

# Azure Architects Connect



Microsoft Azure Cosmos DB: die NoSQL Datenbank einfach gemacht

# Today's data realities



Volume



Variety



Velocity

Can my databases support cloud native applications of any scale?

Cost effective way to modernize?

What performance guarantees does the database offer?

Can people access the data they need?

How can I enable faster business insights?

Is it trustworthy?

What's my compliance exposure?

# Cloud native database

Gigabytes of data

Petabytes of data

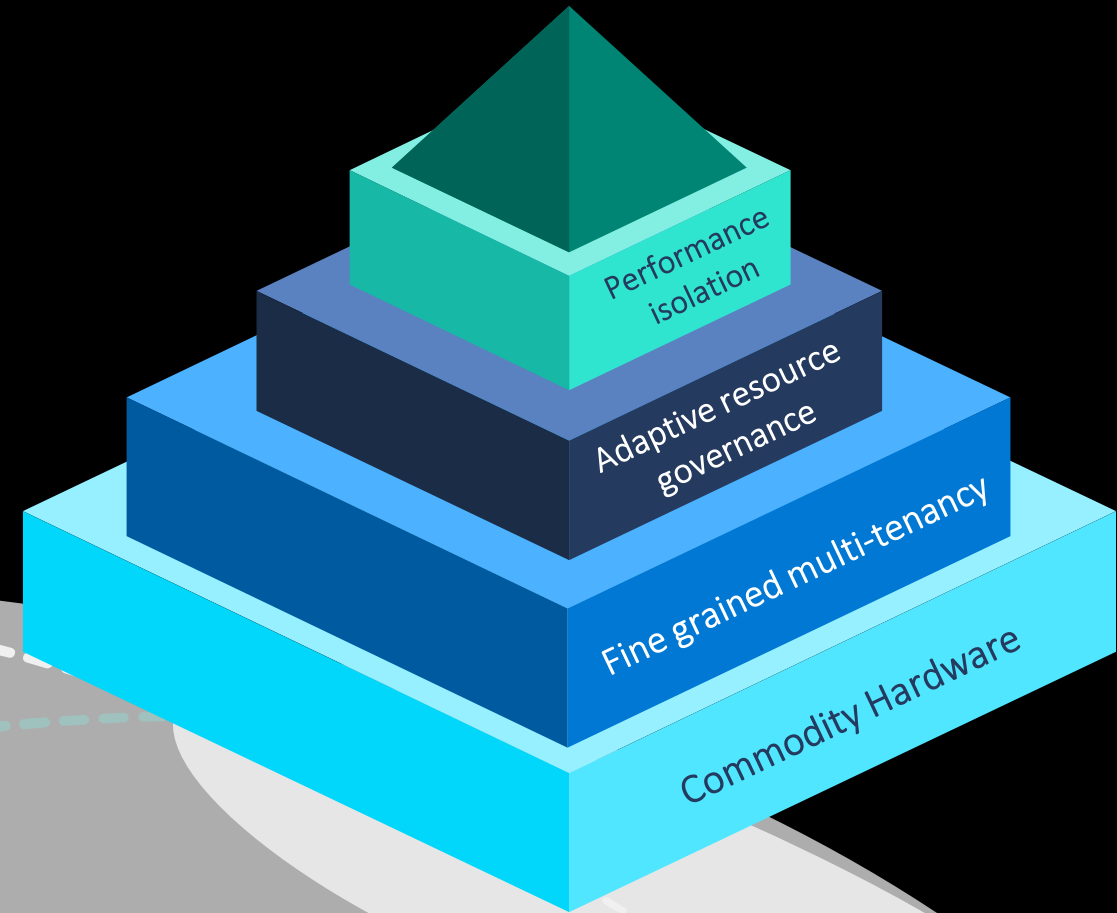
Hundreds transactions/sec

Millions of transactions/sec

2 Elastic and unlimited scalability

1 Global Distribution

3 Cost efficiencies with fine-grained multi-tenancy



# Azure Cosmos DB

Fast, distributed database with relational and non-relational APIs for any scale



Serverless  
Guaranteed speed  
at any scale,  
best TCO

Schema-less,  
flexible app  
development



OSS PostgreSQL,  
MongoDB,  
Cassandra, and  
Gremlin API

Globally distributed,  
RTO=0  
99.999 SLA



Real time  
analytics & BI  
with Synapse Link, seamless  
integration with Azure  
Services

Azure is the first cloud provider to offer its own single database service that supports both relational and NoSQL open-source data.

# Azure Cosmos DB

NEW!



PostgreSQL

NoSQL

MongoDB



cassandra



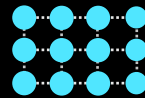
Table



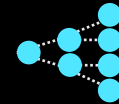
Key-value



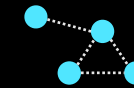
Column-family



Relational



Document



Graph

Instant and elastic automatic scalability

Guaranteed <10 ms latency and 99.999% availability SLAs (for NoSQL data)

Data replication in any Azure region

Fully managed and serverless

Turnkey multi-master writes



# Create a Cosmos DB account

Microsoft

## Which API best suits your workload?

Azure Cosmos DB is a fully managed NoSQL and relational database service for building scalable, high performance applications. [Learn more](#)  
To start, select the API to create a new account. The API selection cannot be changed after account creation.

### Azure Cosmos DB for NoSQL

Azure Cosmos DB's core, or native API for working with documents. Supports fast, flexible development with familiar SQL query language and client libraries for .NET, JavaScript, Python, and Java.

[Create](#) [Learn more](#)

### Azure Cosmos DB for MongoDB

Fully managed database service for apps written for MongoDB. Recommended if you have existing MongoDB workloads that you plan to migrate to Azure Cosmos DB.

[Create](#) [Learn more](#)

### Azure Cosmos DB for PostgreSQL

Fully-managed relational database service for PostgreSQL with distributed query execution, powered by the Citus open source extension. Build new apps on single or multi-node clusters—with support for JSONB, geospatial, rich indexing, and high-performance scale-out.

[Create](#) [Learn more](#)

### Azure Cosmos DB for Apache Cassandra

Fully managed Cassandra database service for apps written for Apache Cassandra. Recommended if you have existing Cassandra workloads that you plan to migrate to Azure Cosmos DB.

[Create](#) [Learn more](#)

### Azure Cosmos DB for Apache Gremlin

Fully managed graph database service using the Gremlin query language, based on Apache TinkerPop project. Recommended for new workloads that need to store relationships between data.

[Create](#) [Learn more](#)

### Azure Cosmos DB for Table

Fully managed database service for apps written for Azure Table storage. Recommended if you have existing Azure Table storage workloads that you plan to migrate to Azure Cosmos DB.

[Create](#) [Learn more](#)

# Motivations to adopt Azure Cosmos DB

Elastic, unlimited throughput

Automatic indexing

Available optimizations for write-centric workloads

Guaranteed low latency

Real-time queries

Fully-managed global distributions

Full PaaS offering for NoSQL and SQL workloads

SLA-backed high availability

Spark and Jupyter integrations

# Common Azure Cosmos DB use cases

[Buy Online Pick-up In-Store](#)

[Frictionless Checkout](#)

[Product Catalogue](#)

[Real-time Personalization](#)

[Real-time Transactions](#)

[Real-time Fraud Detection](#)

[Connected Product  
Innovation](#)

[Real-Time Telemetry](#)

[Real-Time Tracking of Devices](#)

Architectures: <https://learn.microsoft.com/en-us/azure/architecture/browse/?expanded=azure&products=azure-cosmos-db>



# Azure Cosmos Support Assets

## Key assets

Workshop: [Cloud-native in-a-day immersion](#)

Learn: [Develop solutions with Azure Cosmos DB learning path](#)

Learn: [Migrate MongoDB & Cassandra to Azure Cosmos DB \(learning module\)](#)

FTA: [App Innovation with data modernization to Azure Cosmos DB](#)

Partners: [Migrate Linux + OSS DBs advanced specialized partners](#)

Learn: [Migrate MongoDB & Cassandra to Azure Cosmos DB \(learning module\)](#)

# Industry Trends: Buy Online Pick Up In (BOPIS) / Click-and-Collect

Reimagine Retail



**\$141B**

expected in sales revenue from BOPIS from US retailers; up from \$83B in 2021<sup>1</sup>

**44%**

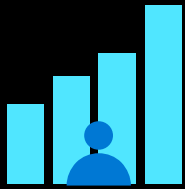
of Top 500 retailers with stores now offer curbside pickup<sup>2</sup>

**208%**

surge in number of orders placed online and picked up in stores between April 2021 and April 2020<sup>3</sup>

# Top Challenges: BOPIS / Click-and-Collect

Reimagine Retail



Health and safety concerns due to COVID-19 pandemic have imposed restrictions on in-store physical customer interactions. As a result, customer adoption of BOPIS has increased and retailers **need to adapt swiftly to changing customer behaviors**



**Enabling seamless web and mobile ordering experience while providing real-time on-site and warehouse inventory visibility** poses workflow challenges



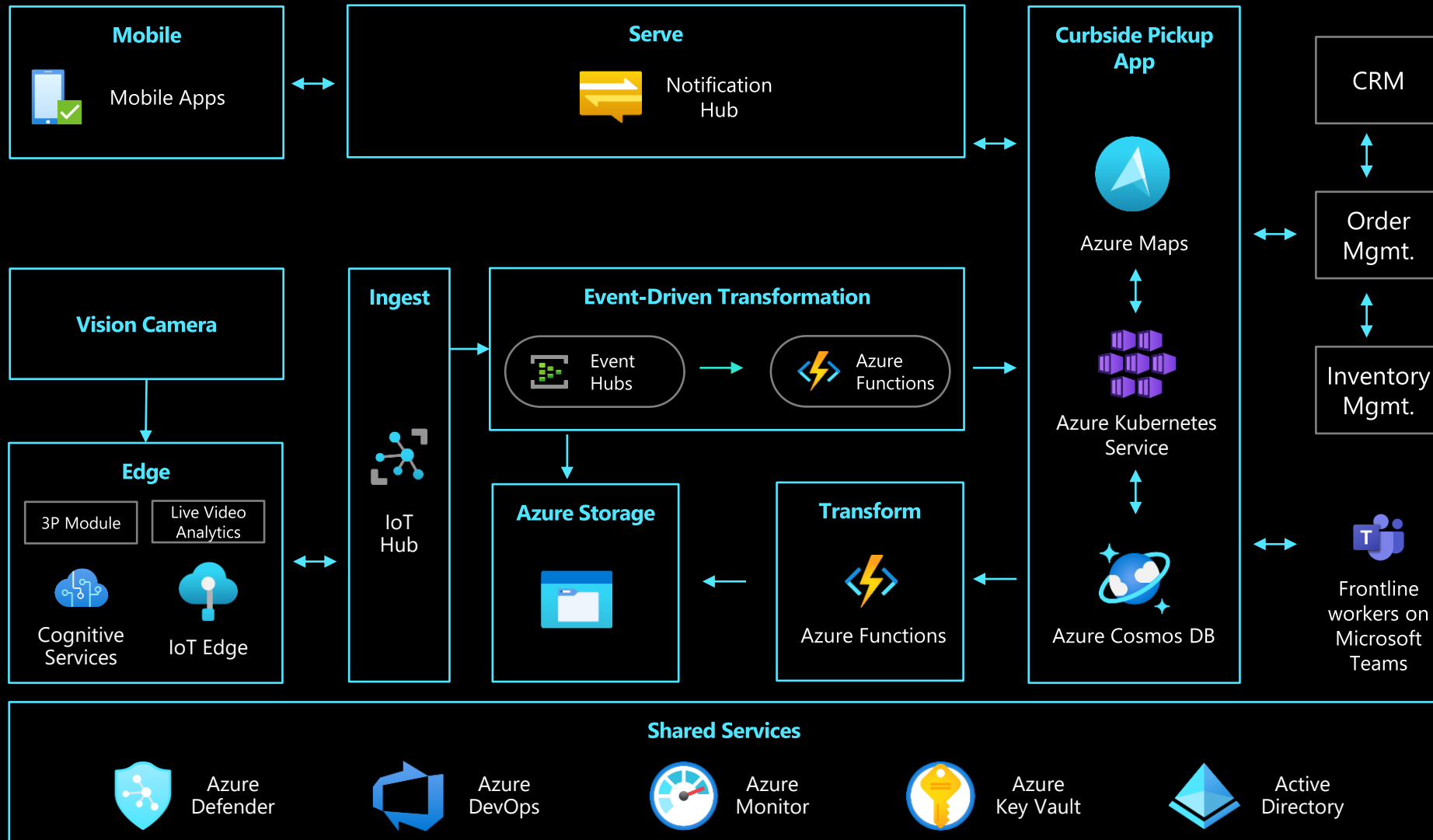
Ability to **deliver real-time notifications to customers and coordinate pickups** critical for maintaining customer satisfaction and increasing associate productivity

Enable **immersive experiences** to drive **customer loyalty**

# Reference Architecture: BOPIS / Click-and-Collect

Reimagine Retail

## Architecture

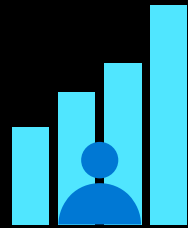


## Overview

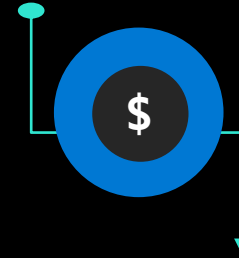
- Use video analytics to detect license plates when the vehicle turns into the parking lot. This information is reconciled with order management system and a task is sent to Teams which alerts and schedules a store associate to start packing.
- When store associate starts task, system will cross-check with geofence rule of the customer location. A notification will be sent to the customer to let them know that their delivery is on the way when the system detects that the customer is in the boundaries of the geofence.

# Business Outcomes: BOPIS / Click-and-Collect

Reimagine Retail



Increased retail store  
traffic and sales



Reduced last-mile  
shipping costs



Improved integrated  
inventory management



Same-day order  
fulfilment

# Case Study: BOPIS / Click-and-Collect

Reimagine Retail

Chipotle was devoting significant resources to supporting three different customer-facing websites: a main site, one for online ordering, and one for catering. Each required manual code updates for even small changes. They needed a scalable and agile single customer web experience to deliver real-time menu, pricing, and inventory data to customers. Using Azure, they built a new unified web presence using a single-page app pattern.

## Approach

- Azure App Service supports each back-end service (order, tax payment, etc.) with an auto-scaling hosting environment.
- Azure Cosmos DB selected to store customer orders; replaced existing relational databases and added scalability, availability, and simplicity.
- Azure Cache for Redis provides in-memory caching to improve website performance.
- Azure Functions enables serverless, event-triggered code.

## Outcomes

- Customer orders now stored in a single, unstructured document in Azure Cosmos DB instead of the previous 30-50 relational database tables.
- Scalability in both database and app compute environments matches capacity with demand.
- Improved website performance and content load times.



*"Switching to Azure Cosmos DB is a big win in terms of scalability, availability, and, down the road, geographic distribution. With Azure Cosmos DB, we can literally store a customer's order as a single, unstructured JSON document, instead of in 30 to 50 different relational tables."*

### Mike Smith

Lead Software Developer  
Chipotle Mexican Grill



[Read Story](#)

# Industry Trends: Frictionless checkout & order processing

Reimagine Retail



**\$23B**

retail store automation market is expected to reach over USD 23 billion worldwide in 2026<sup>1</sup>

**20%**

Growth in contactless payments by 2027<sup>1</sup>

**55%**

Want to focus on brand new consumer experiences<sup>2</sup>

# Top Challenges: Frictionless checkout & order processing

Reimagine Retail



**Delivering reliable order and checkout services at any scale** to meet seasonal, promotional, and global customer demand.



**Delivering relevant real-time offers and insights** to help cross-sell products based on unified data



**Enabling seamless checkout experience** for shoppers pose workflow challenges

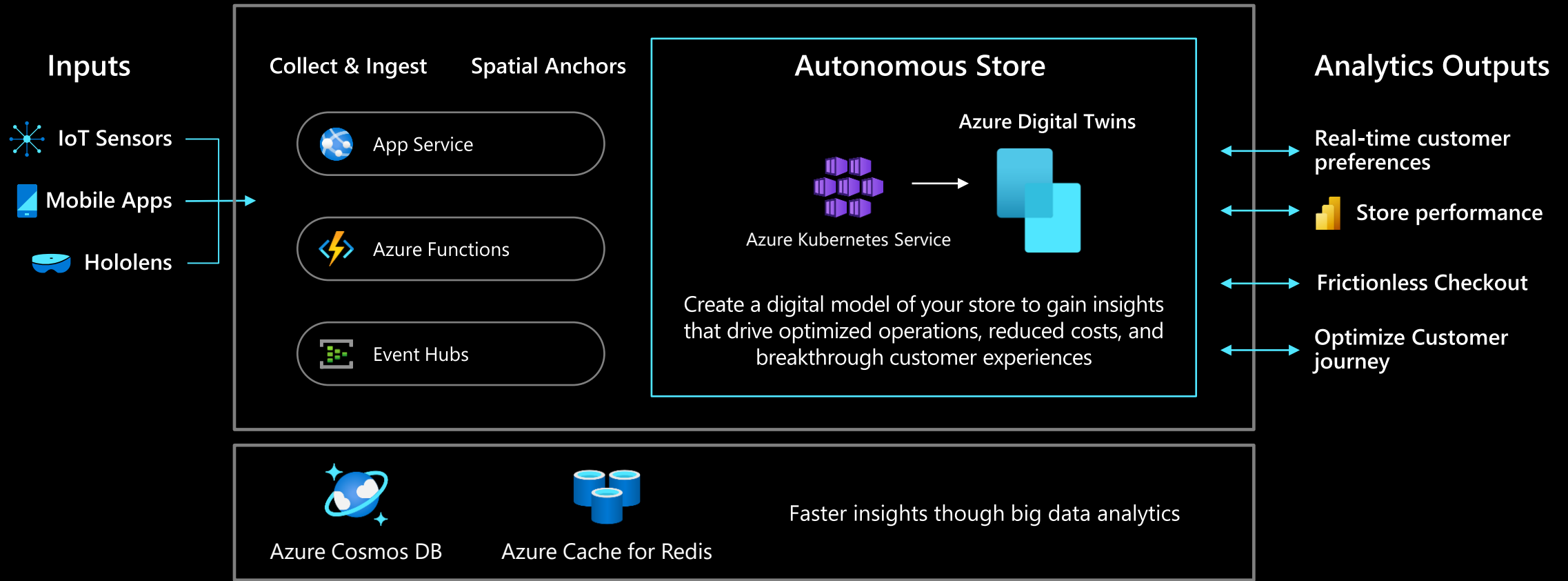
Enable unified experiences to drive customer loyalty



# Solution Overview: Frictionless checkout & order processing

Reimagine Retail

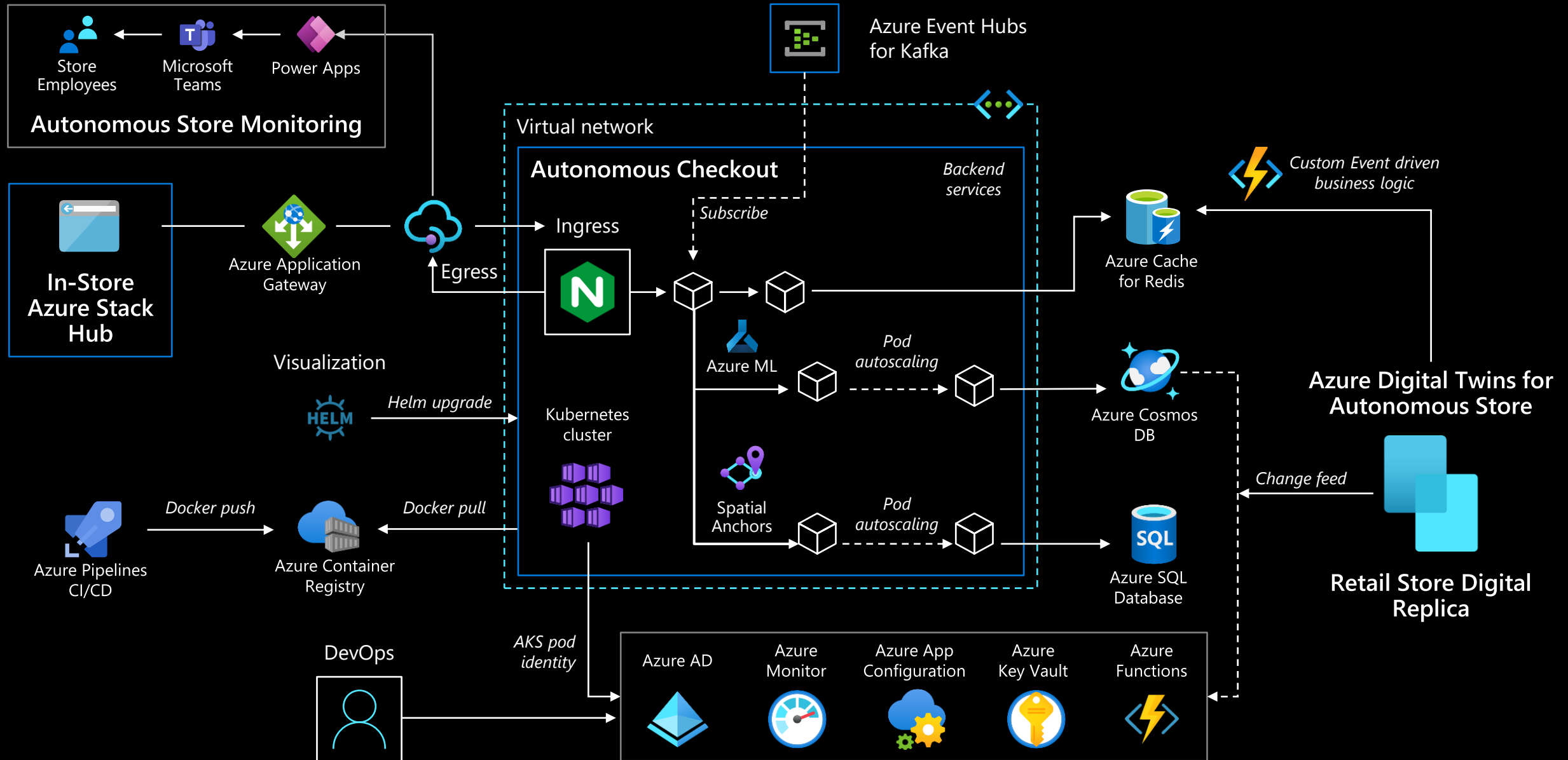
Deliver Grab & Go **differentiated frictionless checkout** experiences for your customers



Innovate at **scale** and modernize experiences with **unlimited** on-demand capacity

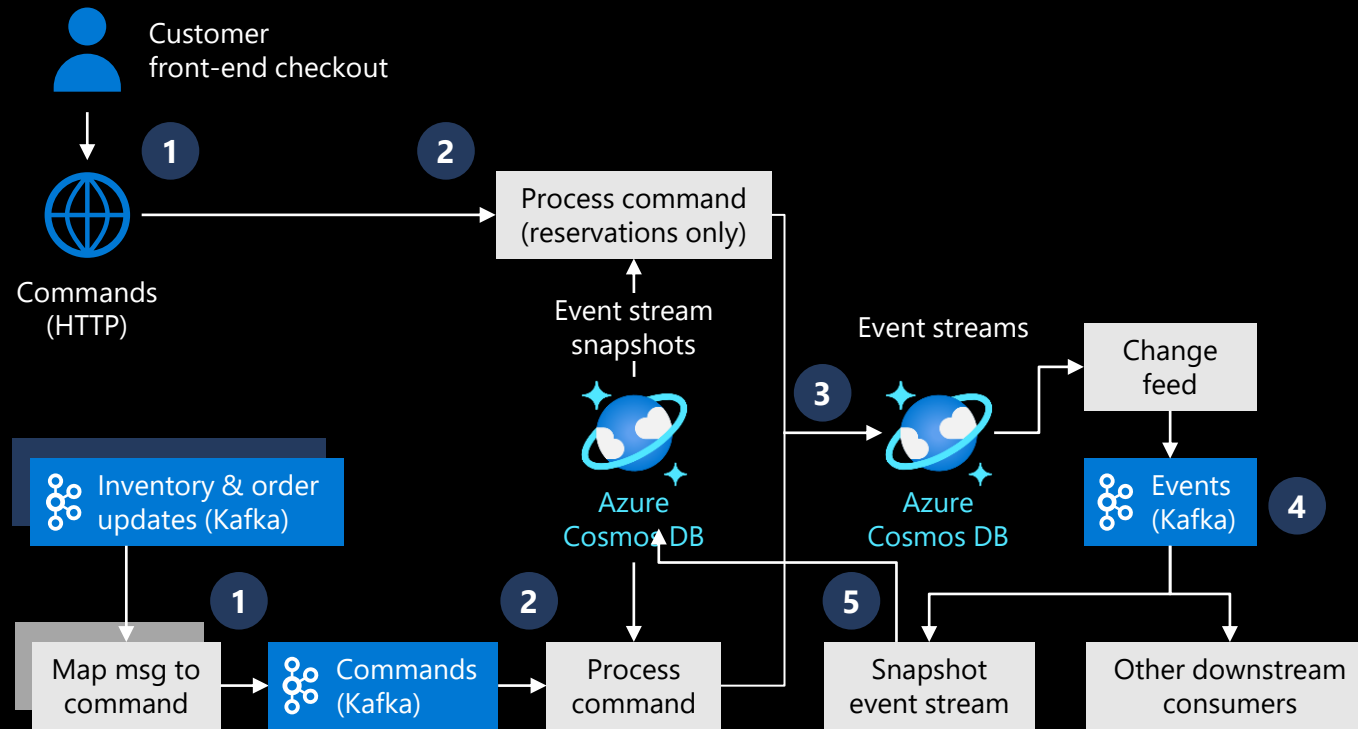
# Reference Architecture 1: Frictionless Checkout

Reimagine Retail



# Reference Architecture 2: Order Processing

## Architecture detailing key components of an order processing pipeline



## Data Flow

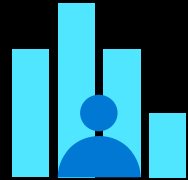
- Event messages enter the system via customer-facing applications. These messages are passed into a command processing pipeline.
- Each event message is ingested and mapped to one of a defined set of commands by a command processor microservice.
- Each event emitted as the output of a command is committed to an event stream database using **Azure Cosmos DB**.
- For each database insert or update committed to the event stream database, an event is raised by Azure Cosmos DB Change Feed.
- All events from the Cosmos DB Change Feed are also sent to a snapshot event stream microservice, which calculates any state changes caused by events that have occurred. The new state is then committed to the event stream snapshot database stored in Cosmos DB.
- **Apache Kafka** is also used to process incoming and downstream events, in the order processing pipeline.



[Component Deep Dive](#)

# Business Outcomes: Frictionless checkout & order processing

Reimagine Retail



Drive customer delight



Modernize ecommerce,  
minimize errors and theft



Optimize processes with  
actionable insights



Improved forecasting of  
consumption demands

# Case Study: Checkout & order processing

Reimagine Retail

Walmart's E-Commerce business generates ~\$5 billion dollars in annual revenue and enjoys 30–40% YoY growth. To support expected hyper-growth, the business needed a platform that could scale-up to meet its requirements. The existing E-Commerce application was built on a Commercial-off-the-shelf (COTS) monolith software unable to scale and expensive across development, support and hardware costs.

## Approach

- New microservices-based architecture packaged in containers and orchestrated with Azure Kubernetes Service.
- High performance, massive scalability, and elasticity by using Azure Cosmos DB and Azure Cache for Redis with multi-region, active-active deployments.
- Azure Cosmos DB selected for globally distribution, horizontal scalability, and schema-less design to replace existing relational databases.
- Azure Cache for Redis deployed to store tokens after every write.

## Outcomes

- Elastic scalability and cost-effectiveness achieved by using autoscale features in Azure Cosmos DB and Azure Kubernetes Service.
- Real-time data access with Azure Cosmos DB, delivering <10 millisecond latency.
- High availability – minimum 99.99% availability required because system downtime is directly linked to a loss in revenue



*"The Azure Cosmos DB data model is carefully designed with the right partition key and access patterns. For our use cases, the [data model] gives us less than 10 ms latency for 99 percentile of our calls."*

**Sidharth Patnaik**

Distinguished Engineer  
Walmart



[Read Story](#)

# Industry Trends: Product Catalog

Know Your Customer



75%

Profitability increase driven by a 5% increase in customer retention <sup>1</sup>

63%

Stock shortages due to fluctuating demand and regulations from the pandemic <sup>2</sup>

47%

US consumers who abandon a brand when there is no personalization or trust factor <sup>3</sup>

# Top Challenges: Product Catalog

Know Your Customer



Keep product **lists updated in real-time** and integrate with in-store shopping experience



Need to **standardize product data** from multiple suppliers and categorize products properly



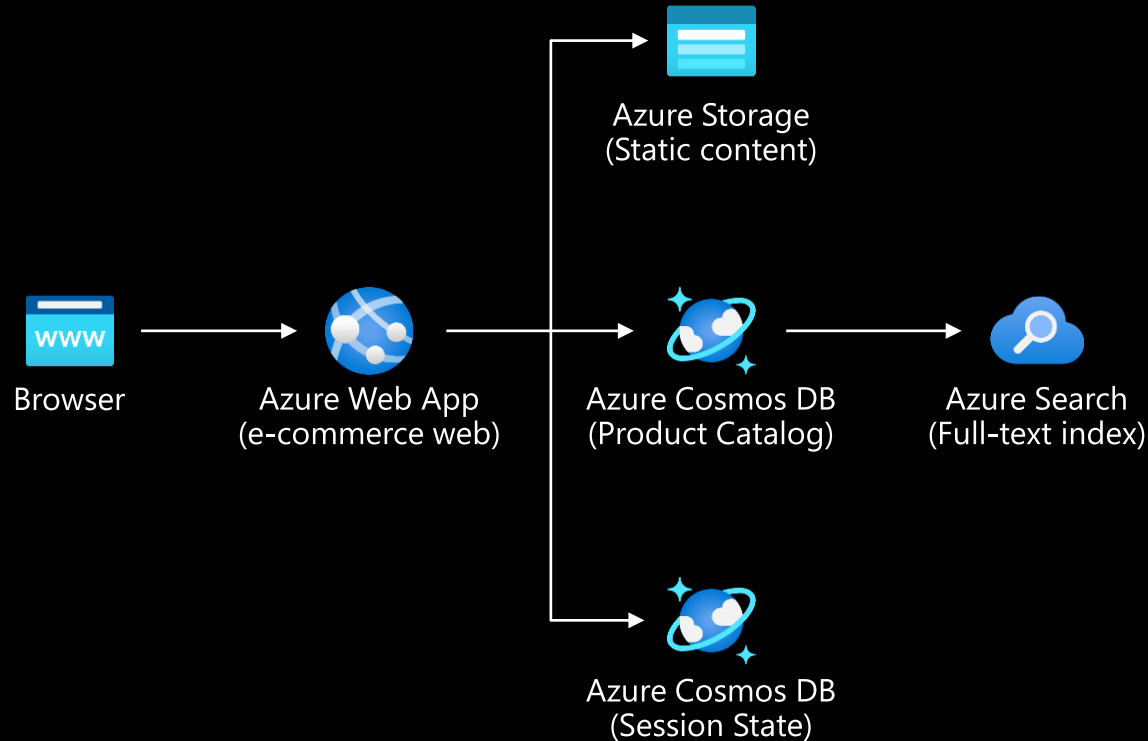
Customers need to **experience satisfying service that is fast, helpful and always available** to them anywhere

Managing product catalog across multiple channels to drive more relevant offers and recommendations, grow revenue, and improve customer experience is key to retailers

# Reference Architecture: Product Catalog

Know Your Customer

## Architecture for Product Catalog



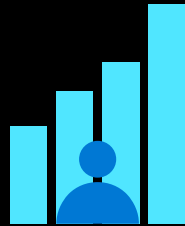
## Key Highlights

- The e-commerce web site is hosted on Azure Web App and uses Azure Cosmos DB as data store for product information and session state. The web application is hosted in an Azure Web App.
- The data (products and session state) gets stored in **Azure Cosmos DB**.
- Static content and product images are stored in an Azure Storage account.
- Azure Search provides search functionality over diverse product catalogs, traffic spikes, and rapidly changing inventory.
- Azure Cognitive Search is used to search across all the products.



# Business Outcomes: Product Catalog

Know Your Customer



Grow sales with real-time  
product catalog management



Increase customer  
satisfaction with  
differentiated experiences



Reduced friction in the  
shopping experience



Build trust with quality  
product information

# Industry Trends: Real-time Personalization

Know Your Customer



80%

Consumers more likely to make a purchase when the brand offers a personalized experience <sup>3</sup>

30%

Outselling of counterparts by companies who invest in online personalization <sup>2</sup>

47%

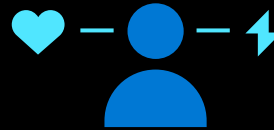
US consumers who abandon a brand when there is no personalization or trust factor <sup>4</sup>

# Top Challenges: Real-time Personalization

Know Your Customer



**Data siloes and lack of data governance** make it hard to get a 360-degree view of consumers across channels.



Need to respond to **changes in customer behavior** and **tailor interactions** to individual needs, to drive enhanced loyalty.



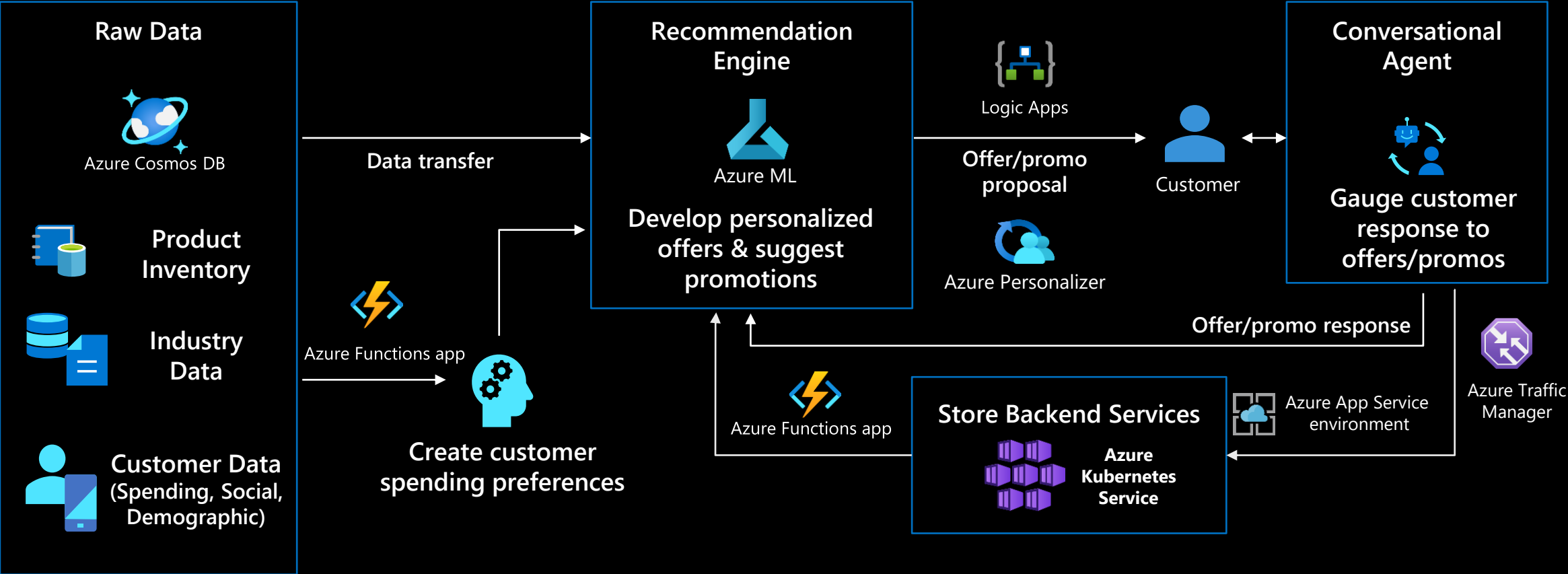
**Ineffective targeting** of advertisements and product information and **inability to track cross-sell** effectiveness and customer satisfaction across customer personas.

Delivering personalized experiences across multiple channels to drive more relevant offers and recommendations, grow revenue, and improve customer experience is key to retailers

# Solution Overview: RT Personalization

Know Your Customer

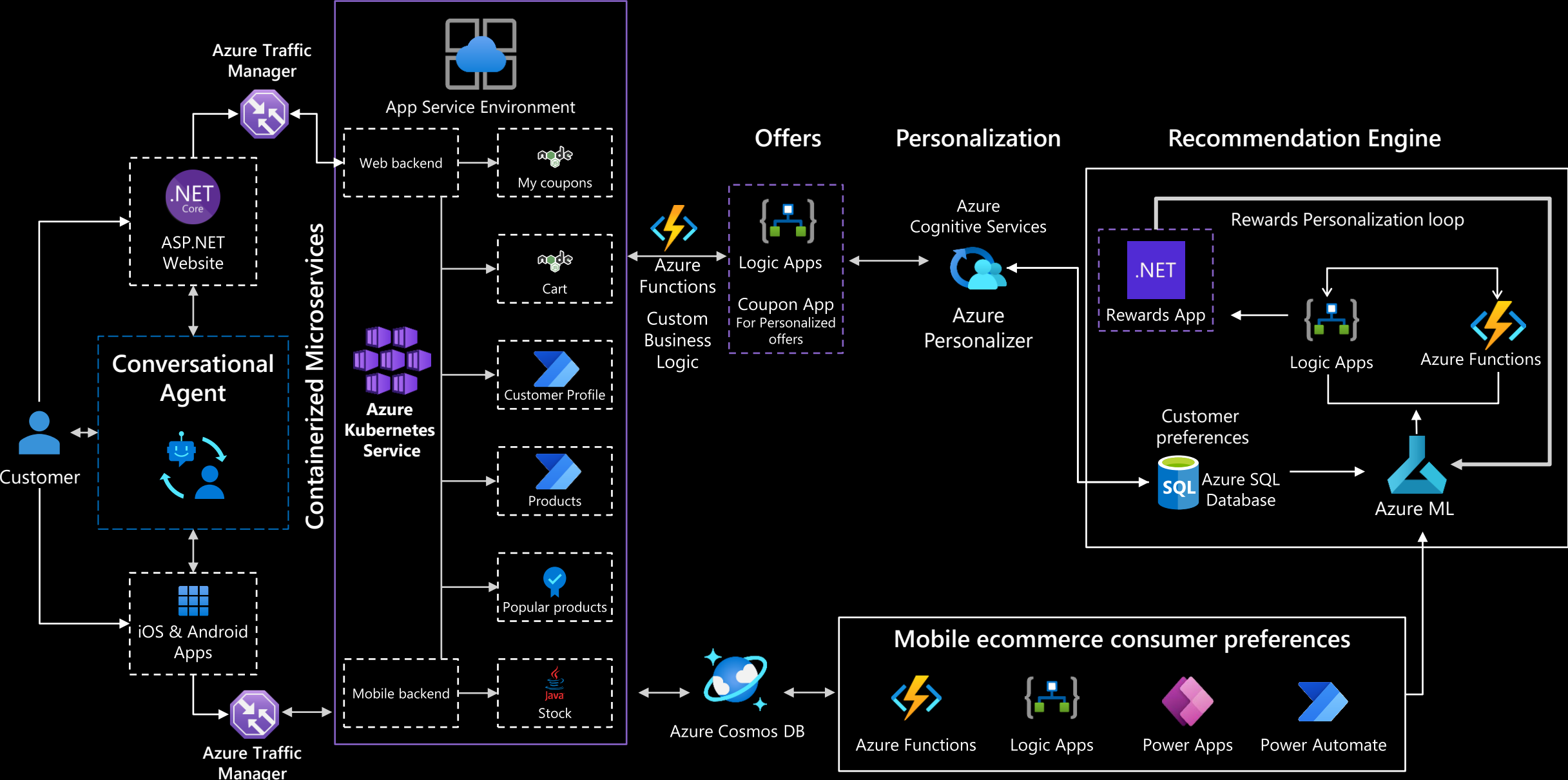
Make relevant and appealing **customer-centric offers** delivered **just-in-time**



Ensure immediate **offer** uptake & **fuel incremental spending** to maximize revenue

# Reference Architecture 1 : RT Personalization

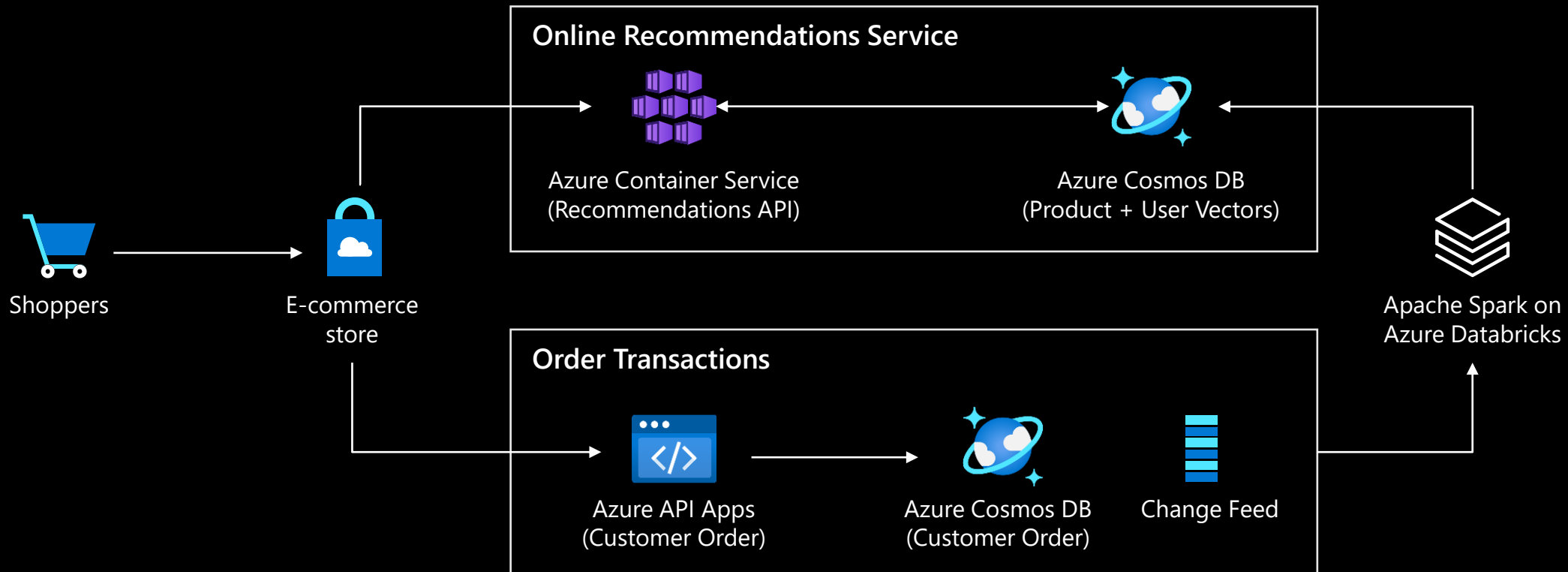
Know Your Customer



# Reference Architecture 2: Personalization with Azure Cosmos DB

Know Your Customer

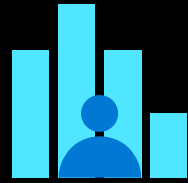
Architecture for generating personalized recommendations for customers in real time



[Deep Dive on Components of the Architecture](#)

# Business Outcomes: Real-time Personalization

Know Your Customer



Increase  
customer loyalty



Grow revenue with  
differentiated customer  
experience



Cater to customer needs  
proactively



Improve marketing  
effectiveness

# Case Study: Real-time personalization

Online retailer delivers real-time product recommendations and instant order updates to 15M+ customers.

## Approach

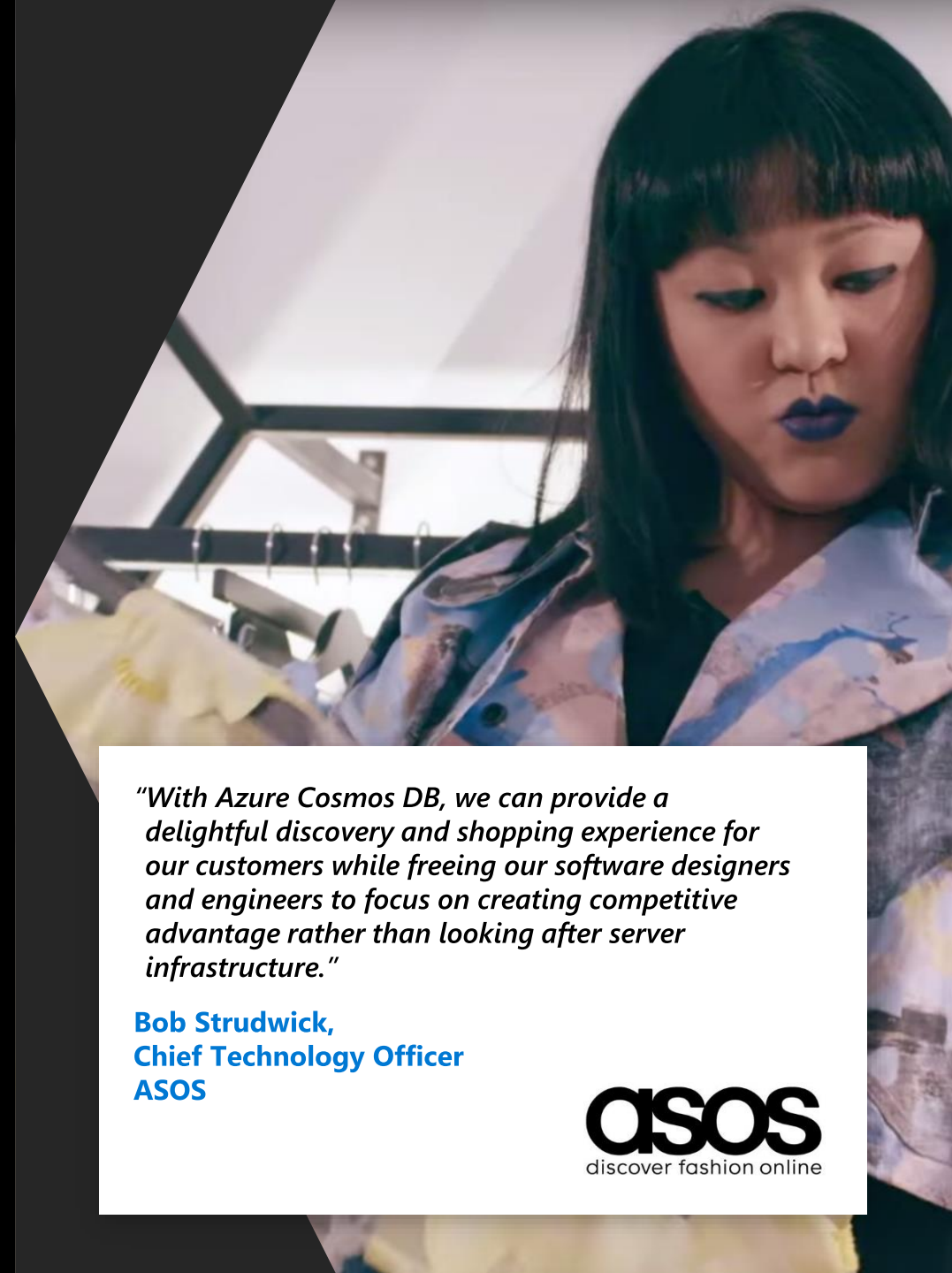
- An agile recommendations platform enables customers to discover new products they'll love across a catalogue of 85,000 products, and scales to ingest 5,000 new products each week.
- Azure Cosmos DB selected to provide data for multiple microservices including order processing, online returns, user profiles, and product recommendation platform.
- ASOS chose **Azure Machine Learning** to power a recommendations model.

## Outcomes

- Leverage data science to **create brand recommendation models** that suggest styles for its customers and help generate sales
- **Generate product recommendations in real time** as customers browse product listings.
- **Reduced time-to-market** for a recommendations model that increases marketing agility from six months to about six weeks



[Read Story](#)



*"With Azure Cosmos DB, we can provide a delightful discovery and shopping experience for our customers while freeing our software designers and engineers to focus on creating competitive advantage rather than looking after server infrastructure."*

**Bob Strudwick,**  
Chief Technology Officer  
ASOS

**ASOS**  
discover fashion online



# Industry Trends: Real-Time Transactions

Modernize Payments  
& Core Banking



42%

CAGR over the next 5 years for the US real-time payments transaction volume; projected to increase from \$734 million in 2019 to \$4.2 billion by 2024 <sup>1</sup>

69%

year-over-year growth in real-time payments in the United States in 2020 <sup>2</sup>

1.9T

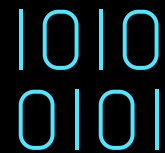
Projected number of cashless transactions in 2025; up from 1T in 2020 <sup>3</sup>

# Top Challenges: Real-Time Transactions

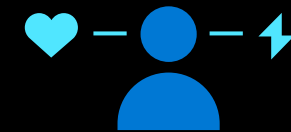
Modernize Payments  
& Core Banking



Payment infrastructure **needs to be agile and mature** enough to capitalize on the benefits of the innovation



Need to **leverage enterprise data to drive greater business value**, develop new business models, and implement innovative pricing models



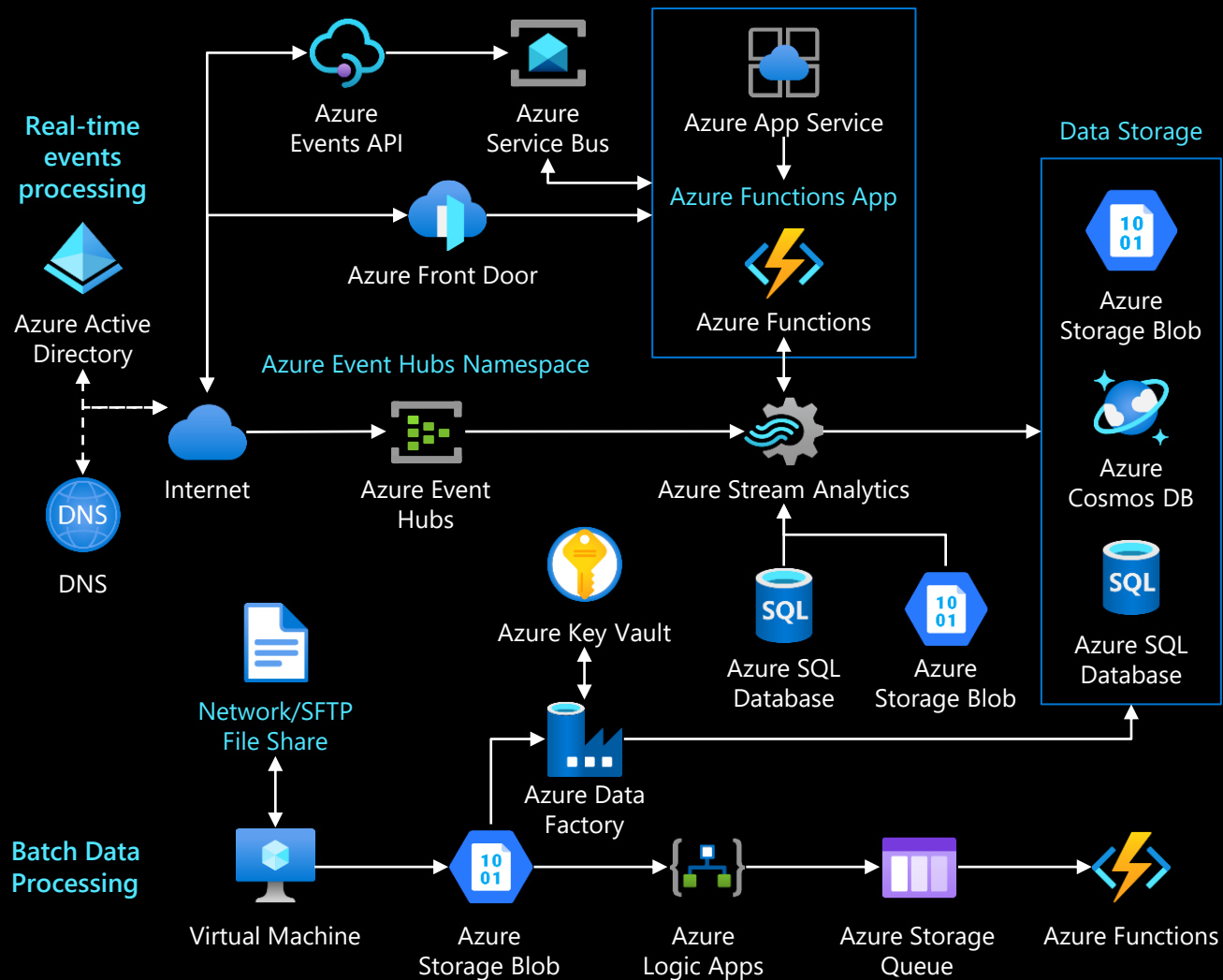
Need ways to **improve customer satisfaction and retention** by providing bridge from cash and check forms to real-time digital transactions

New digitally sophisticated market entrants are offering consumers innovative, value-added services that complement payments execution and fundamentally shift consumer expectations

# Reference Architecture 1: Real-Time Transactions

Modernize Payments  
& Core Banking

## Architecture for the Data Pipeline for Online Transactions



## Key Highlights

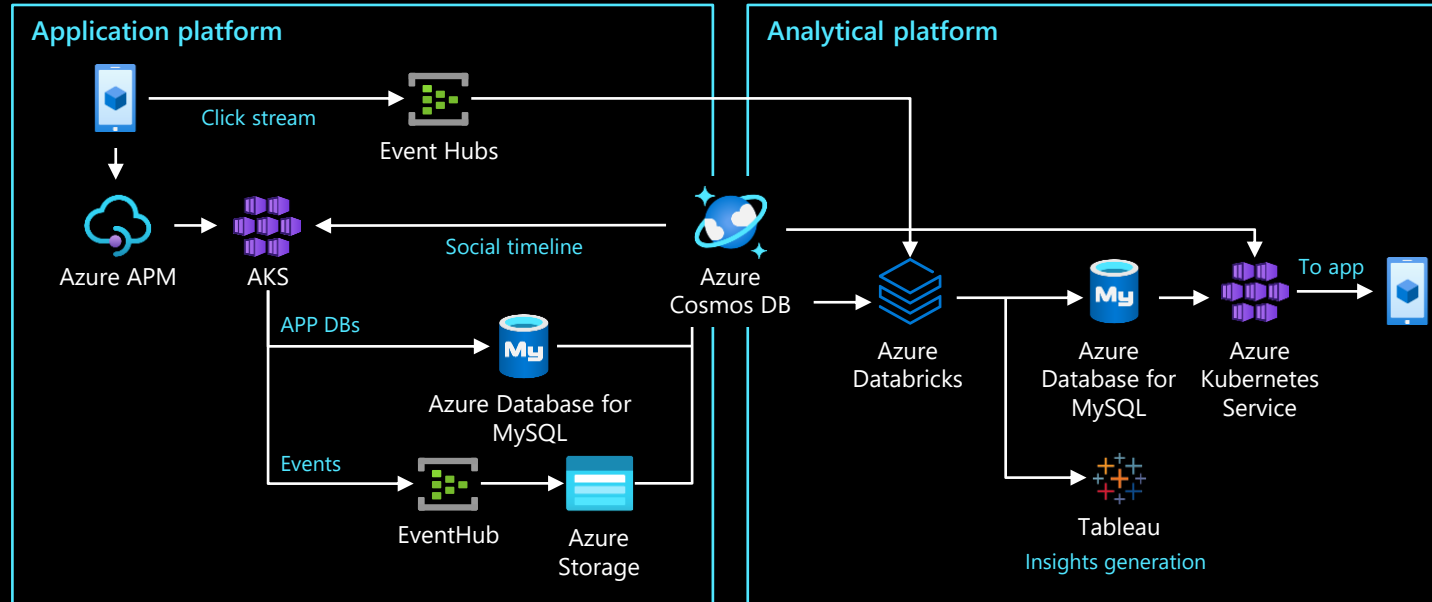
- An Azure Stream Analytics job reads and processes events in Azure Event Hubs in real time. These are the orchestrators, and this is where the data gets processed.
- As the event is read, it goes through a set of checks to detect any frauds and to ensure that it complies with the business requirements. This is done by passing the event to Azure Functions for processing and fraud detection.
- After all this is done, the data finally lands in either Azure Cosmos DB or Azure SQL Database, based on the business rules.
- The design is for scalable and services-based infrastructure with disaster recovery across paired Azure Regions.

# Reference Architecture 2: Real-Time Transactions

Modernize Payments  
& Core Banking

## Digital Payment Platform Architecture for HSBC's PayMe App

## Key Highlights



- In order to create more value for both businesses and consumers, Azure Cosmos DB is used for graph data modelled to store customer-merchant-transaction relationships.
- Massive amounts of structured and unstructured data from Azure Database for MySQL, Event Hubs, and Storage are streamed and transformed.
- The team designed an internally developed data ingestion process, feeding an analytical model called S.L.I.M (simple, lightly, integrated model), optimized for analytics queries performance, as well as making data virtually available to the analytics platform, using Azure Databricks Delta's unmanaged table capability.

Reference: [PayMe](#) social app allows consumers establish their personal networks while facilitating interactions and transactions with the people in their circle and business entities

# Reference Architecture 3: Real-Time Transactions

Modernize Payments  
& Core Banking

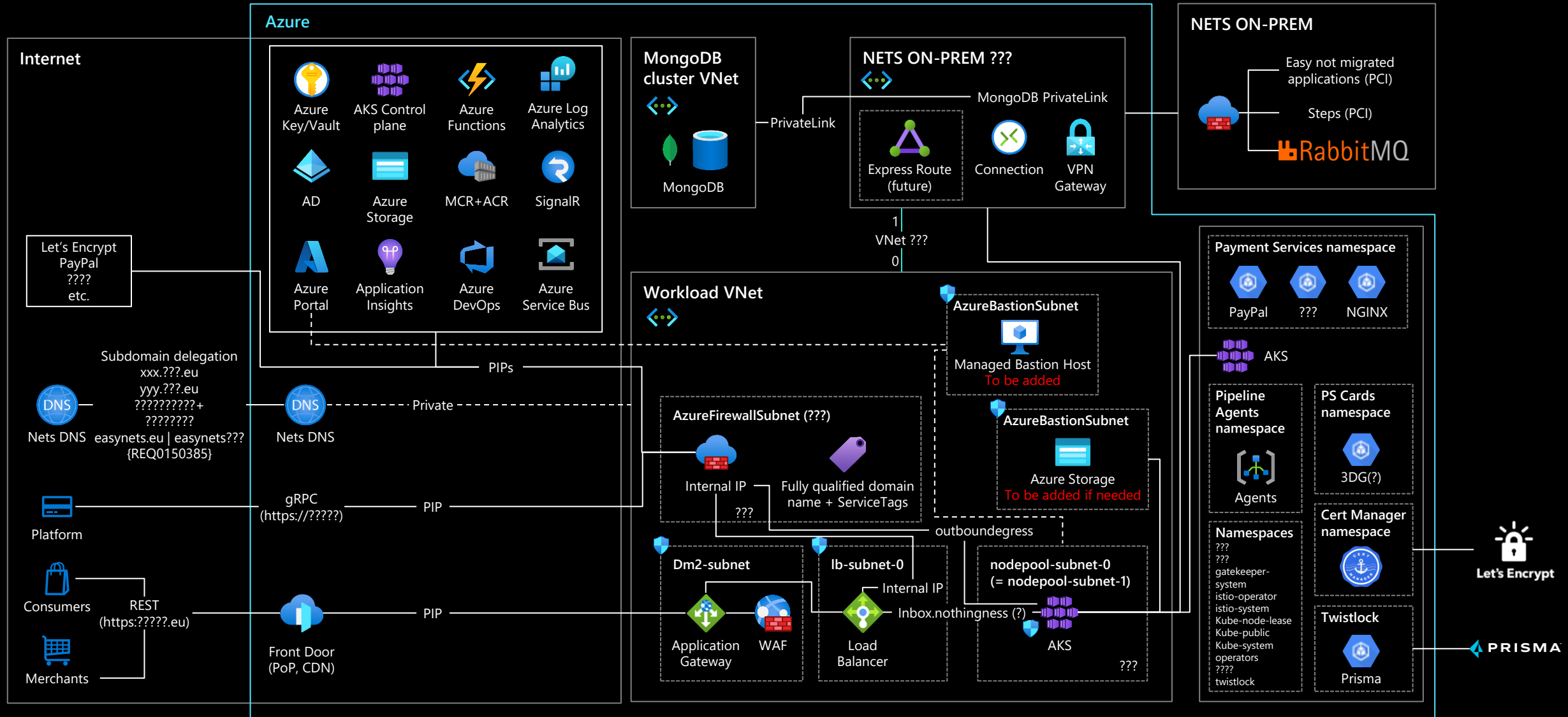
## Key Highlights

- The PayTech company chose Azure Cosmos DB as their preferred platform for all solution for processing payments within Merchants.
- Rebuilding a processing API based on Cosmos DB for both legacy merchant processing application as well as their flagship offering EASY.
- Handle real time as well as historical data up to 500TB.
- Cost cutting initiative. Lower cost of alternative solution Mongo DB Atlas
- Faster time to market. Native PaaS easier for the dev team to deliver
- Global scale and redundancy delivering on 5 nines as the only vendor in the world

# Reference Architecture 3: Real-Time Transactions

Modernize Payments & Core Banking

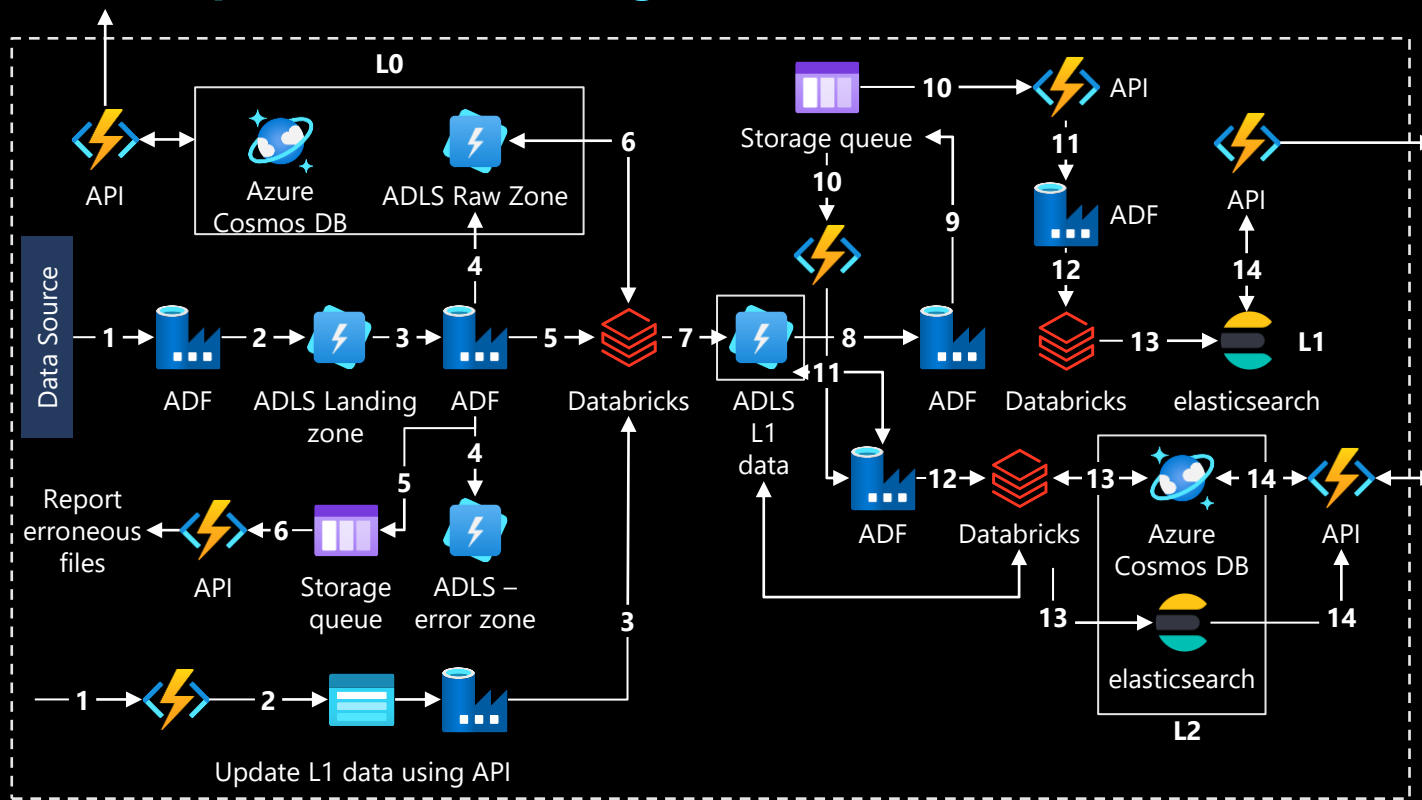
## Architecture for Payment Processing at a European PayTech Company



# Reference Architecture 4: Real-Time Transactions

Modernize Payments  
& Core Banking

## Architecture for Trading, Rating and Pricing at a European Stock Exchange



## Key Highlights

- By centralizing the data (from trading, rating and pricing) and bringing it to the Azure platform, the European Stock Exchange offers new insights to their internal business users such as Post-Trading and Clearing.
- The customer aims to monetize the new insights gained to external customers such as institutional traders, insurers and rating.
- Faster time to market by an Azure-based infrastructure with low-latency and SLA-backed.
- Key differentiator to competitor stock exchanges – providing valuable insights through a central data platform.
- Regulator approved data platform by choosing Microsoft Azure - through internal compliance and auditing units and alignment with BAFIN.

"We are proof that leveraging Azure Cloud is a benefit in scalability, speed, but also simplification of content and data models."

Executive Vice President @ European Stock Exchange Customer

# Business Outcomes: Real-Time Transactions

Modernize Payments  
& Core Banking



Scale high volumes of payment data  
at any time accurately and reliably



Centralized payment  
pipelines with real-time  
processing and analytics



Financial engine with  
minimal dev ops



Fast, scalable,  
on-demand, globally  
distributed tech platform



# Industry Trends: Real-Time Fraud Detection

Combat  
Financial Crime



73%

Institutions with >\$100B in assets use AI for payment fraud detection

\$6.9B

Estimated value of online banking fraud in the US by 2020 <sup>2</sup>

67%

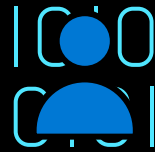
Year-on-year increase in online banking fraud in the UK in 2015 <sup>3</sup>

# Top Challenges: Real-Time Fraud Detection

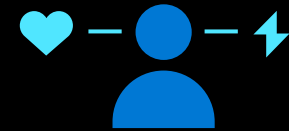
Combat  
Financial Crime



Need to **detect fraud faster and with greater accuracy** using data-based scoring models



Identify subtle patterns in data and **uncover hidden insights** and proactively target suspicious behaviors

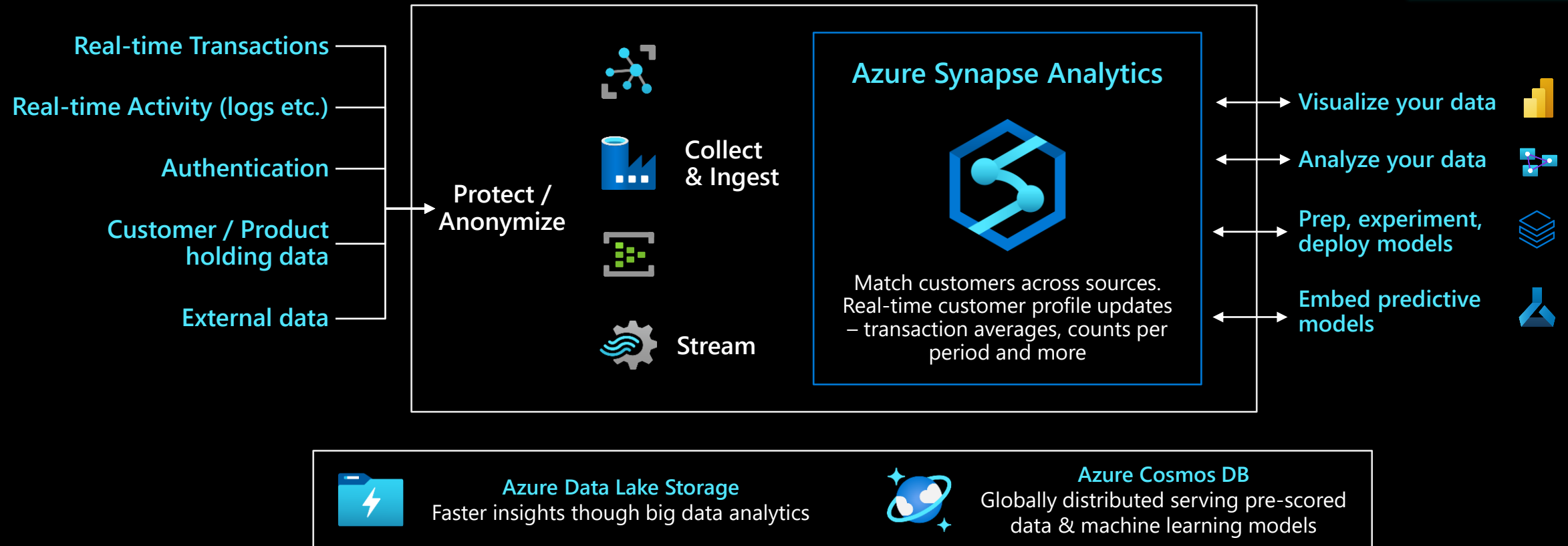


Need ways to **improve customer satisfaction and retention** by providing real-time customer analytics

Companies have never been as data-rich as they are today, making it possible to explore new opportunities to detect material frauds through data mining, analysis, and interpretation.

# Business Architecture: Real-Time Fraud Detection

Combat  
Financial Crime



## Deliver New Services

Provide new services to customers, helping them save costs by applying machine learning and advanced analytics to detect fraudulent transactions

## Cut Losses & Investigation Time

Use more data and advanced detection models to improve detection and deliver better insights to case workers.

## Reduce Customer Friction

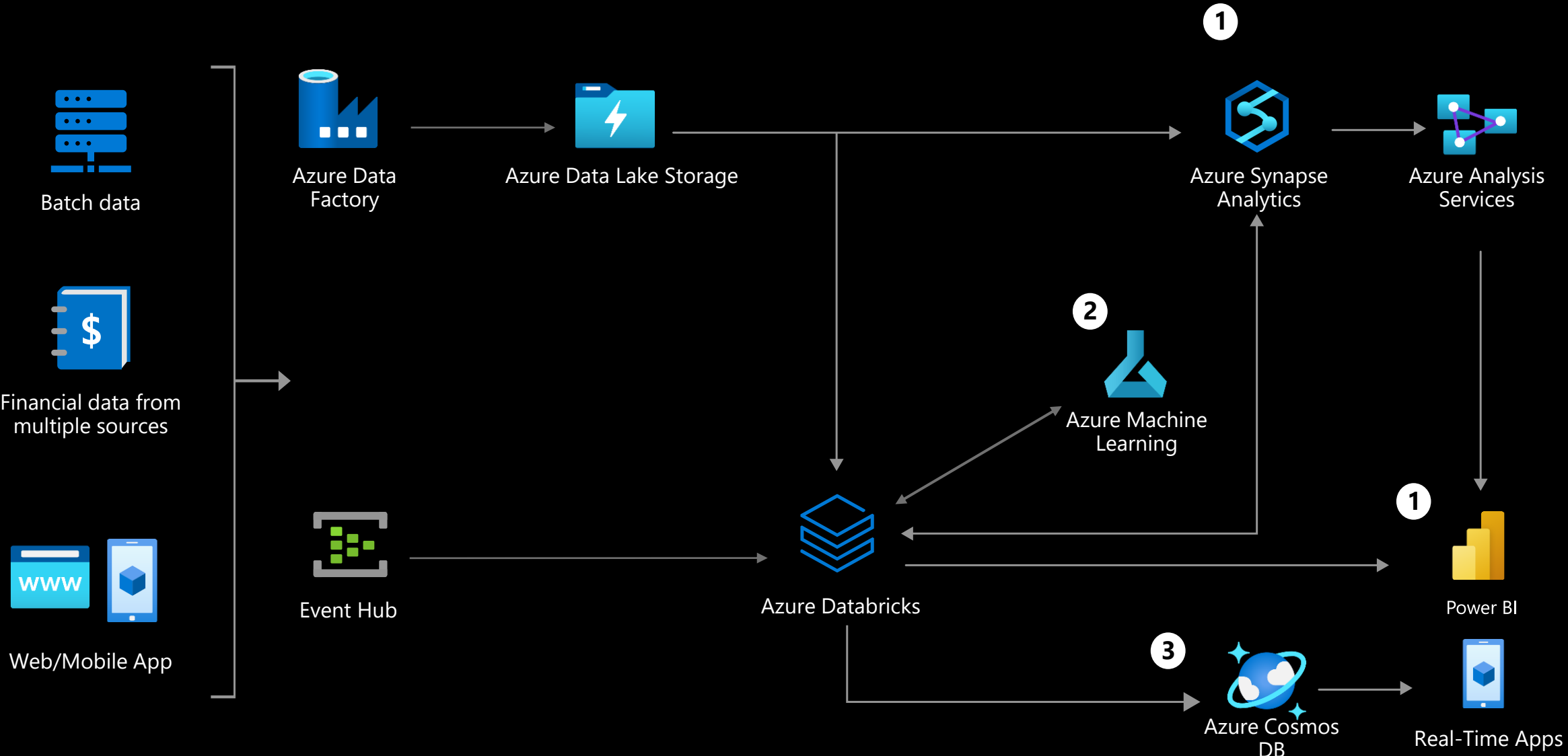
Reduce false positives and minimize customer inconvenience. Tailor post-detection actions to customer needs and automate.

## Speed up Detection

Meet the needs of real-time payment schemes by reviewing transactions and continuously refreshed customer profiles in milliseconds.

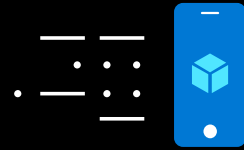
# Reference Architecture: Real-Time Fraud Detection

Combat Financial Crime



# Business Outcomes: Real-Time Fraud Detection

Combat  
Financial Crime



Detecting fraudulent  
mobile-phone calls in  
telecommunications scenarios



Identifying fraudulent credit  
card transactions for banking  
institutions



Identifying fraudulent  
purchases in retail or e-  
commerce scenarios



Significantly reduce the  
amount of time companies  
discover and stop fraud

# Case Study: Real-Time Fraud Detection

Combat  
Financial Crime

Moneris, which supports the payment processing needs for 350,000 merchant locations across Canada. The Moneris Portfolio Risk Management team completes more than 1,000 risk assessments a day based on 25 to 60 key risk indicators. These indicators are then used to report on the performance of the company's portfolio at both an amalgamated and account level.

## Approach

- Aided by AI, Moneris has created new workflows for a "high-risk-in, first-out" model. The workflows assess the risk level based on the indicators and then prioritize events in a fully automated process.
- Higher risk events are expedited for review by the team, while low-risk events are scored based on a model and automatically reprofiled as appropriate.

## Outcomes

Brought their data into a single view that is consistent across the entire team, resulting in a **450 percent improvement in the speed** at which Moneris can identify the factors that go into evaluating risk. That shift alone has resulted in a **10 percent decrease in losses from fraud**.



[Read Story](#)



*"We've seen some pretty dramatic shifts in how fraud presents itself in payments. To combat that fraud, we've steadily used larger and larger datasets each year, and we make use of more self-sustaining AI programs that help us make sense of that data."*

### Daniel Trunzo

Vice President of Merchant  
Portfolio Risk Management at  
Moneris

# Industry Trends: Connected Product Innovation

Build More Agile  
Factories



35%

improvement expected in product quality in discrete manufacturing industries with Machine Learning <sup>1</sup>

20%

of leading manufacturers will rely on embedded intelligence to automate processes <sup>2</sup>

20%

of leading manufacturers will rely on embedded intelligence to automate processes <sup>3</sup>

# Top Challenges: Connected Product Innovation

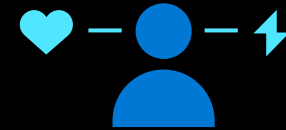
Build More Agile  
Factories



Product **lifecycles continue to grow in complexity**, causing manufacturers to find new ways gain data-driven visibility into processes and make continual improvements



Ubiquitous connectivity, dynamic customer demands, and volatile procurement behavior are causing long-term **changes in the way products are designed** and managed throughout their life cycles



Need ways to keep pace with rapid product design changes to **improve customer satisfaction and retention**

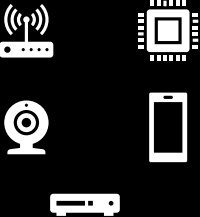
Advances in industrial automation technologies have created a pressure that requires manufacturers to shorten product life cycles and development timelines.



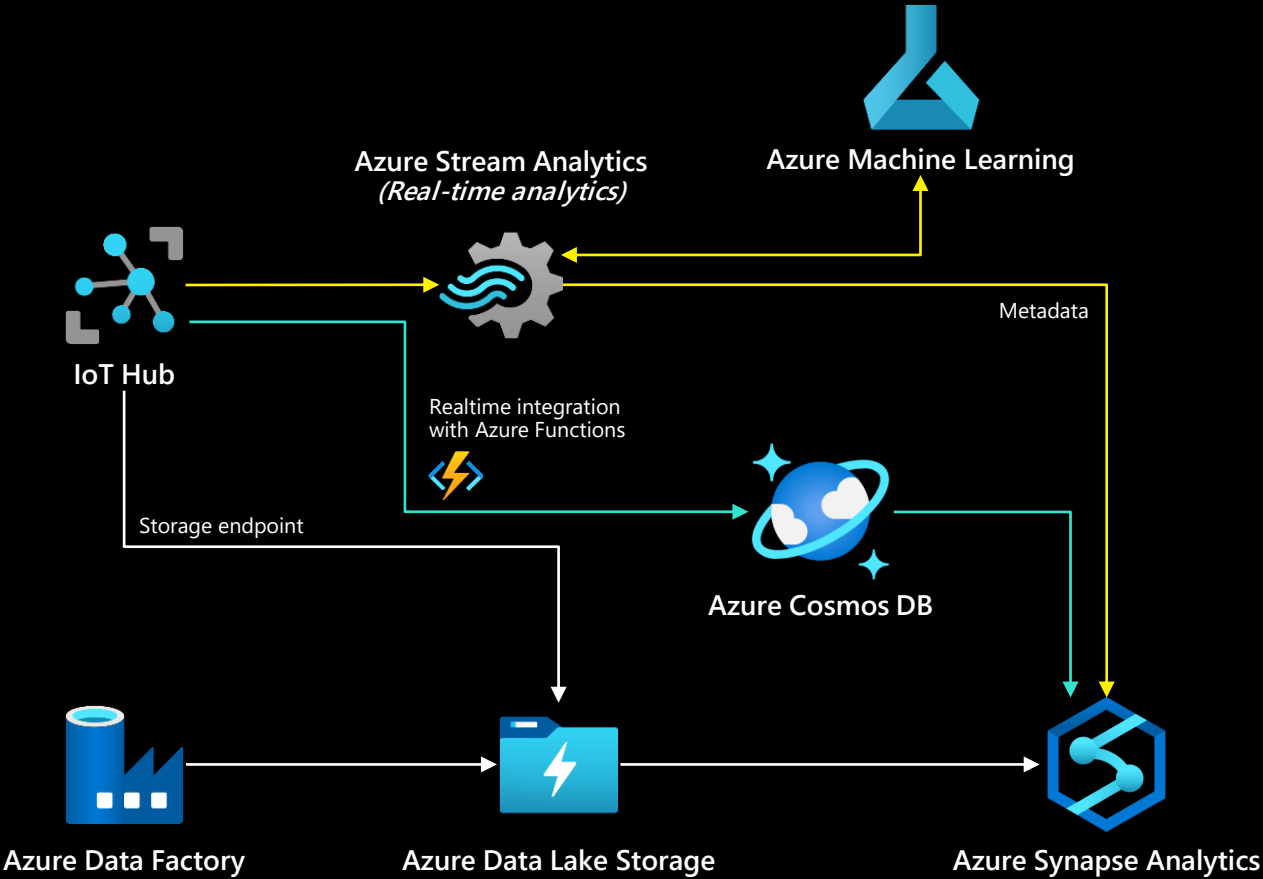
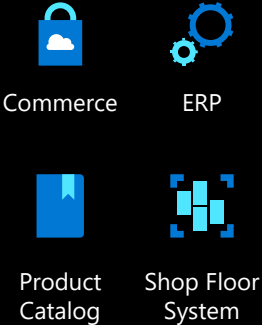
# Reference Architecture: Connected Product Innovation

**Build More Agile  
Factories**

**IoT Devices/Sensors**



**Manufacturing Systems**



Hot Path (in-memory) →

Warm Path →

Cold Path (batch) →



Power BI



Azure Analysis Services



Product Refinement and Improvement

# Business Outcomes: Connected Product Innovation

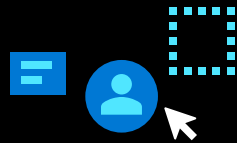
Build More Agile  
Factories



Shorten the time to market for  
new generations of products



Apply digital transformation on  
traditional product innovation process to  
become nimbler in competitive  
responsiveness



Production engineers can improve  
and validate designs for  
production to prevent bottlenecks  
and production challenges



Improve operational efficiencies by  
migrating on-premise compute  
infrastructures that are strapped with poor  
elasticity, crushing overheads, and poor  
performance scalability

# Case Study: Connected Product Innovation

Build More Agile Factories

The concept of “Container-driven cars” at Mercedes refers to a microservices-based architecture that relies on containers to fetch and push app updates at the scale of the Internet of Things (IoT). Using cloud-native services [such as Azure Cosmos DB] on Azure, the R&D team **freed developers from the limitations of a hardware-driven release cycle**, where software updates could happen only once or twice a year. Today developers create new versions as fast as they want and ship new solutions to market in just three months, thanks to a mix of agile tools and managed services on Azure Kubernetes Service (AKS), APIs, and databases.

## Approach

- When a driver starts the car, the head unit sends a request using the vehicle’s SIM card to connect to the service across a mobile network.
- AKS handles the back-end operation, which supports two platforms—one for containerized app creation and the other for app configuration and delivery to the vehicles.
- The app metadata and configuration details, are pushed to Azure Cosmos DB

## Outcomes

With Azure, Mercedes’s software development team can keep the software inside of the cars updated and **release new features in weeks instead of months**, while preserving quality and security of vehicle and driver data.



Mercedes-Benz

*“With Azure, our software development process is so much better now. We’re able to keep the software inside of the cars updated and release new features in weeks instead of months, while preserving quality and security of vehicle and driver data.”*

## Rodrigo Nunes

Principal software engineer  
Mercedes-Benz R&D



[Read Story](#)

# Industry Trends: Real-Time Telemetry Data

Build More Agile  
Factories



70%

of manufacturers may be using digital twins to conduct simulations and evaluations by 2022 <sup>1</sup>

50%

of U.S. organizations are investing in smart factories right now <sup>2</sup>

5-20%

Loss in production due to unplanned downtime <sup>3</sup>

# Top Challenges: Real-Time Telemetry Data

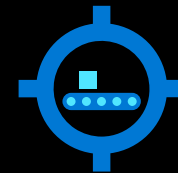
Build More Agile  
Factories



Need to **improve equipment effectiveness and asset productivity** by capturing and analyzing all connected shopfloor data



Need to **avoid unplanned downtime** due to unexpected machine failures



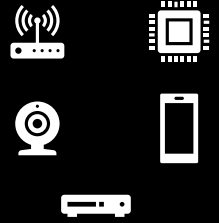
Deliver real-time platforms that enable factories to **closely monitor daily operation and perform real-time diagnostics remotely**

Leverage real-time data on cycle times, yields, utilization, and other factory insights to deliver more throughput and greater product quality with increased efficiencies and more uptime.

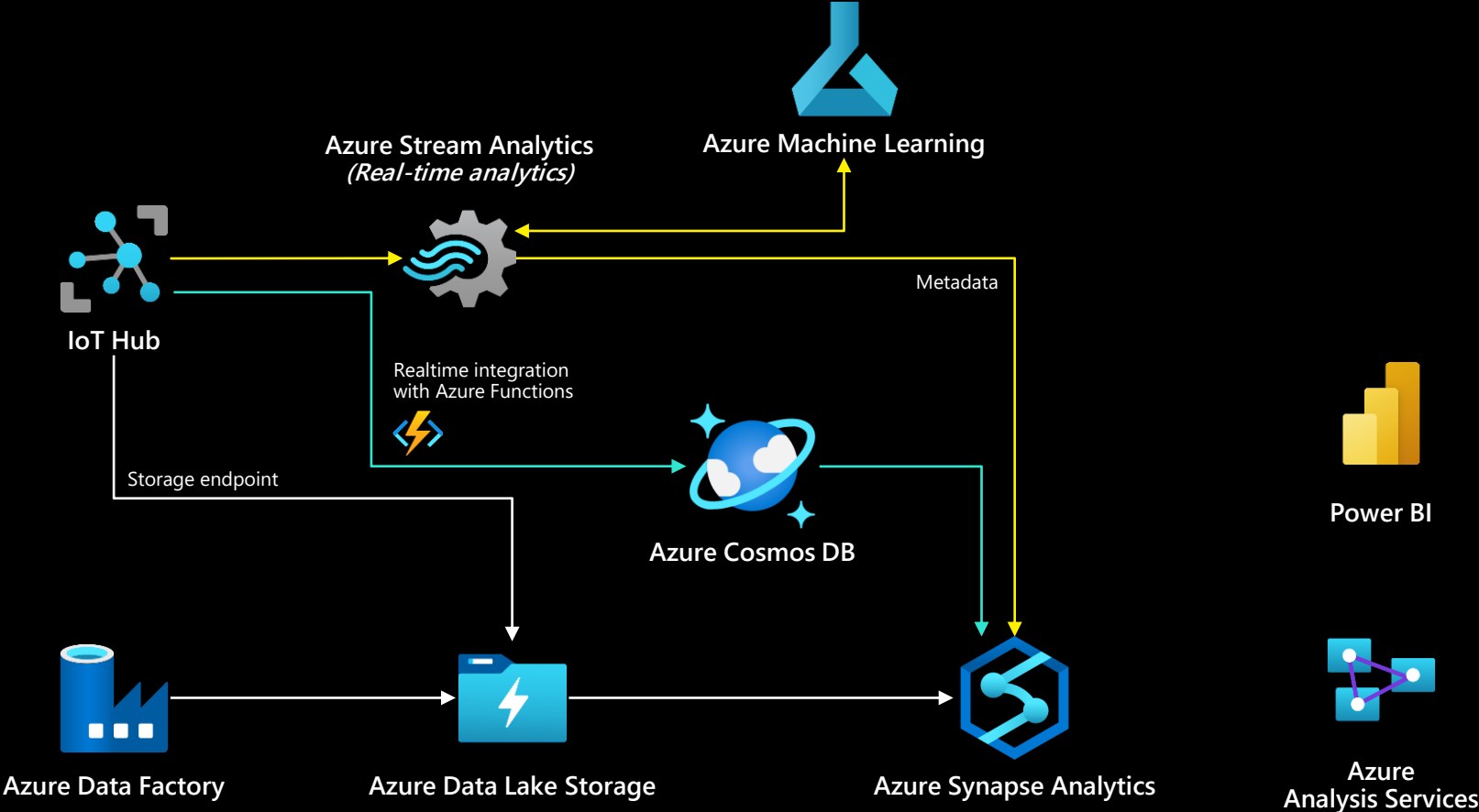
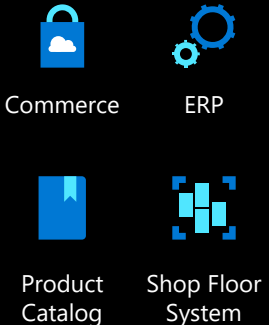
# Reference Architecture1: Real-Time Telemetry Data

Build More Agile Factories

### IoT Devices/Sensors



### Manufacturing Systems

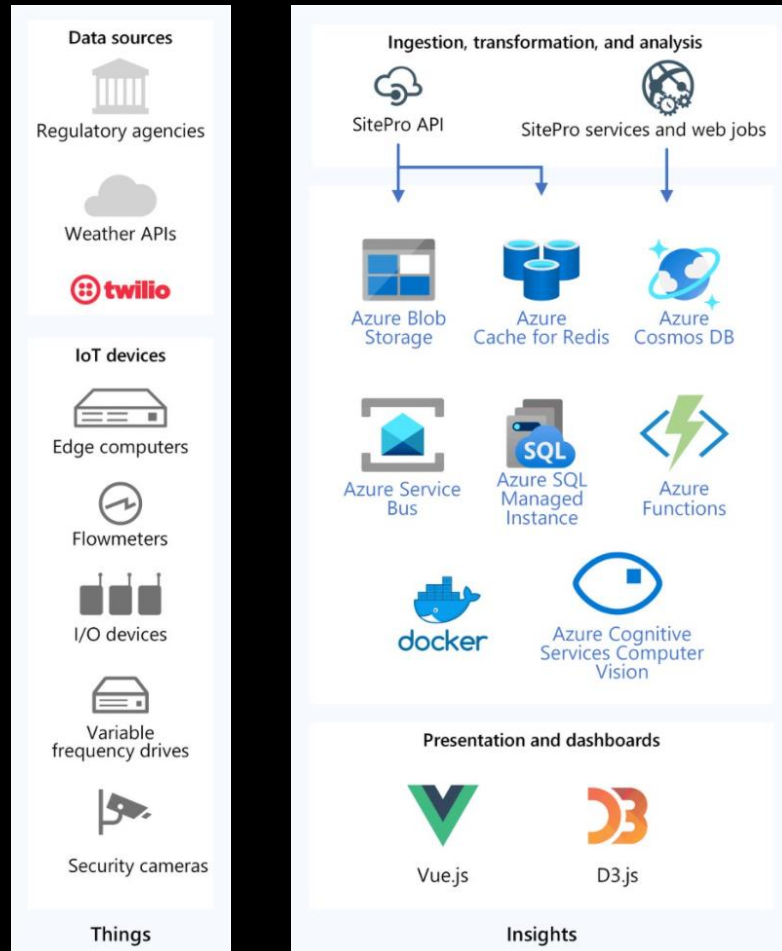


Hot Path (in-memory) →  
Warm Path →  
Cold Path (batch) →

# Reference Architecture2: Real-Time Telemetry Data

Build More Agile  
Factories

## Architecture



## Key Highlights

- In this architecture, multiple services and web jobs capture real-time and historical data from hundreds of thousands of sensors, import weather and other external data, monitor communications, build reports, and provide relevant context for users
- Dozens of web jobs and app services in the background to handle change feeds and to pipe data to Azure Cosmos DB
- Key capabilities made possible due to the architecture include:
  - Web, mobile, and on-site access
  - Real-time IoT and intelligent control
  - Code-free configuration and deployment
  - Analytics suite
  - Field ticketing
  - Regulatory reporting
  - Camera streaming

# Business Outcomes: Real-Time Telemetry Data

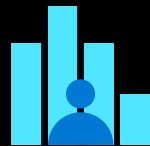
Build More Agile  
Factories



Machine learning models  
generate real-time  
recommendations across  
physical processes



Higher overall equipment  
utilization and asset productivity



Improved employee productivity  
with freeing up of time for  
performing more value-added tasks



High app performance and  
instant efficiency insights  
worldwide with low latency



# Case Study: Real-Time Telemetry Data

Build More Agile  
Factories

SitePro disrupted the oil and gas industry when it launched a fresh take on digital oilfield automation based on IoT tech. The company's innovative end-to-end approach automates everything from real-time data capture at the source to final payments and analysis. SitePro aggregates real-time streaming data from IoT sensors and controllers at facilities, pumps, valves, and wellheads. Site engineers can monitor and control every part of their field operations and solve issues from anywhere—enabling faster, safer, and more efficient operations.

## Approach

- The SitePro platform manages high volumes of unstructured data from onsite IoT sensors and other monitoring devices. Sensor data is streamed to the SitePro edge API and ingested by the proprietary dataflow.
- The team used a combination of back-end Azure data services to store the real-time and historical data, including three managed databases—Azure Cosmos DB, Azure SQL Database, and Azure Cache for Redis.

## Outcomes

- The new architecture of the SitePro solution has adapted the best from the original and has tweaked the back end to simplify the dataflow, creating an environment for smarter IoT decision-making.
- Adoption has been so high that at some points, the SitePro solution has controlled up to half of the fluid moving in the Permian Basin—the richest oil-producing area in the United States.

**SITEPRO**

*"Azure Cache for Redis was the only thing that had the throughput we needed. Between Azure Cosmos DB and Azure Cache for Redis, we've never had congestion. They scale like crazy.."*

### Aaron Phillips

Founder, President  
Co-CEO  
SitePro



[Read Story](#)

# Industry Trends: Real-Time Tracking of Medical Devices

Improve Clinical & Operational Insights



30%

of healthcare executives say their most pressing IT problem is difficulty turning data into actionable insights <sup>1</sup>

\$94B

is the expected value of the connected healthcare devices market by 2026, growing from \$28B in 2020 at a CAGR of 19% <sup>2</sup>

41%

providers who say data and analytics challenges are preventing them from succeeding in value-based care models <sup>3</sup>

# Top Challenges: Real-Time Tracking of Medical Devices

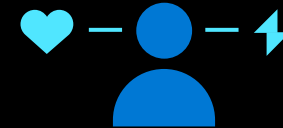
Improve Clinical & Operational Insights



Need to **improve processes, gain efficiencies, and effectively manage resources**; increase capacity utilization of the existing medical product stock. This enables hospitals to avoid unnecessary new acquisitions.



Need to equip decision makers with **real-time dashboards** that visualize patient data such as treatment progress and hospital data such as inventory data, supply chain status, and cost management

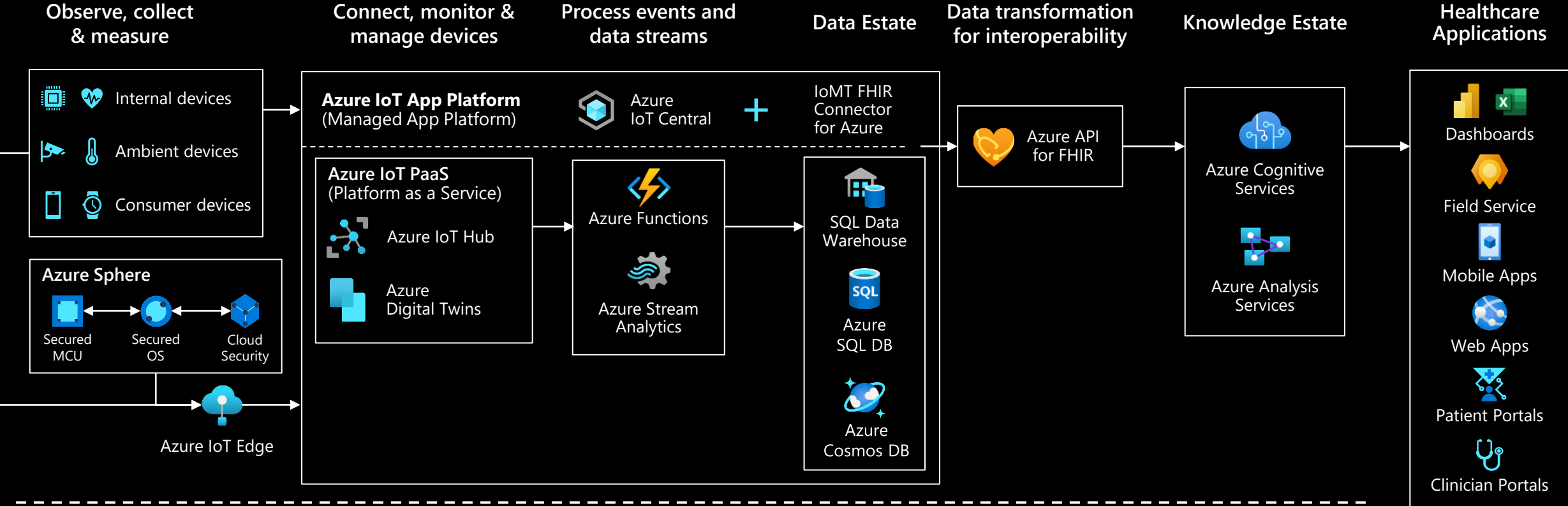


Need ways to **improve the quality of patient care and healthcare outcomes**

Deliver increased access to care, better care, and lower costs to ensure healthier members

# Solution Overview: Real-Time Tracking of Medical Devices

The most comprehensive portfolio of IoT and Edge offerings in the market



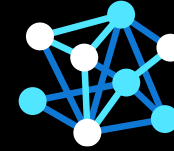
Built with end-to-end security & compliance: HIPAA, HITRUST, GDPR

# Business Outcomes: Real-Time Tracking of Medical Devices

Improve Clinical & Operational Insights



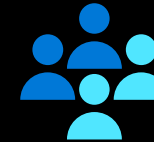
Deliver consistent real-time, always-on user experience anywhere in the world



Improved decision making with smart-connected devices with access to better information



Increase capacity utilization of the existing medical equipment and inventory



Easily identify those in need of guided care based upon presenting symptoms & personal history