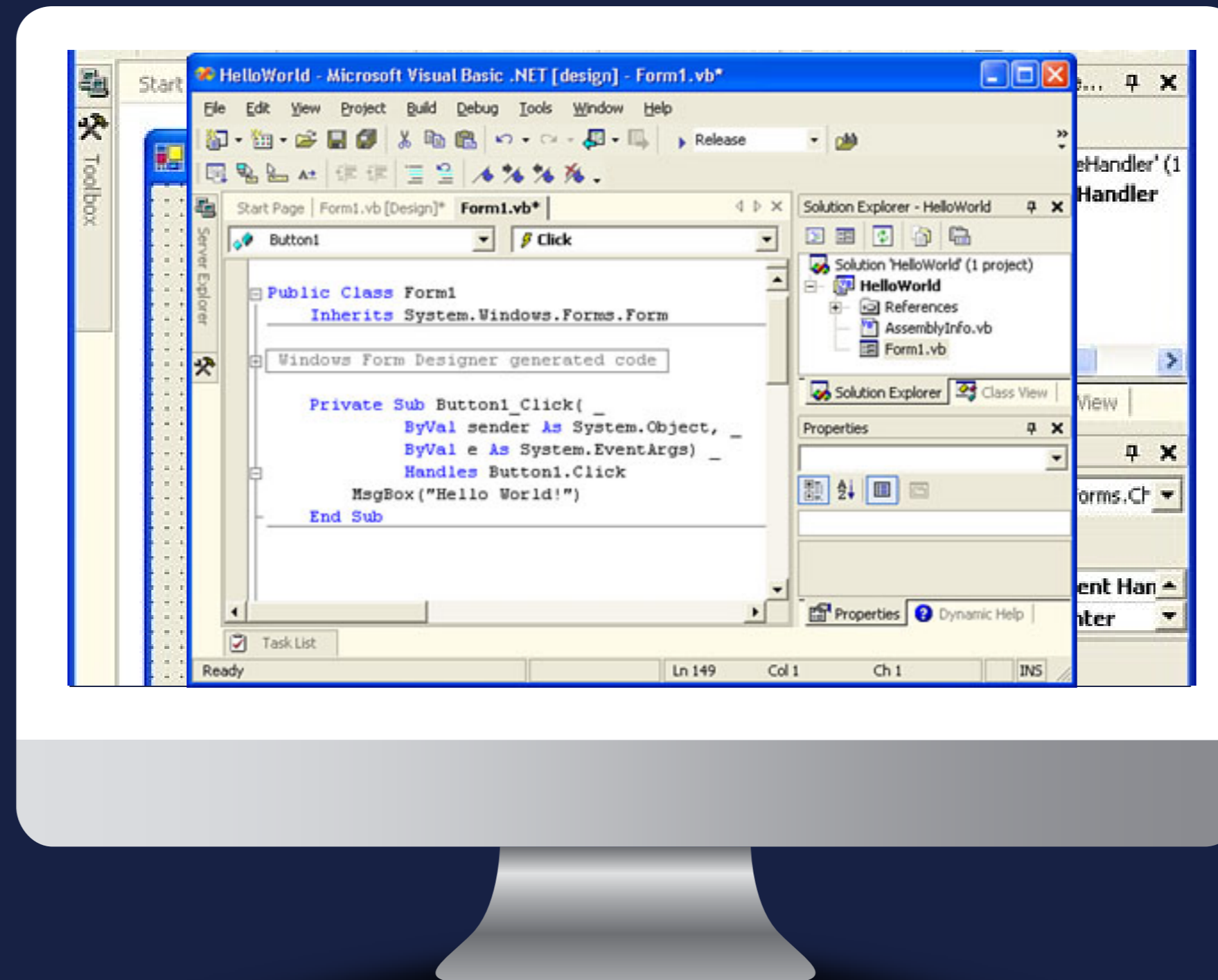Enterprise Architecture

Event-Driven Architecture

"

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

- Wikipedia -

Event-Driven Architecture

Event-Driven Architecture
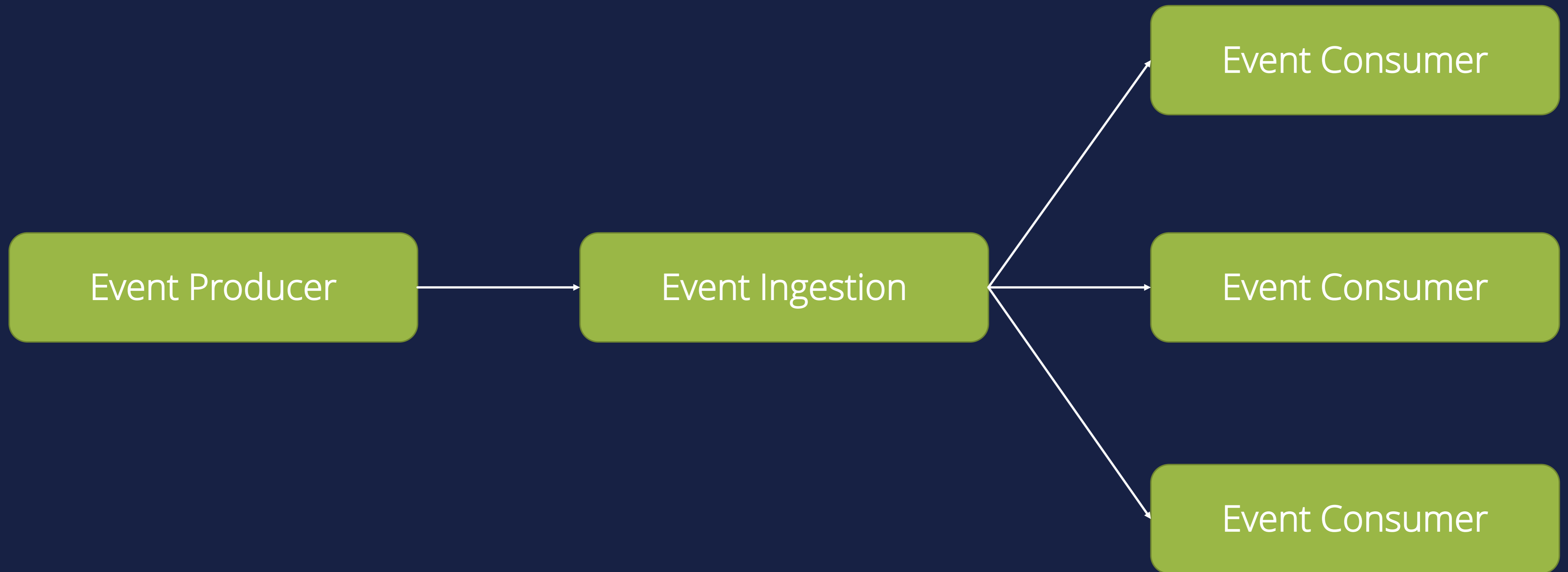
Event-Driven Architecture

"

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.
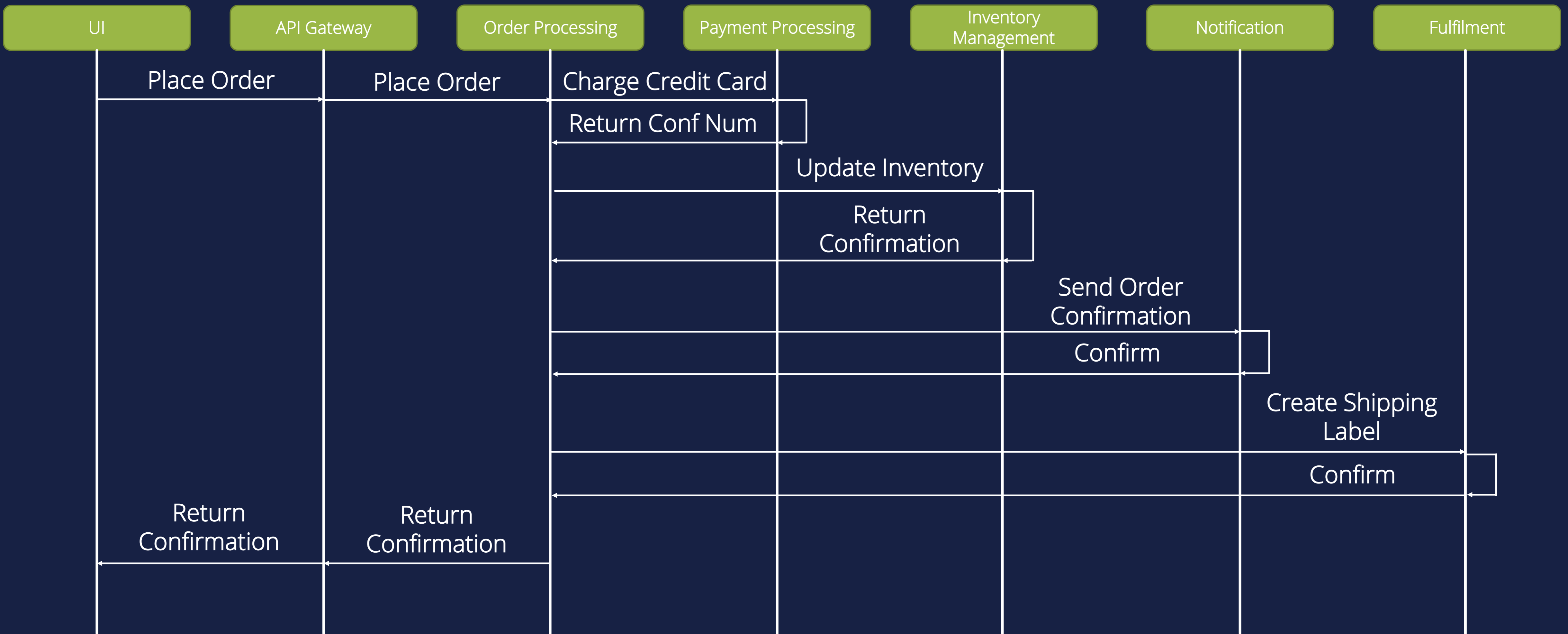
- Gartner -

Event-Driven Architecture

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

UI

Place Order

API Gateway

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
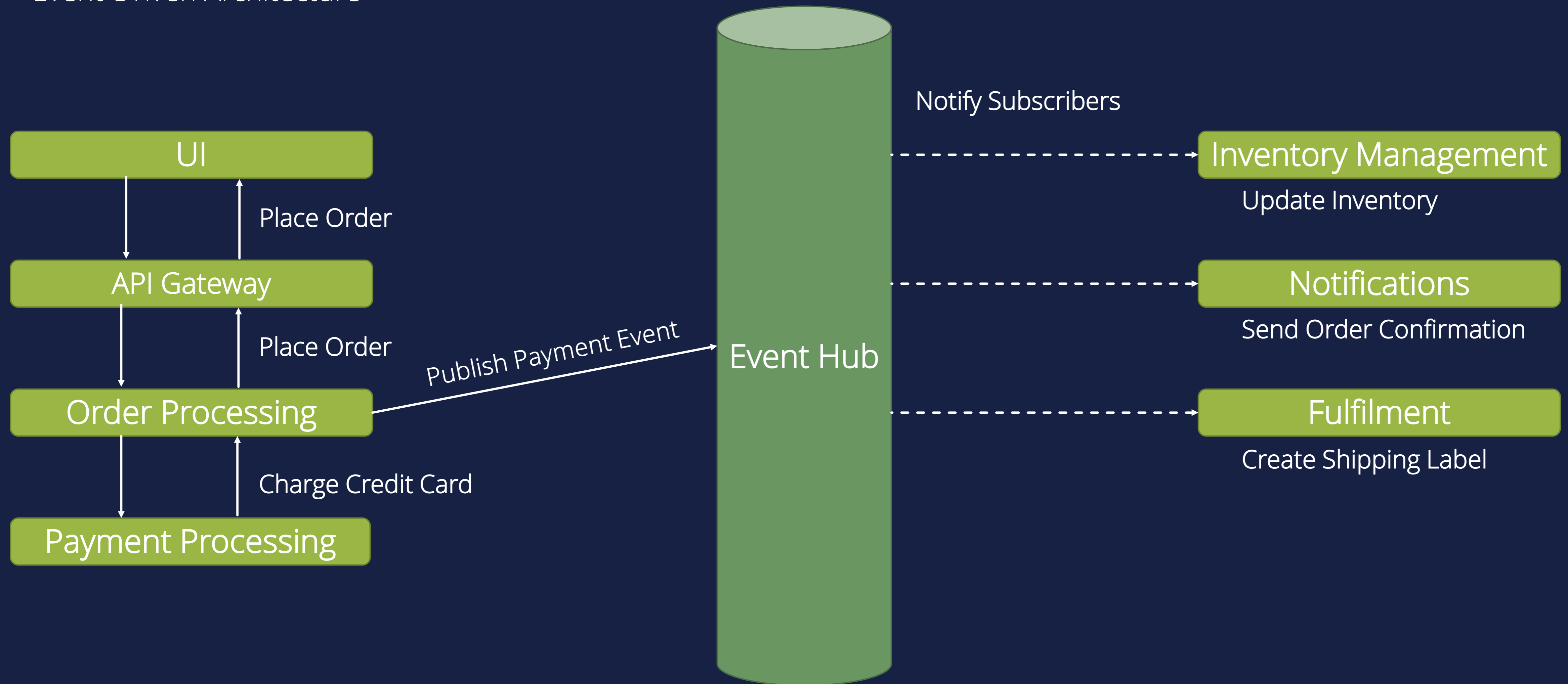
Not Queue Based Processing

Event-Driven Architecture

```
UI
      |  ↑
      |  | Place Order
      ↓  |
API Gateway
      |  ↑
      |  | Place Order
      ↓  |
Order Processing  ──── Send Message to Queue ────→  Update Inventory Queue
      |  ↑                                                    ↑
      |  | Charge Credit Card                                 ↓
      ↓  |                                          Inventory Management
Payment Processing                                  Update Inventory    | Send Message to Queue
                                                                         ↓
                                                    Order Confirm Queue
                                                            ↑
                                                            ↓
                                                    Notifications
                                                    Send Order Confirmation  | Send Message to Queue
                                                                             ↓
                                                    Fulfilment Queue
                                                            ↑
                                                            ↓
                                                    Fulfilment
                                                    Create Shipping Label
```
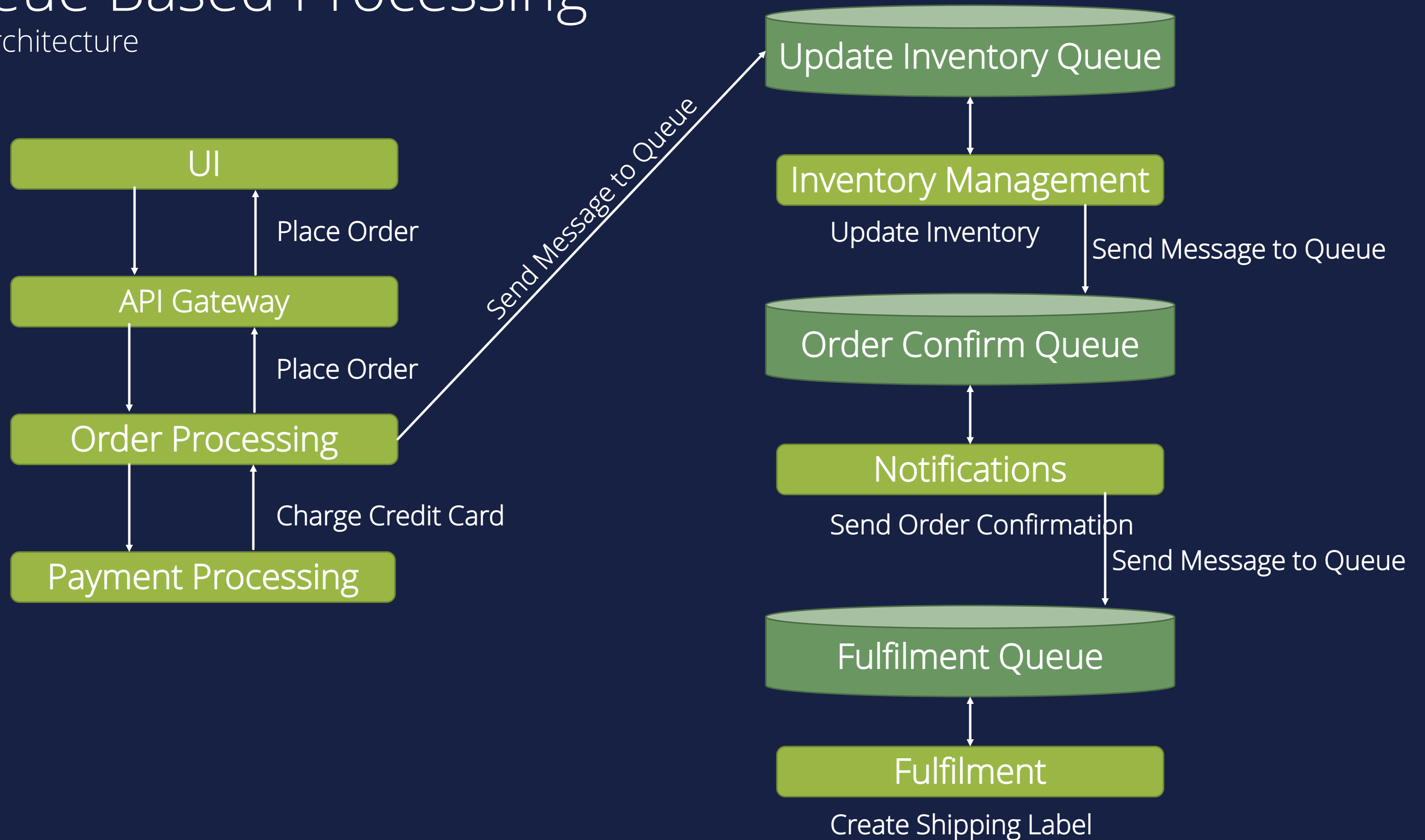
Event Consumption Models
Event-Driven Architecture

Pub/Sub

Event Streaming

Event Producer → Event Ingestion

Event Consumer

Event Consumer

Event Consumer

Event-Driven Architecture in the Cloud
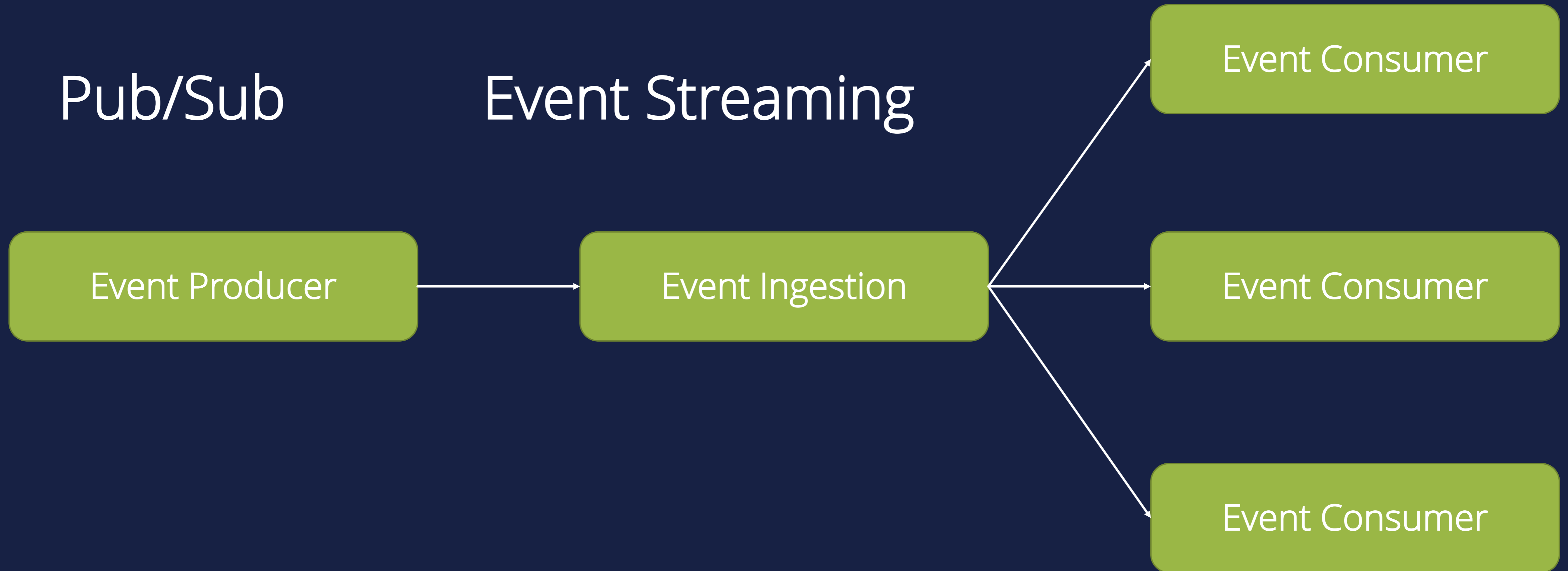
Consumer Processing Variations
Event-Driven Architecture

Event Producer → Event Ingestion

Simple Event Processing

Complex Event Processing

Event Stream Processing
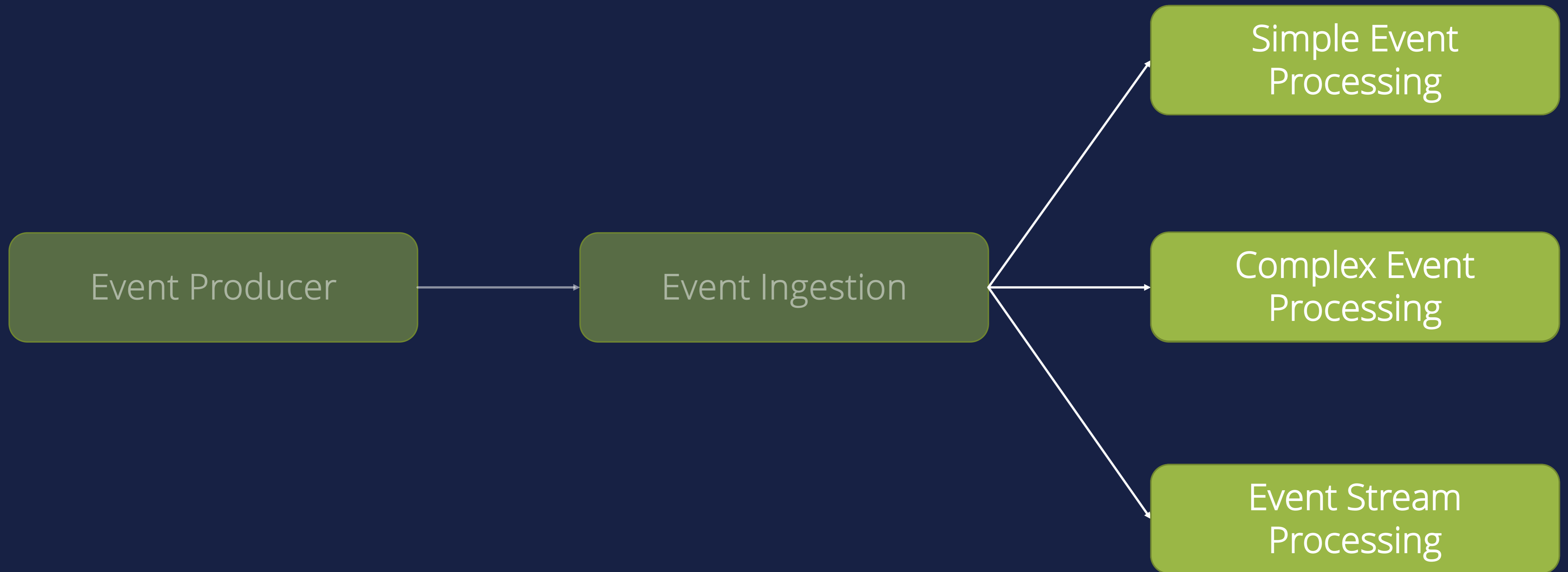
External Event Sources
Event-Driven Architecture
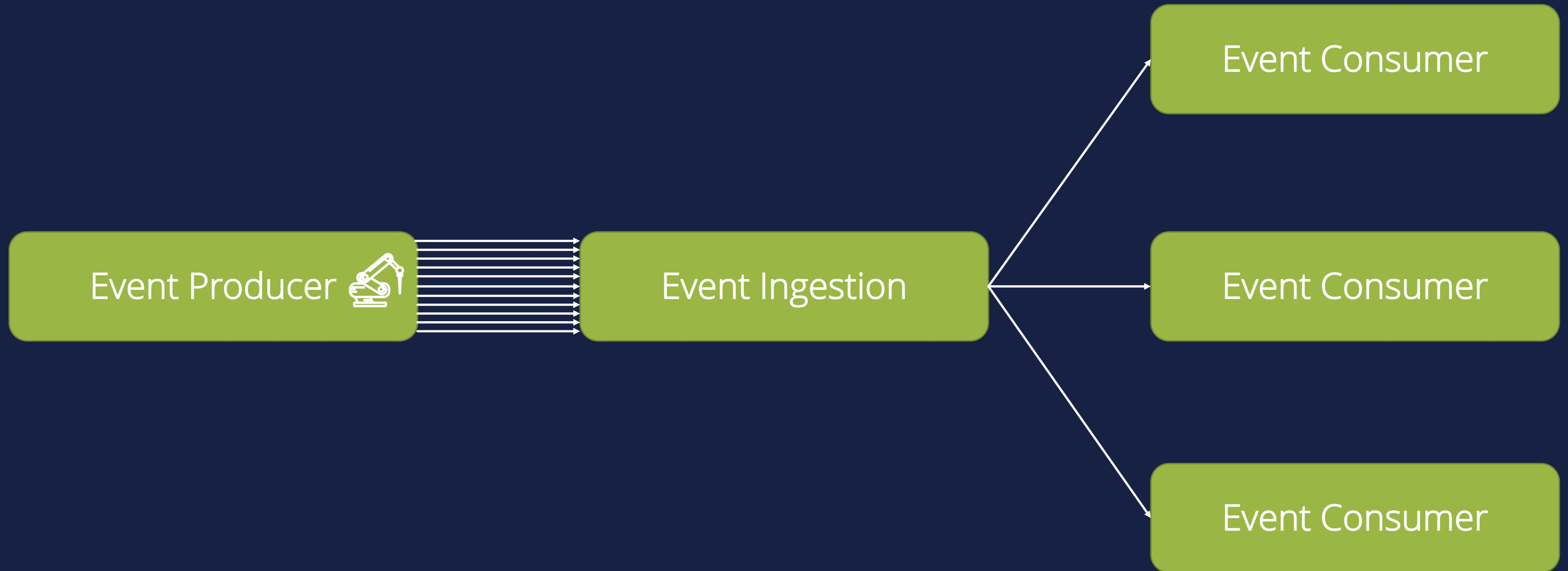
Multiple Consumer Instances
Event-Driven Architecture

Event Producer → Event Ingestion →

Event Consumer
Event Consumer
Event Consumer

Event Consumer
Event Consumer
Event Consumer

Event Consumer
Event Consumer
Event Consumer
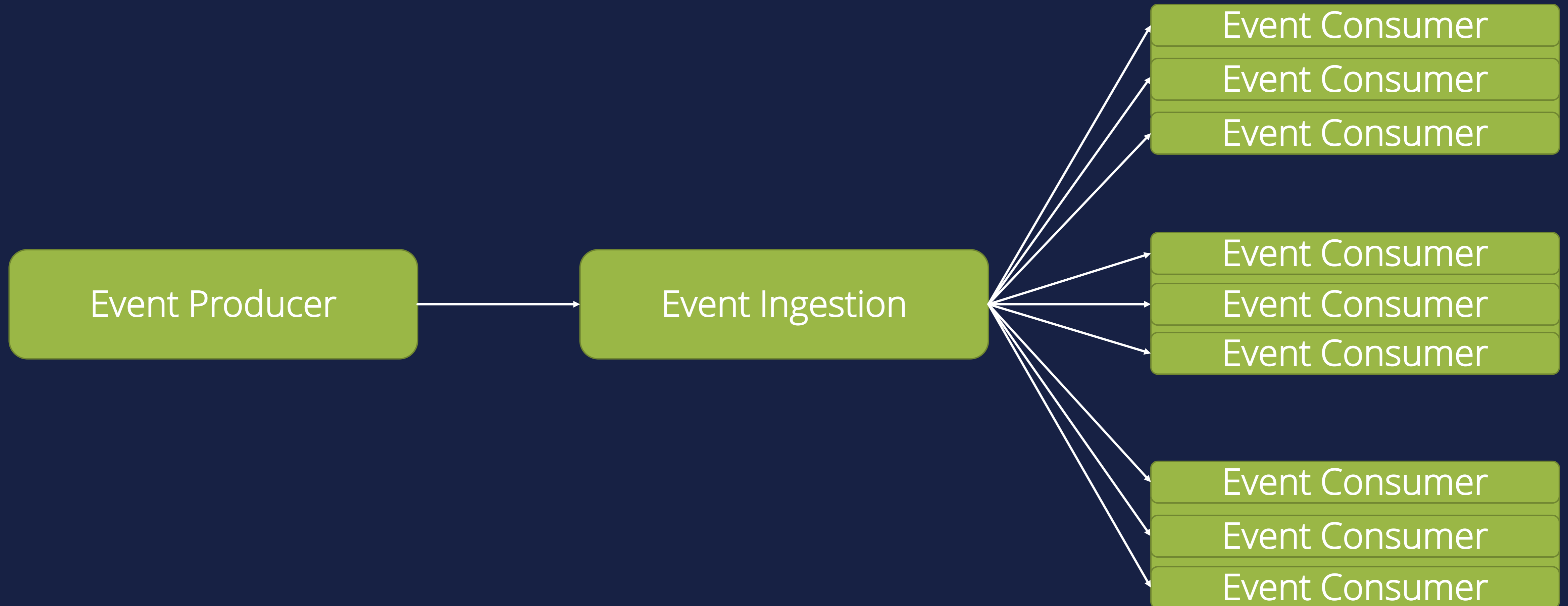
When to use this architecture
Event-Driven Architecture

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
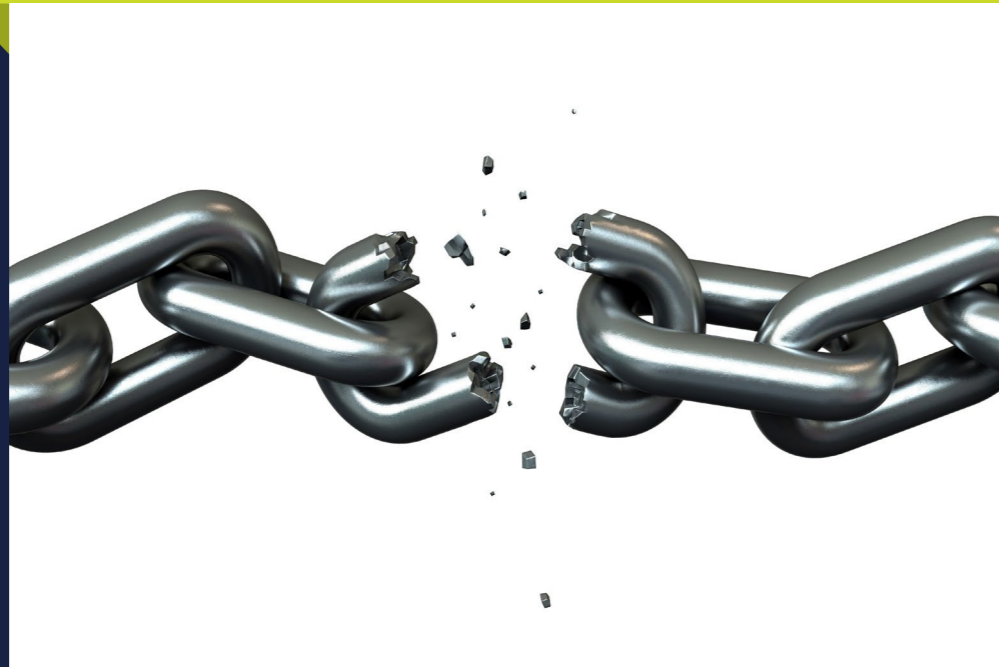
Encapsulation

Responsive

Scalable/Distributed

Independence

Drawbacks
Event-Driven Architecture

Steep Learning Curve

Complexity

Loss of Transactionality

Lineage
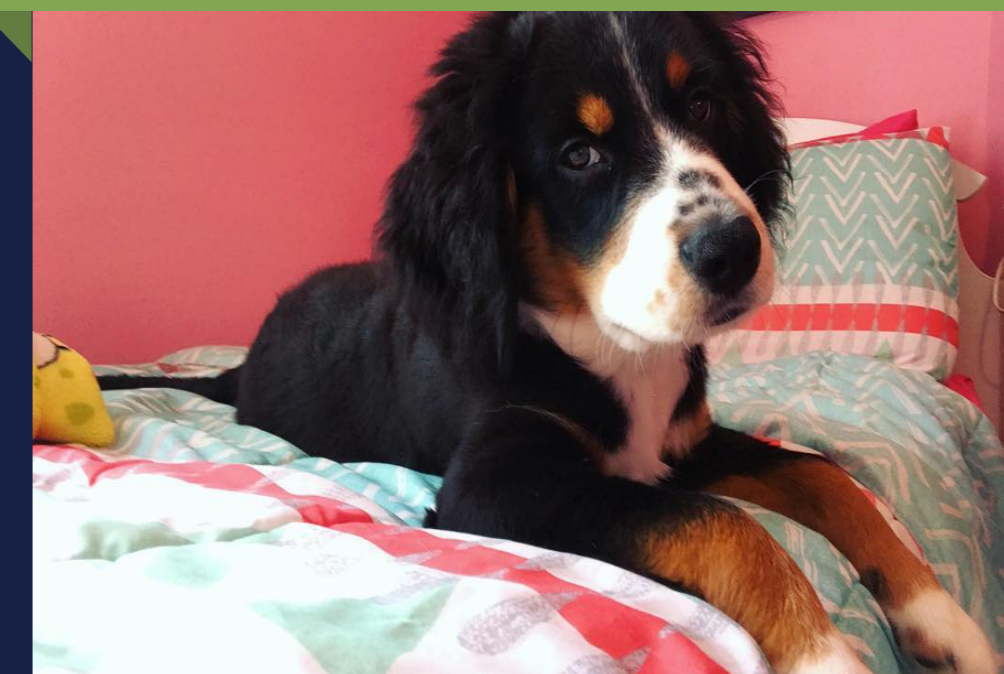
Challenges
Event-Driven Architecture

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
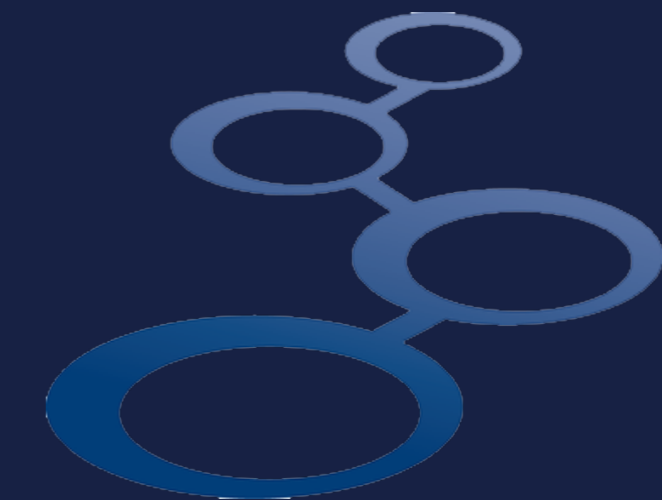
SQLstream

IBM Streaming Analytics

Astronomer

Striim
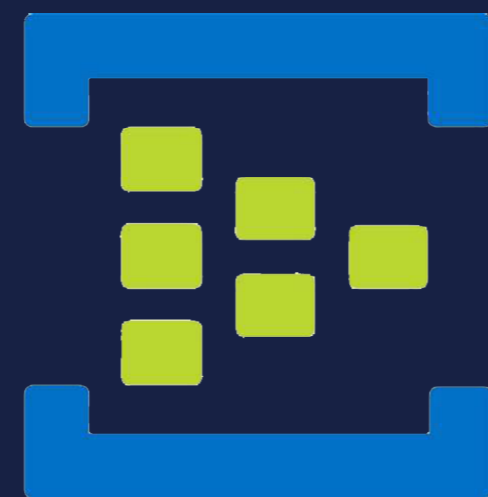
Azure Event Hubs

Azure Event Hubs

Simple, secure, and scalable real-time data ingestion

PieSync

TiO Spotfire

Amazon Kinesis

Amazon ElasticSearch Service

Google Cloud Pub/Sub

StreamSets

PubNub Data Stream

ALIUM

Confluent

HVR

Antiunity Replicate

SQLstream

IBM Streaming Analytics

e PI System

The PI System

Astronomer

Striim

Azure Event Hubs

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

Why choose Event Hubs?
Azure Event Hubs
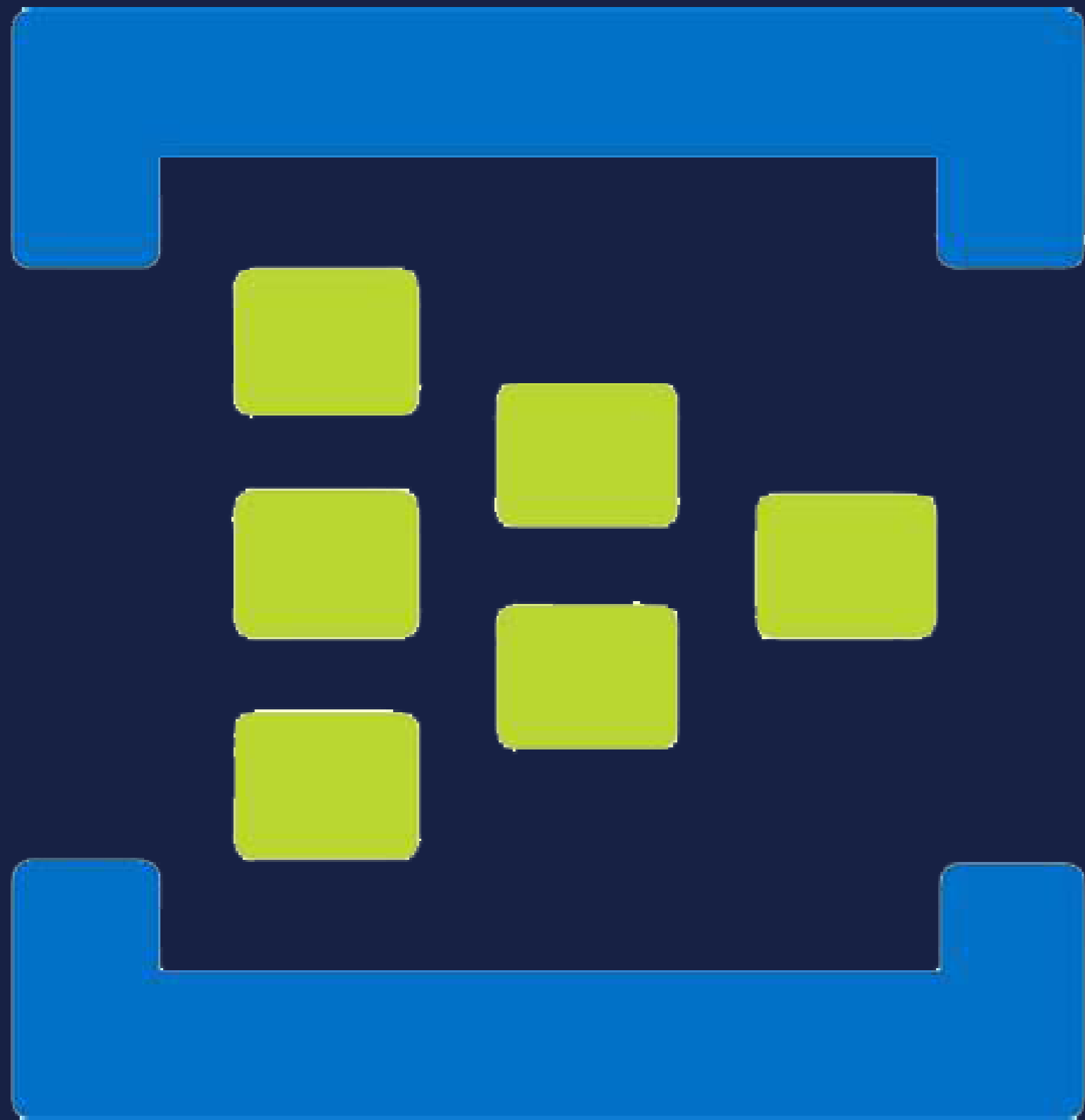
Simple

Secure

Scalable
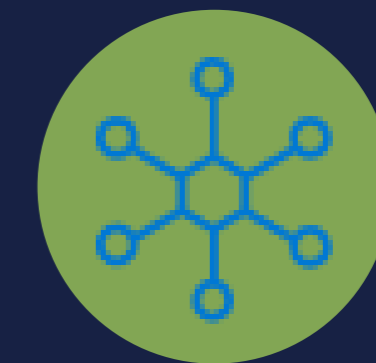
Open

Key Architecture Components
Azure Event Hubs
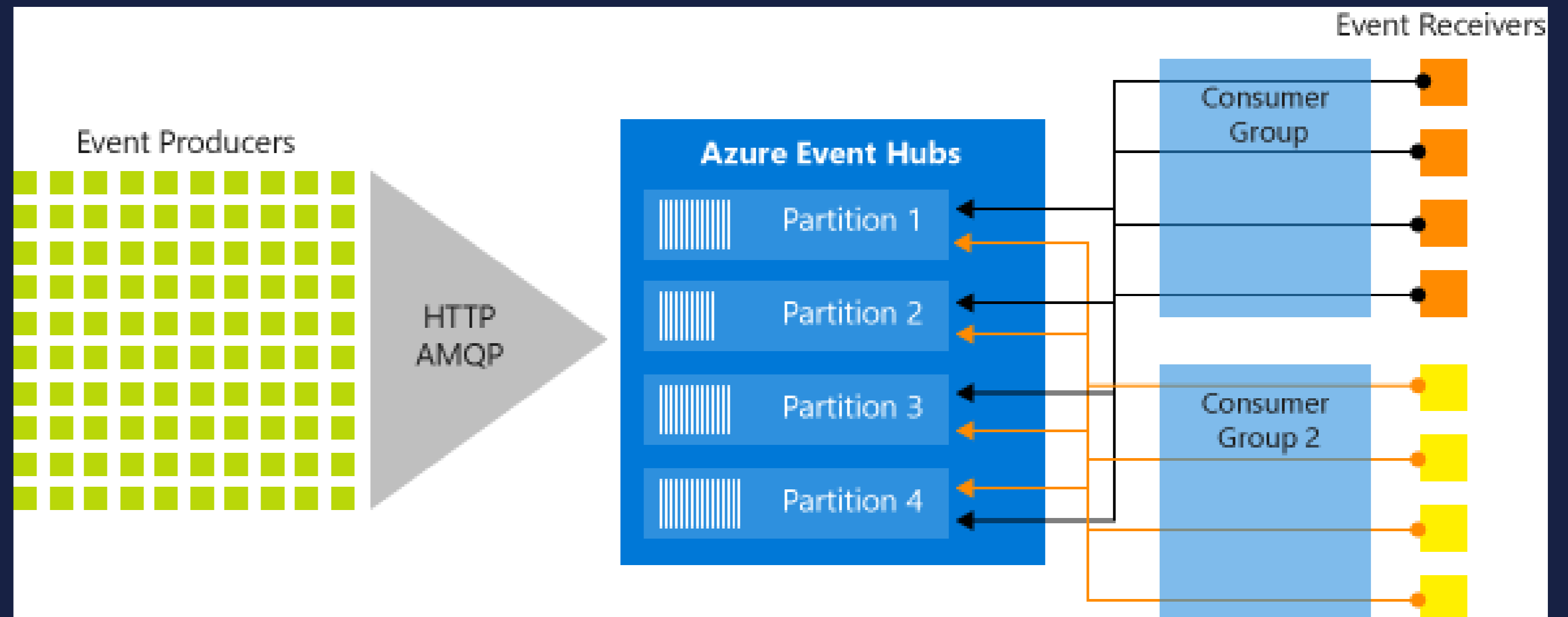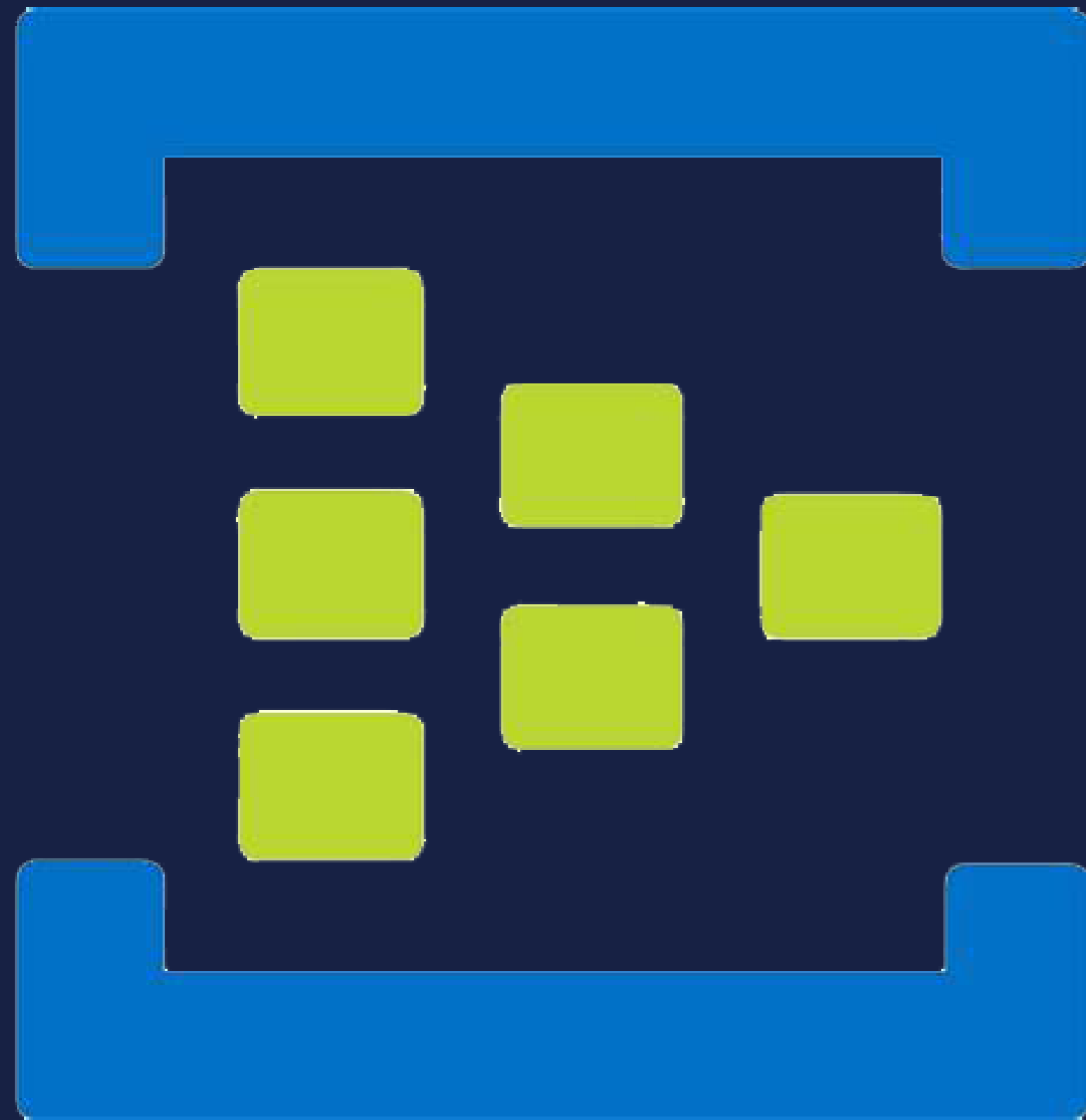
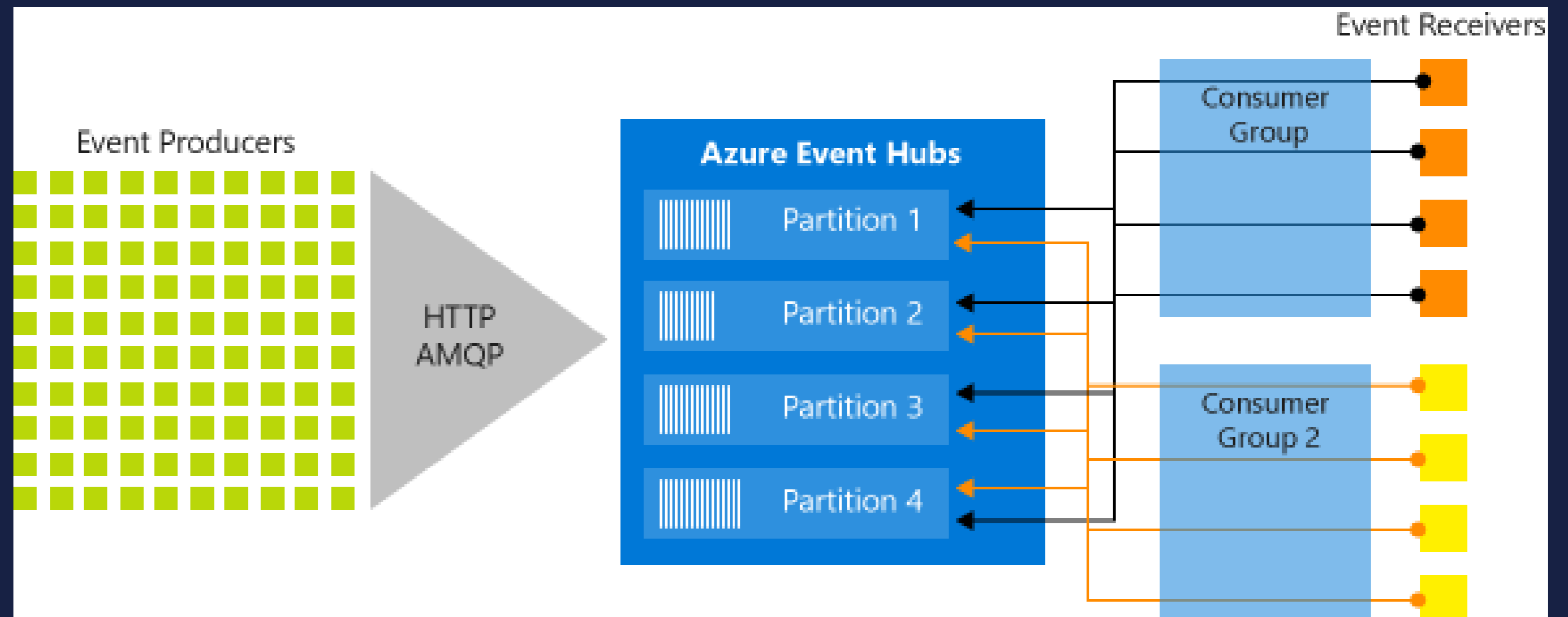Event Producers

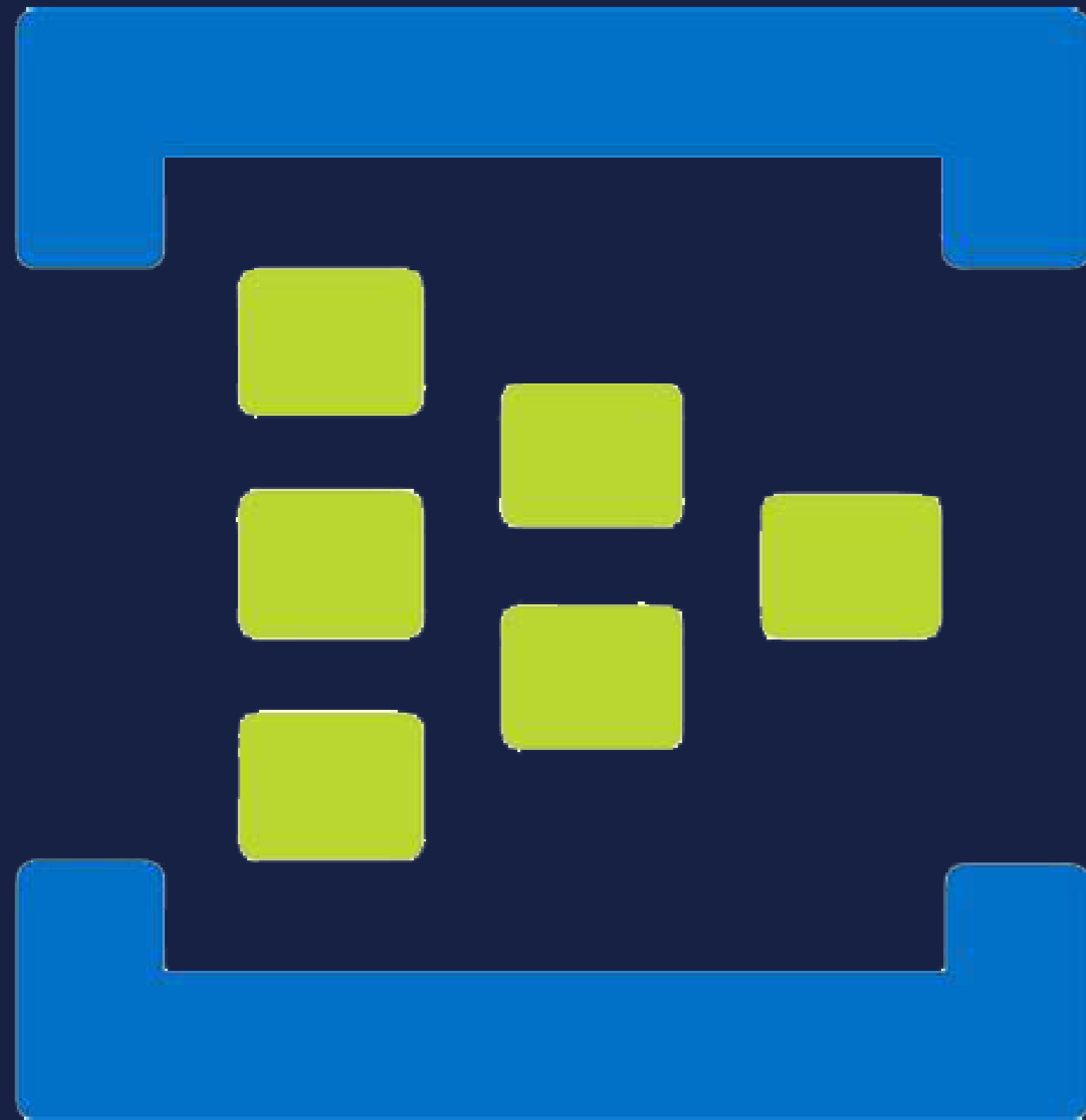# Key Architecture Components
Azure Event Hubs
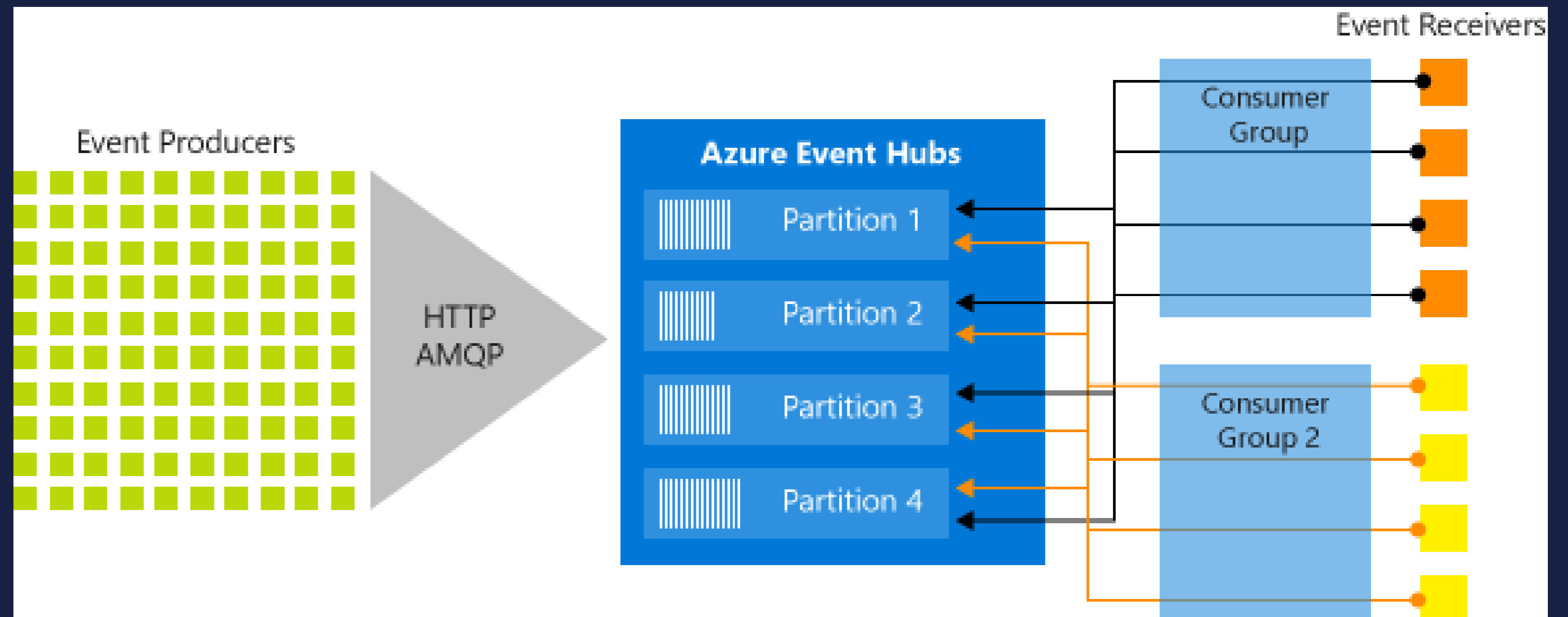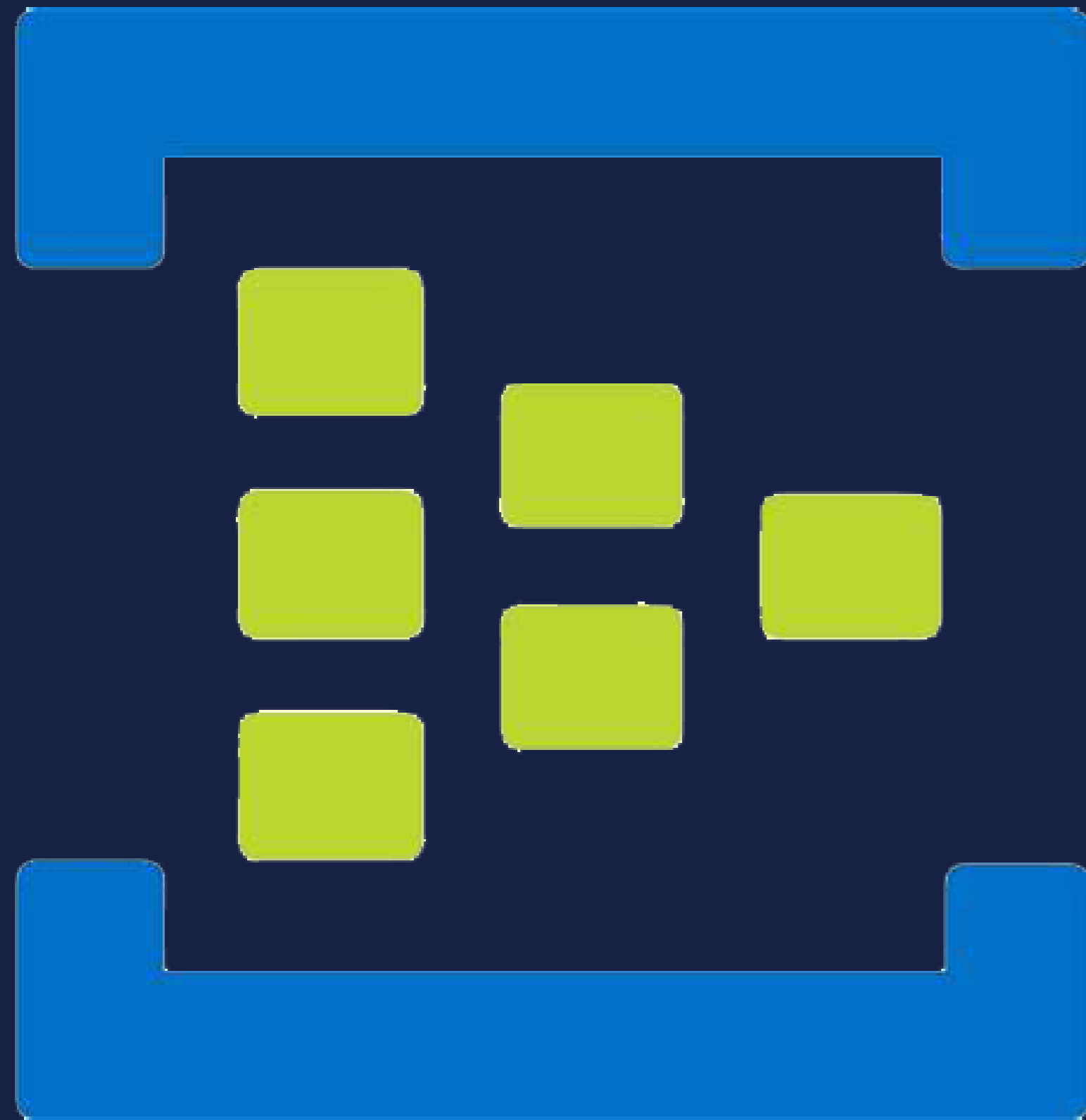
Partitions
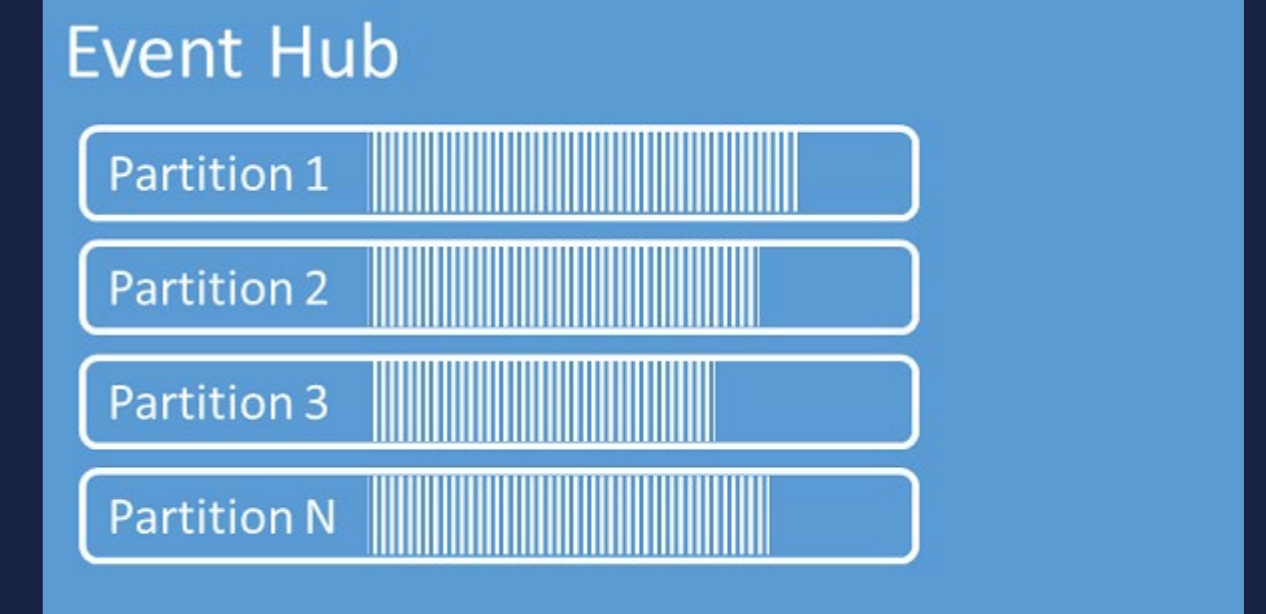
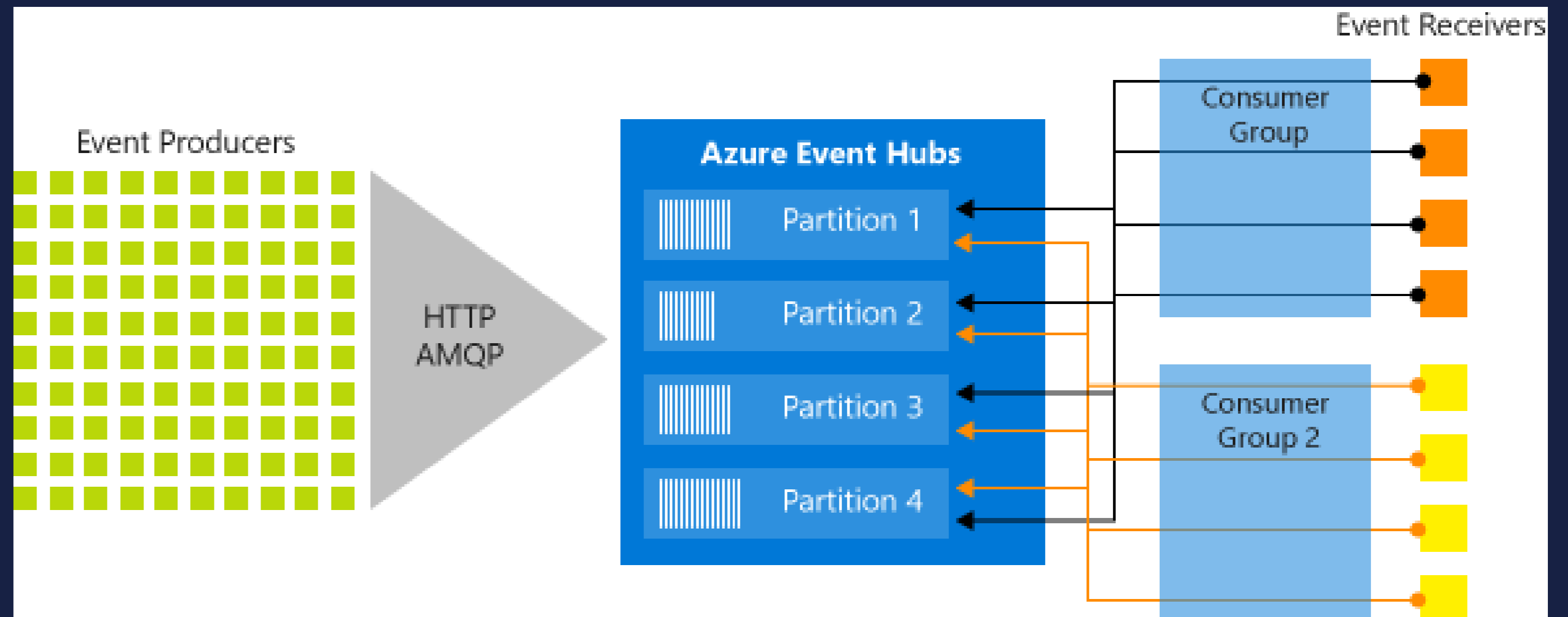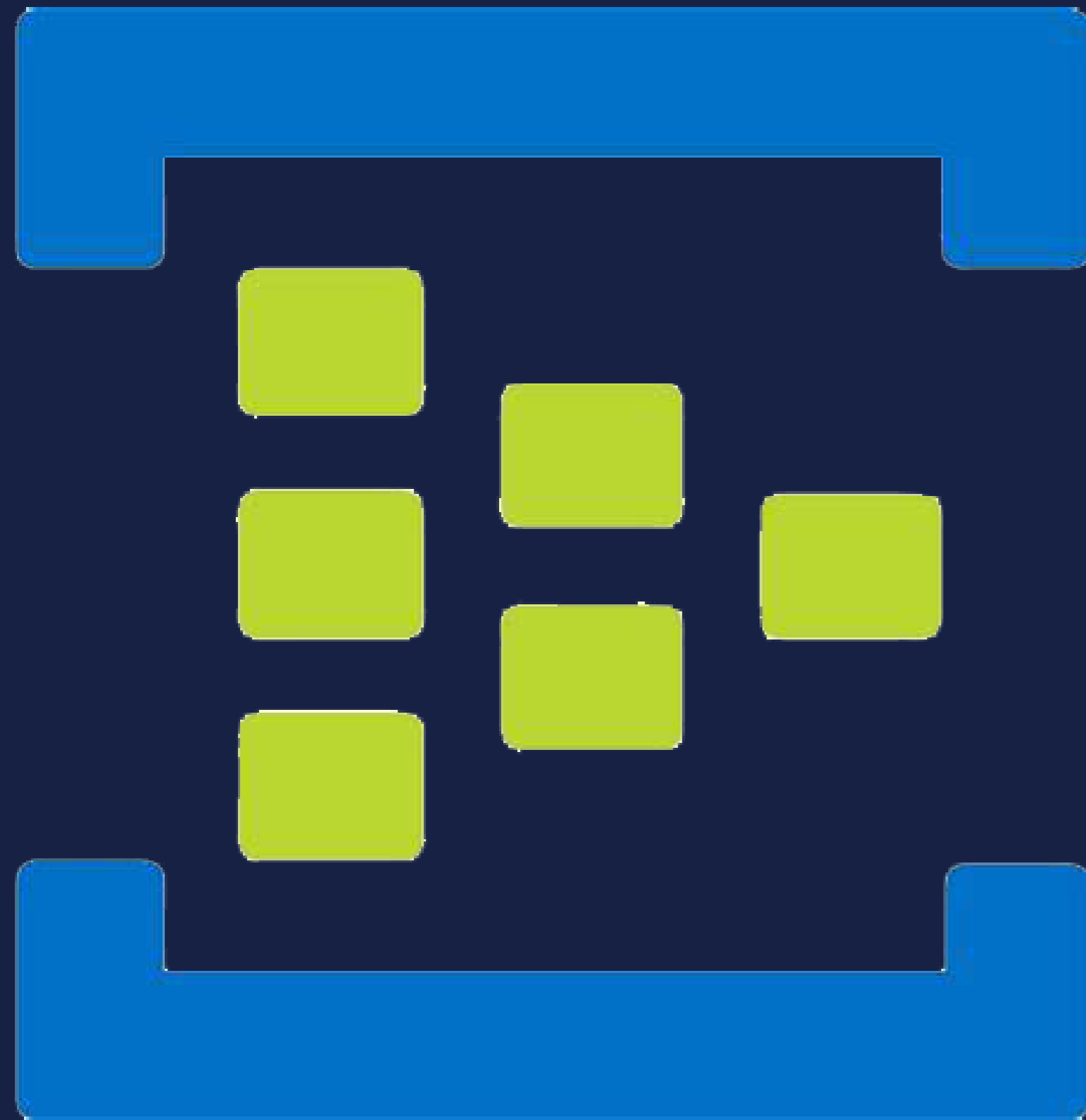# Key Architecture Components
Azure Event Hubs
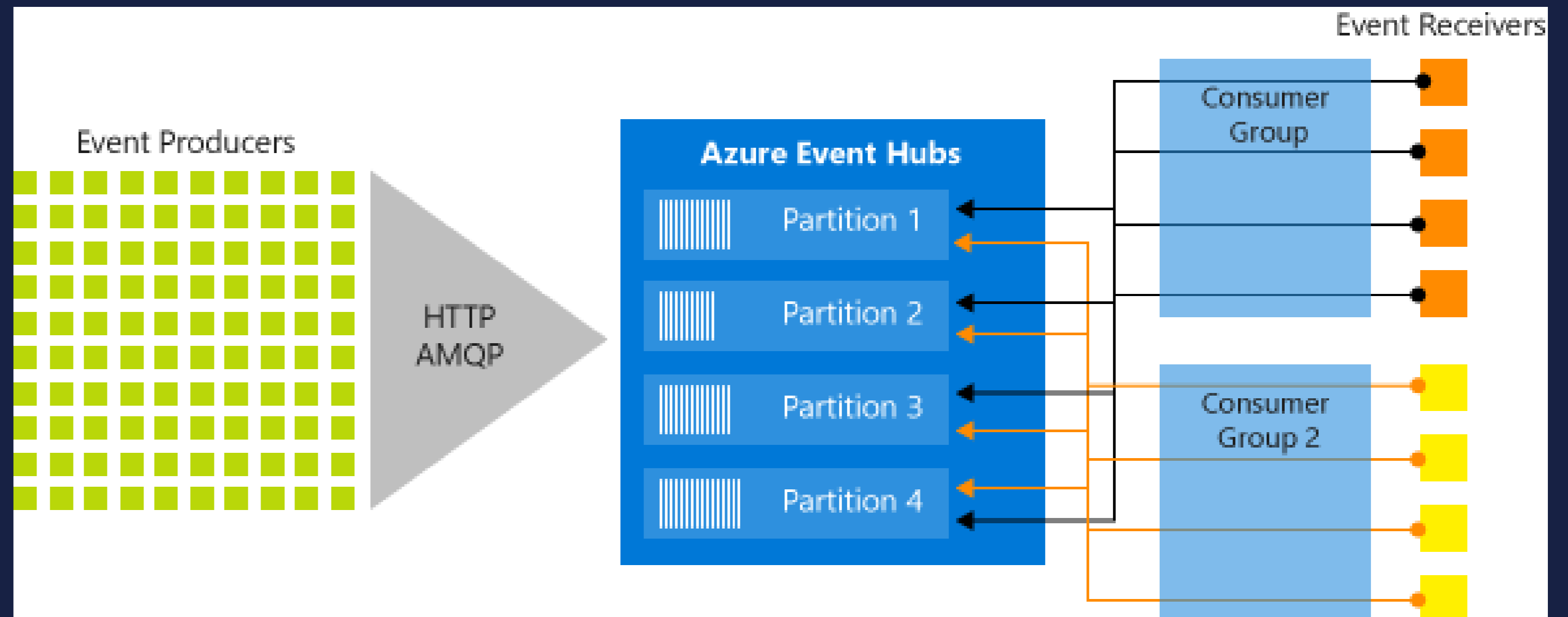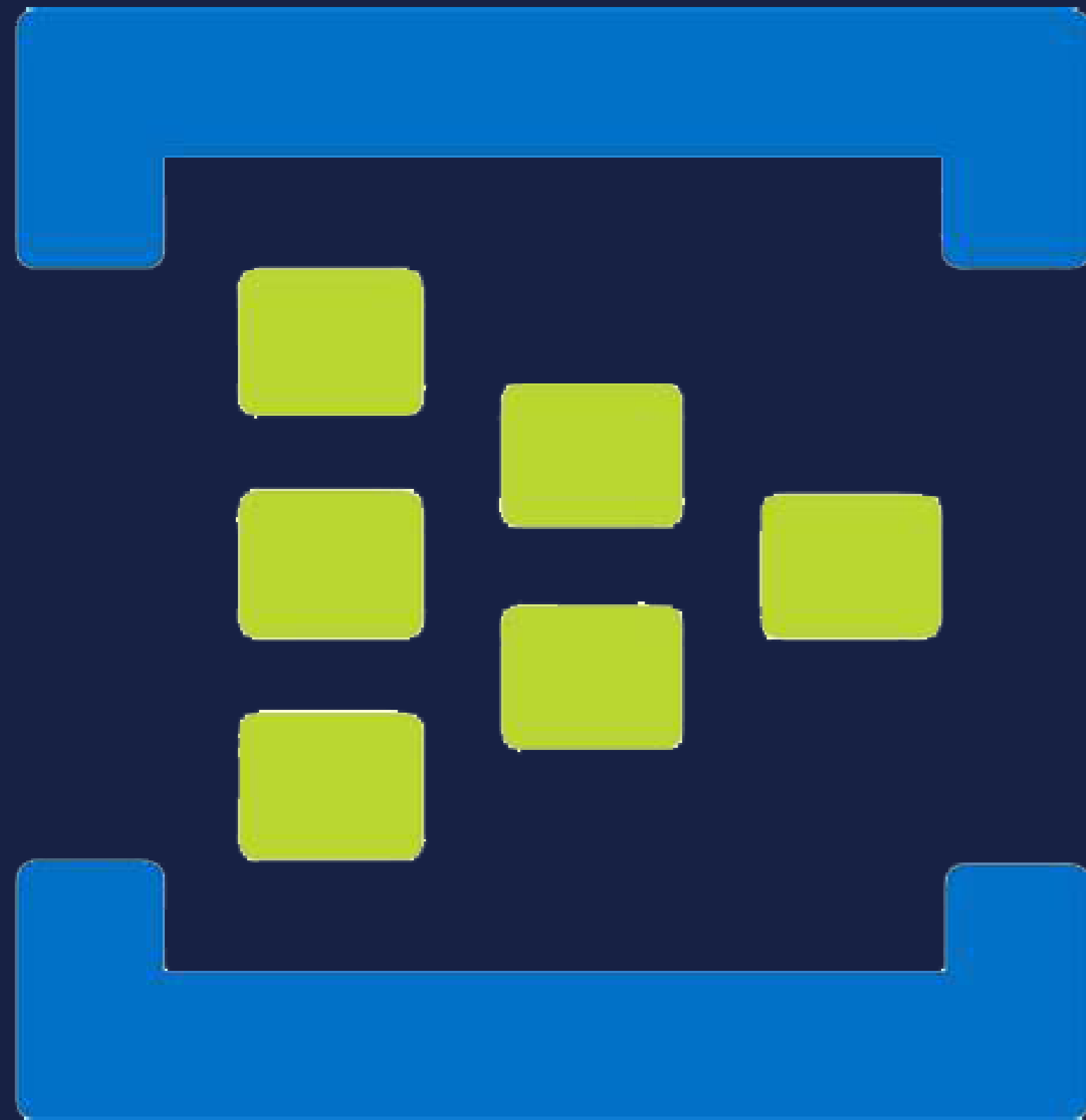

Consumer Groups

Key Architecture Components
Azure Event Hubs

Throughput Units

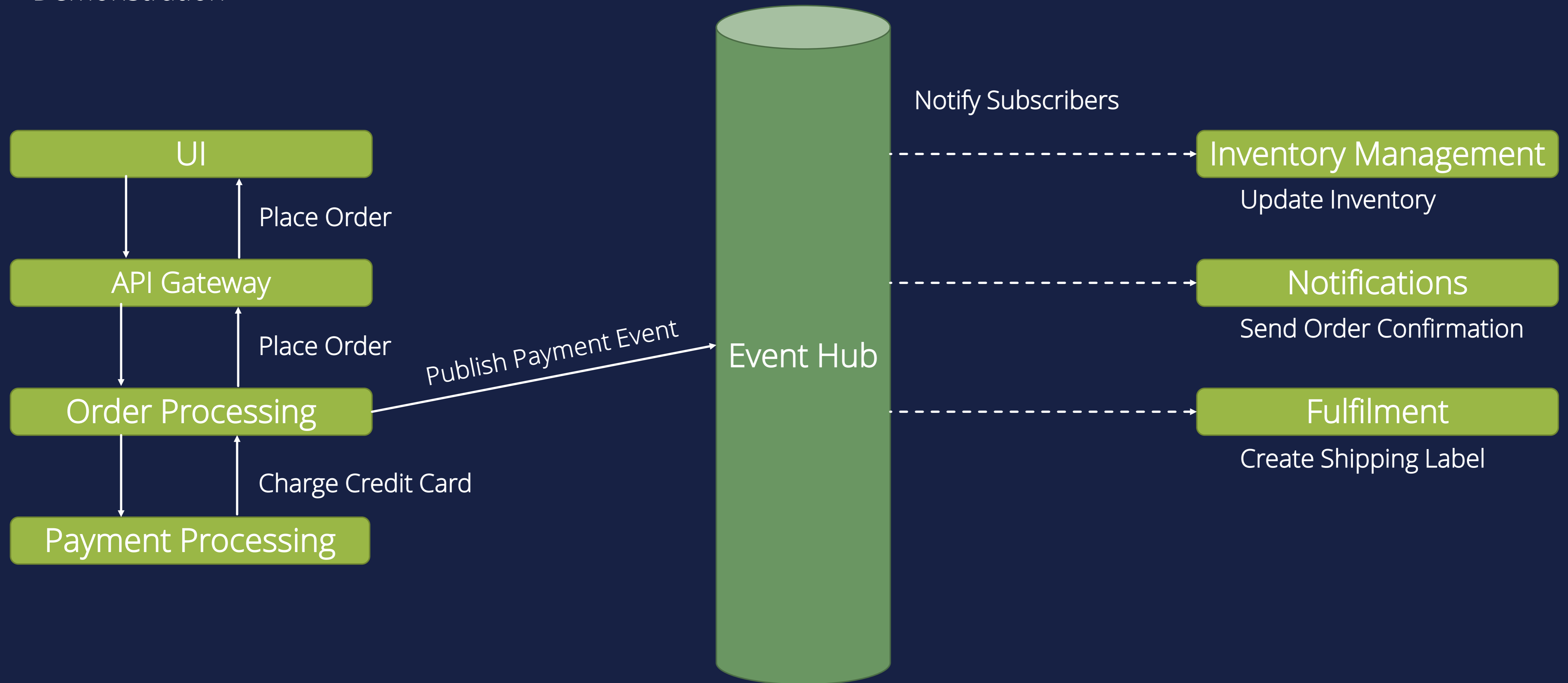# Key Architecture Components
Azure Event Hubs

Event Receivers

Demonstration
Event-Driven Architecture in the Cloud

Scenario
Demonstration

UI

Place Order

API Gateway

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

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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
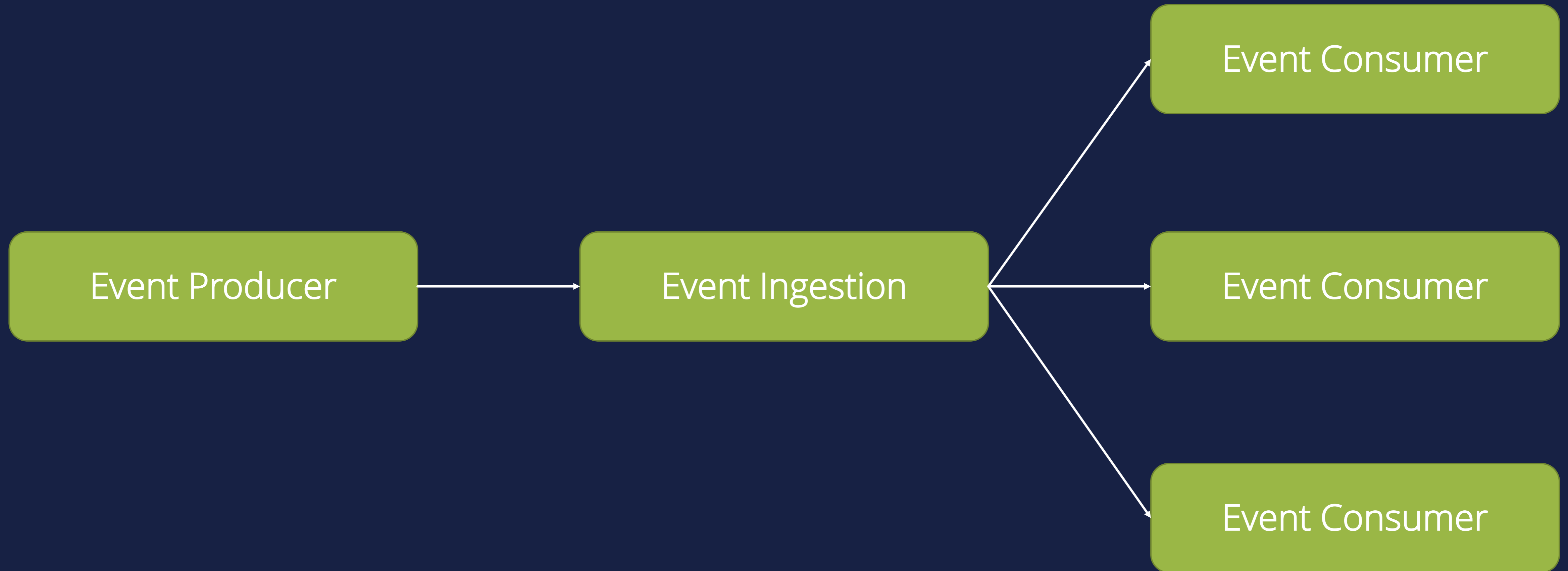- Complex Event Processing
- High Volume / Velocity Data

Threats

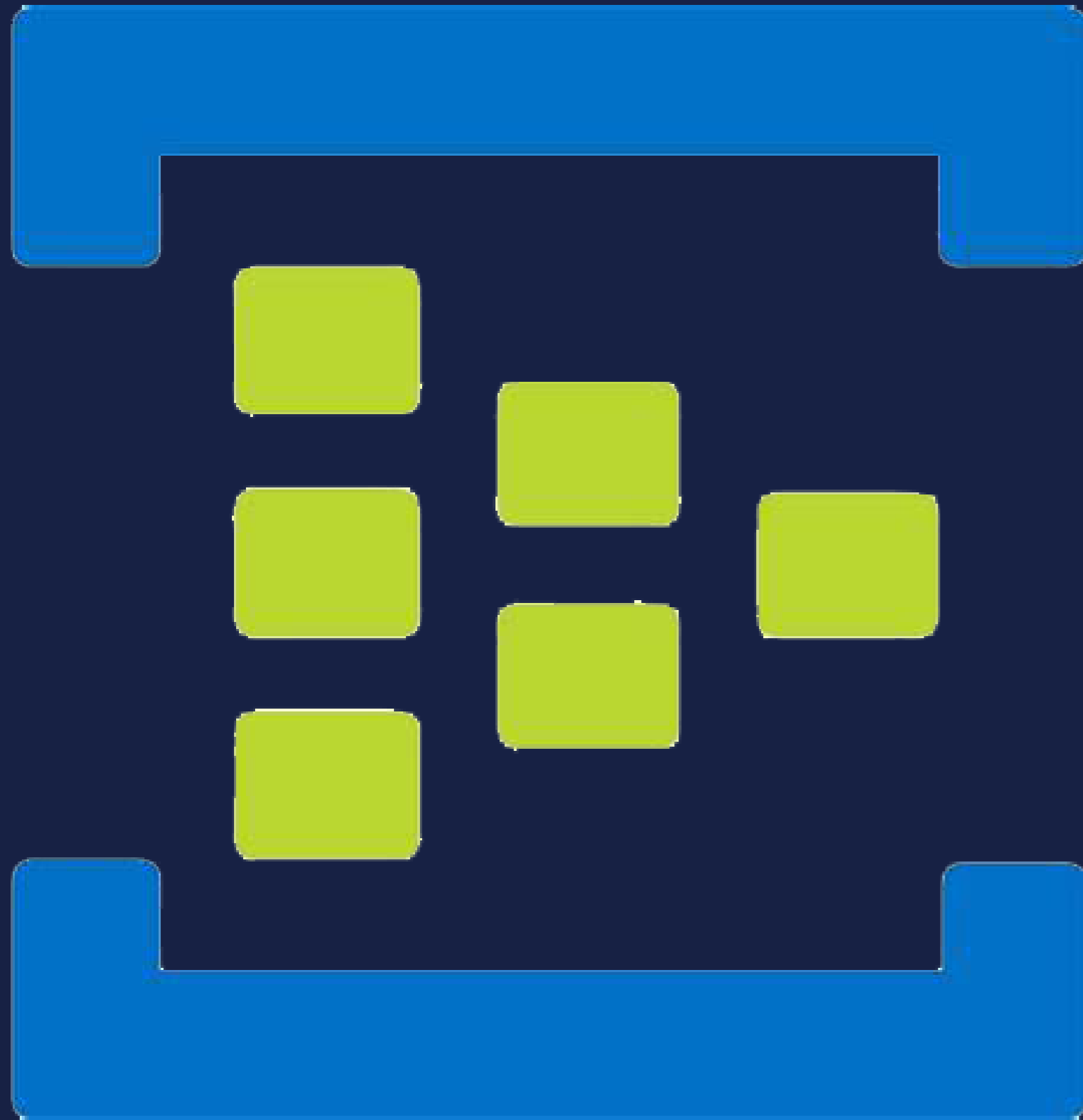- No Guaranteed Delivery
- Potential Sequencing Issues

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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