Azure at ASOS

Andrew Potts | Michael Royster | March 2023

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Andrew's Bio

Andrew Potts, Chief Architect @ ASOS

- ▲ Studied Electronic Engineering
- ▲ My first job was building TV broadcast software
- ▲ Contracted for 10 years
- ▲ Returned to permanent employment with ASOS
- ▲ Solution Architect, Principal Architect & Chief Architect
- ▲ Have stayed with Microsoft tech for most of my career

Michael Royster Bio

Principal Azure Technical Specialist @ Microsoft

▲ Michael Royster is a Technical Architect helping Microsoft's largest enterprise customers architect for or migrate to the Azure platform. Working in the Azure business since 2009, he has helped a number of leading global organisations adopt the Azure platform from global retailers and consumer goods companies to some of the world's leading engineering companies.

Since joining the company in 2001, Michael has worked in several solution architect and development consultant roles in Microsoft Services specializing in application development prior to his current role.
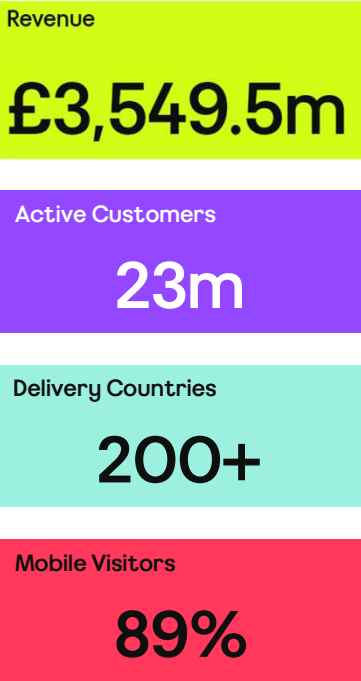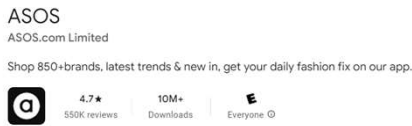
Prior to joining Microsoft, Michael was a Distinguished Engineer with ICL/Fujitsu for more than 12 years working in core operating system development in both UNIX and VME and architect for their middleware and integration product portfolio.

▲ He started his career in software development at IBM's Hursley Park Research and Development facility. Michael graduated with a first-class honours degree in Computing Science and lives in Cheshire in the UK.

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ASOS

Mission: The number one fashion destination for twenty-somethings

Revenue

£3,549.5m

Active Customers

23m

Delivery Countries

200+

Mobile Visitors

89%

Figures: Sep '23

ASOS - Discover Fashion Online
Shop clothes, beauty & extras
ASOS
#36 in Shopping
Free

ASOS
ASOS.com Limited

Shop 850+brands, latest trends & new in, get your daily fashion fix on our app.

4.7 ★
550K reviews

10M+
Downloads

E
Everyone

A brief history of **ASOS**

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1999-2001

Company Begins as AsSeenOnScreen

Started in 1999 by Nick Robertson and Quentin Griffiths.

Originally sold clothes or accessories 'As Seen On Screen'.
Running as an ASP Site.
The first product sold was Delia Smith's Mortar and Pestle.

ASOS is admitted to the Alternative Investment Market (AIM) in 2001.

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2003

The BT "Karma Chameleon" Phone

▲ Rebranded to ASOS.com

▲ The Karma Chameleon phone helps the ASOS cashflow

2005
ASOS.com

In 2005 the Buncefield oil depot fire closed the business for six weeks during the Christmas shopping period.

ASOS lost £5m of inventory.

Profits approx. £1m.

2011

Facebook Store and ASOS Mobile
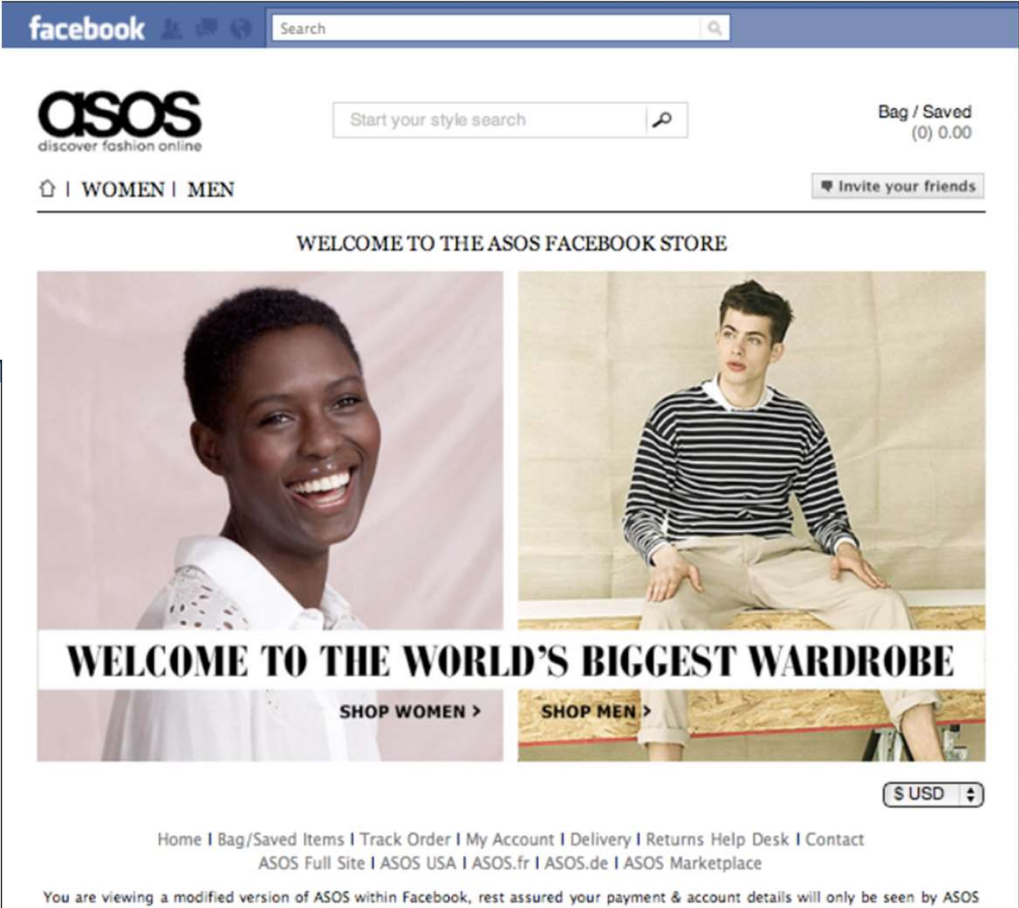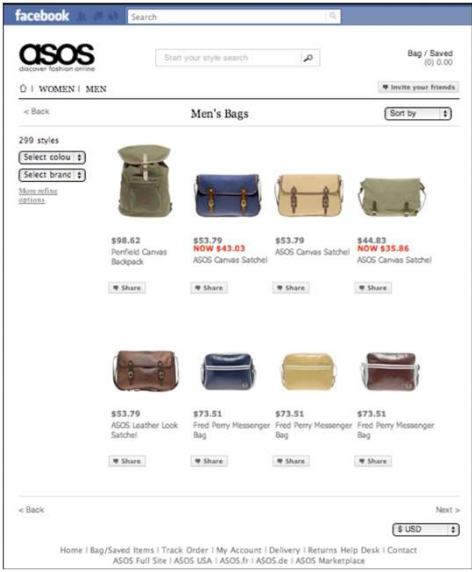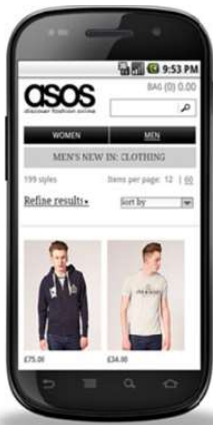
2008

The Shift to 16:9

▲ Widescreen monitors become more prevalent, and the site is transformed to a 16:9 format

▲ Kidswear is debuted (and removed in 2010 as branded wear declines).
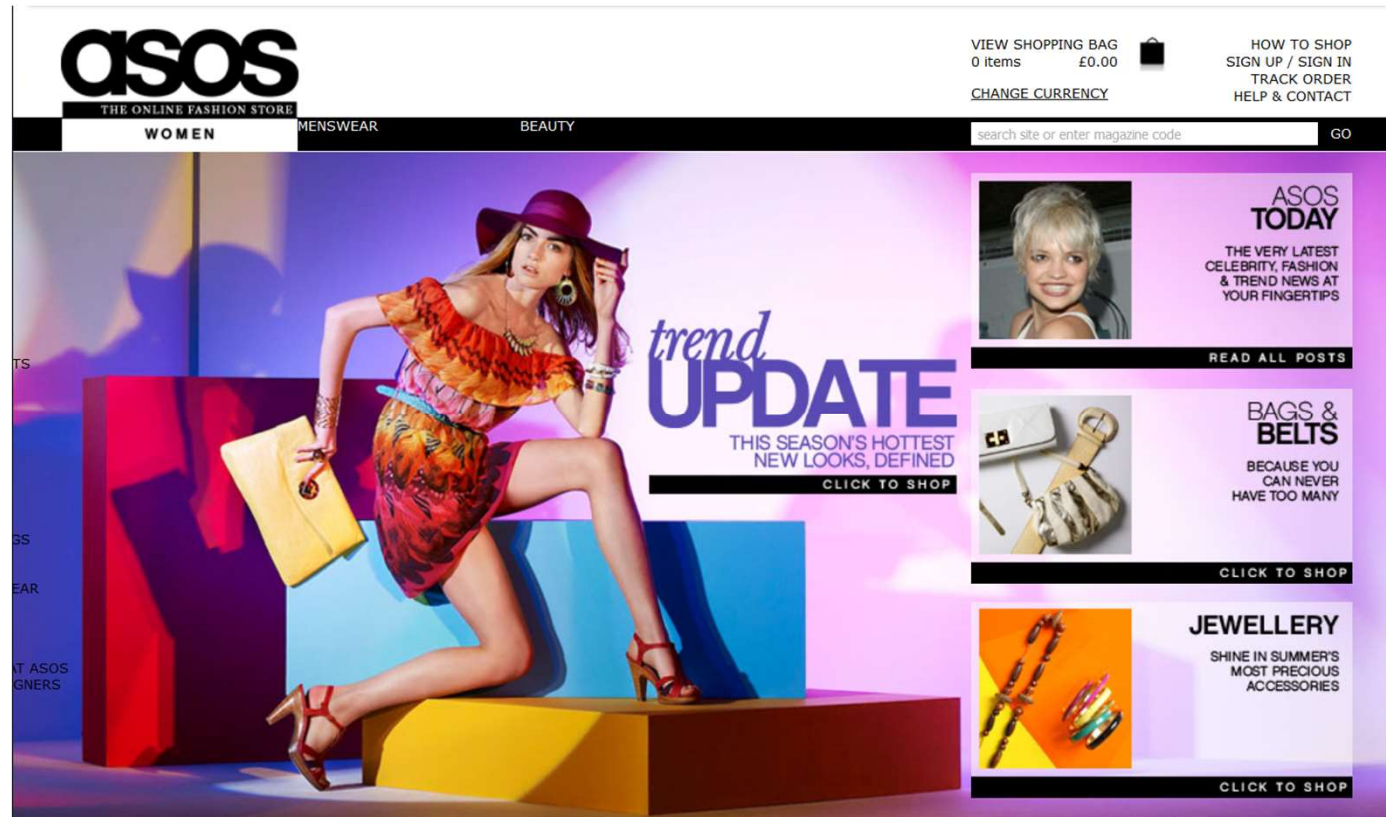
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2016

In Azure

▲ We switch to Azure hosting

▲ 4,000 employees

Today
In Azure

Architecture 1.0

```
Browser
  ↓
CDN
  ↓
Usablenet Mobile
  ↓
MotionPoint Translation
  ↓
[IIS] Web Server Cluster
```

3rd party

Windows Services MS DTC

System Processes

[SQL Server] Checkout Database

[SQL Server] BackOffice Database

[SQL Server] Reporting Database

Operational Reports

MicroStrategy

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The Challenges

- Complex code-base
- Hard to determine the impact of changes upon others
- Weak ownership
- Releases being coordinated, painful events, performed once a month

- Continued growth with the business growing at 20-30% per annum
- Huge increases in sales on key trading days (e.g. Black Friday)
- Mobile devices becoming the primary device for accessing ASOS
- Need to become more engaging and interactive
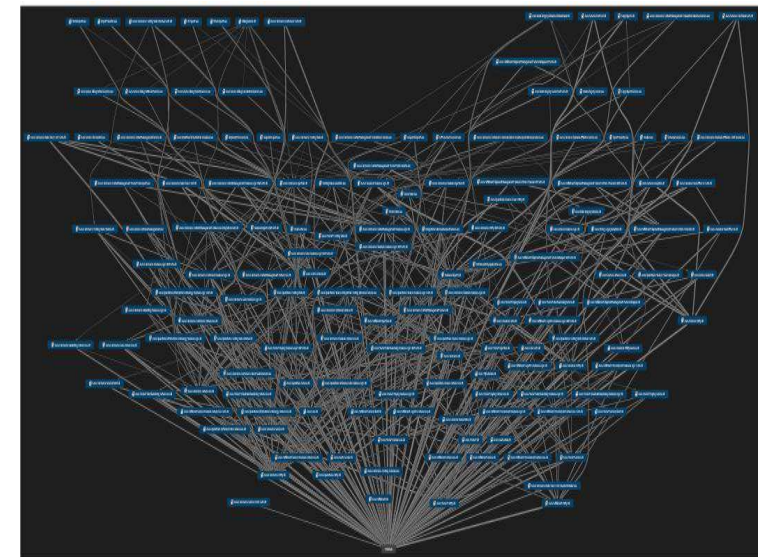
Code map – "Ball of Mud"

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Moving forward

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The Direction

Four changes to the way we operated

1

Mobile First

Native Mobile experience

2

Cloud Native

100% hosted in the cloud

3

Platform model

Everything is owned

4

Microservices Architecture

Smaller deployments

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Mobile First

- ▲ One of our principles is **Build where we differentiate**
- ▲ We want to provide the best-in-class customer experience
- ▲ We chose native development tools (originally Objective C and Java, now Swift and Kotlin)
- ▲ We featured regularly on the app stores

Visits by Device Type
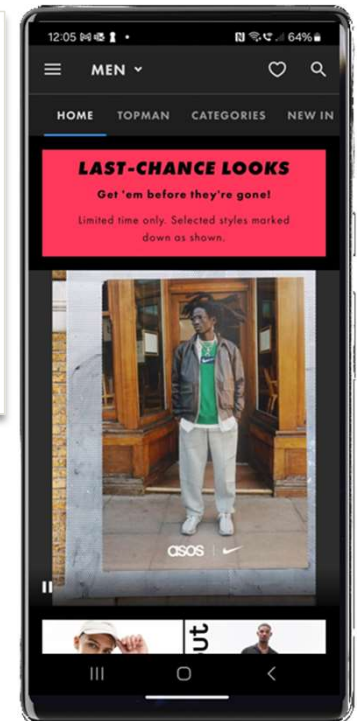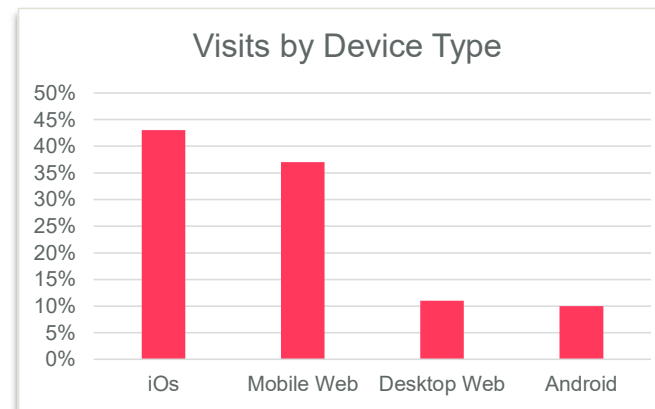
Lessons learned

Cross-development tooling has improved

A platform model can produce fine-grained functionality which results in a lot of API calls

Now we are considering pushing more logic into common components

Microsoft Azure

▲ We did not want to operate a data centre, or patch software

▲ We prefer SaaS > PaaS > IaaS

▲ We moved to Microsoft Azure – in the time of Virtual Machines, Cloud Services, and Azure Service Bus

▲ We now operate 100% in the cloud

The end of our data centre

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Platform Teams

▲ We re-organised from feature teams to platform teams

▲ Ownership from "cradle to grave" was an important outcome

▲ Platform teams manage one or more **application services**

▲ Platform teams exist within an **organizational domain**

▲ Commerce Digital Tech and Customer Experience typically build custom software

▲ Commercial and Supply Chain Tech integrate Commercial Off-The-Shelf product as IaaS

Customer Experience
| Android | iOS | Web | Market Place | Experimentation & Measurement |

Commerce Digital Tech
Bag & Checkout	Product Catalogue	Browse
Partner Fulfils	Promotions	Price & Sizing
Saved Items	Premier	Limited Drops

Customer Marketing Tech
| Content & DAM | Notifications | Audience Targeting | Customer Marketing Data Set |

Customer Profile, Orders, Delivery & Returns, Stock and Fulfilment
| Customer Profile & Identity | Order Management | Delivery & Returns Experience | Stock & Fulfilment |

Payment & Tax
| Alternative Payment Management | Card Systems | Fraud, Tax & Payment Orchestration |

Supply Chain Tech
| Warehouse | Warehouse Services | CMS & Return Ops | SCT Integration |

Customer Care
| CC Advisor Experience | CC Customer Experience |

Commercial Tech
| Commercial Planning & Optimisation (CPO) | Merchandise Management | Commercial Integration | Wholesale | Studio Tech |

Finance & PX
| Fin Tech | PX Tech |

Data Services
| Advanced Analytics | Enterprise Reporting | Data Lake | External Product Feeds |

AI & Data Science
| Data Science | Data Engineering |

Technology Operations & Infrastructure
| Site Reliability Engineering | Platform Engineering | Scalability & Resilience | Path To Live | Enterprise Operations | Infrastructure |

Cyber Security & Fraud
| Security Engineering | Security Operations |
| Incident Response | Fraud |

Service Governance
| Enterprise Asset Management | Operational Risk & Compliance | Scalability & Resilience | Service Design | Service Management | Operational Insight & Analytics |

ASOS

Microservices

A walkthrough

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Operating in Azure: Resiliency

Availability versus consistency

Consistency

Availability

Partition
Tolerance

▲ We set internal SLOs for 99.99% availability for our mission critical services.

▲ With many of the Azure product SLAs this requires us to deploy to two regions

▲ Following CAP theory, we trade consistency for availability

Order Booking: Availability

Processing: Consistency

Viewing: Availability

Checkout

Browser

EUN

EUW

Traffic
Manager

Traffic
Manager

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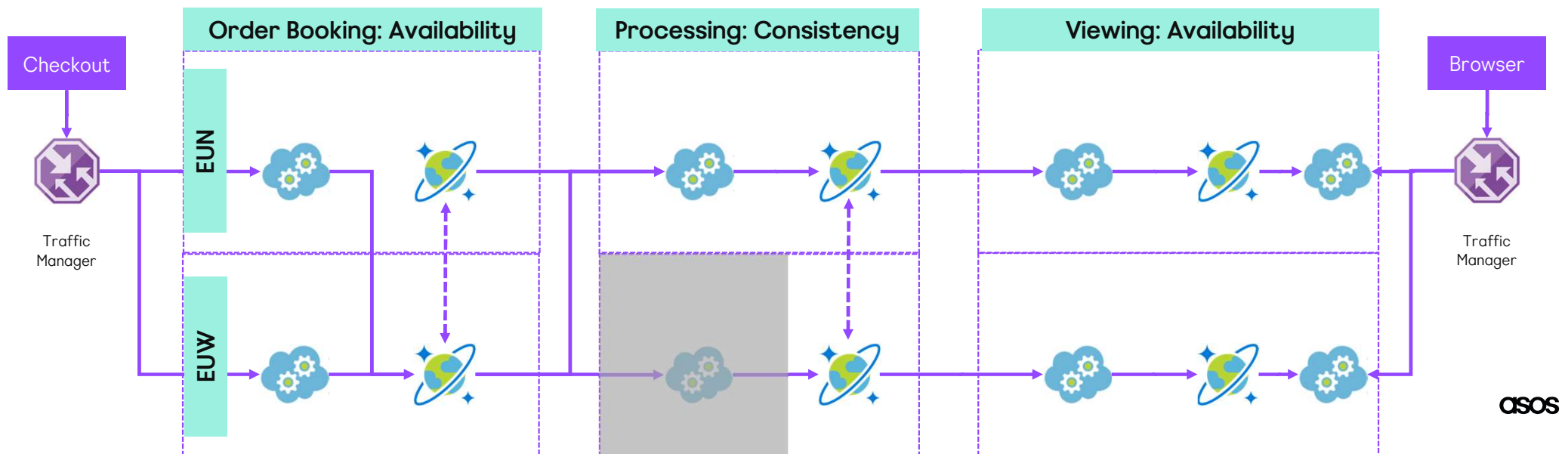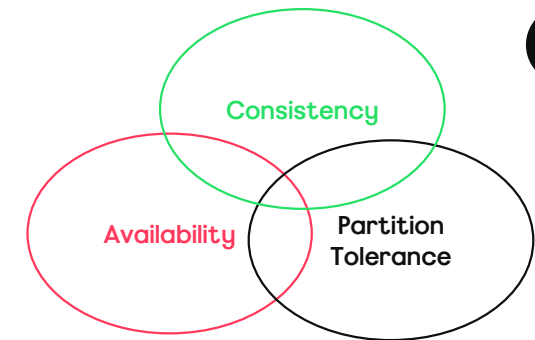
Event-driven microservices

A **deep dive** into Commerce

Event-Driven

- The Commerce architecture is event-driven
- Azure Service Bus is used to transport messages between systems
- The asynchrony provides temporal decoupling and load-levelling
- We adopted a choreography model for interactions between services
- It removes the bottleneck from a coordinator
- Scaling is adjusted for peak trading periods for each component
- However, it makes state difficult to determine state
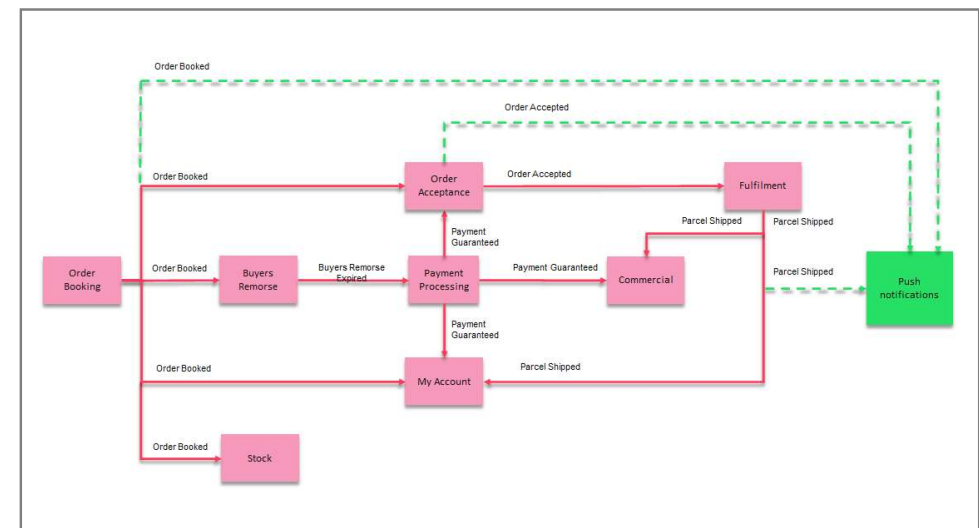
Order workflow

Typical Microservice

Order Management

- The monolithic codebase was refactored by the platform teams into a set of technical services.

- We went from 12 releases a year to now over 5,000 per year.
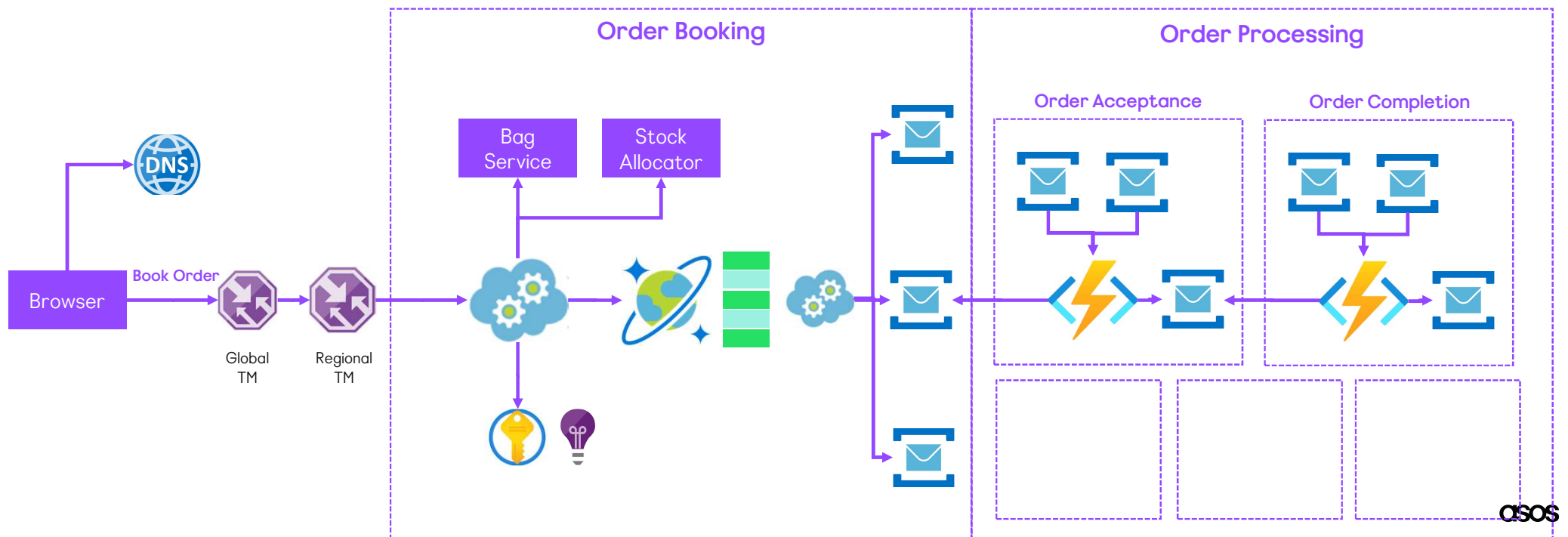
Cosmos DB

▲ We replaced our on-premise Mongo DB with Cosmos DB for our document database as it was PaaS

▲ Cosmos DB allow us to store data as JSON documents

▲ It offers scalability for our peak trading periods

▲ Replication distributes our data across regions

▲ The Change Feed Processor is the imitator for our event-driven architecture.

▲ The leases provide resiliency over our readers

▲ Synapse Link makes our transactional data available without a performance impact or the need ETL into an analytical store

Change Feed Reader

Change Feed Reader

Change Feed Reader

Change Feed Reader
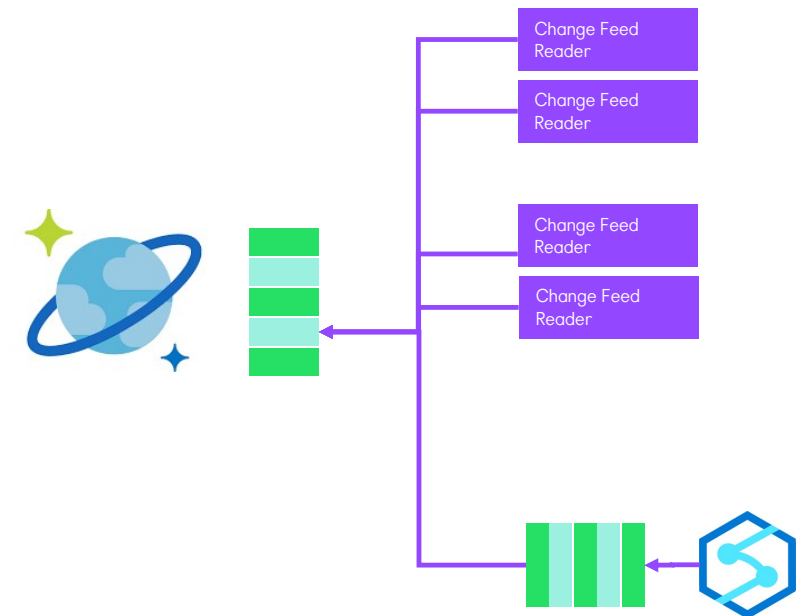
Partitioning

Scaling containers to meet performance needs

<superscript>26</superscript>

▲ ASOS has 23 million active customers

▲ Large datasets are distributed across many partitions

▲ Full partition management is required. Just need to pick a good partition key.

▲ Partition split is handled seamlessly and online
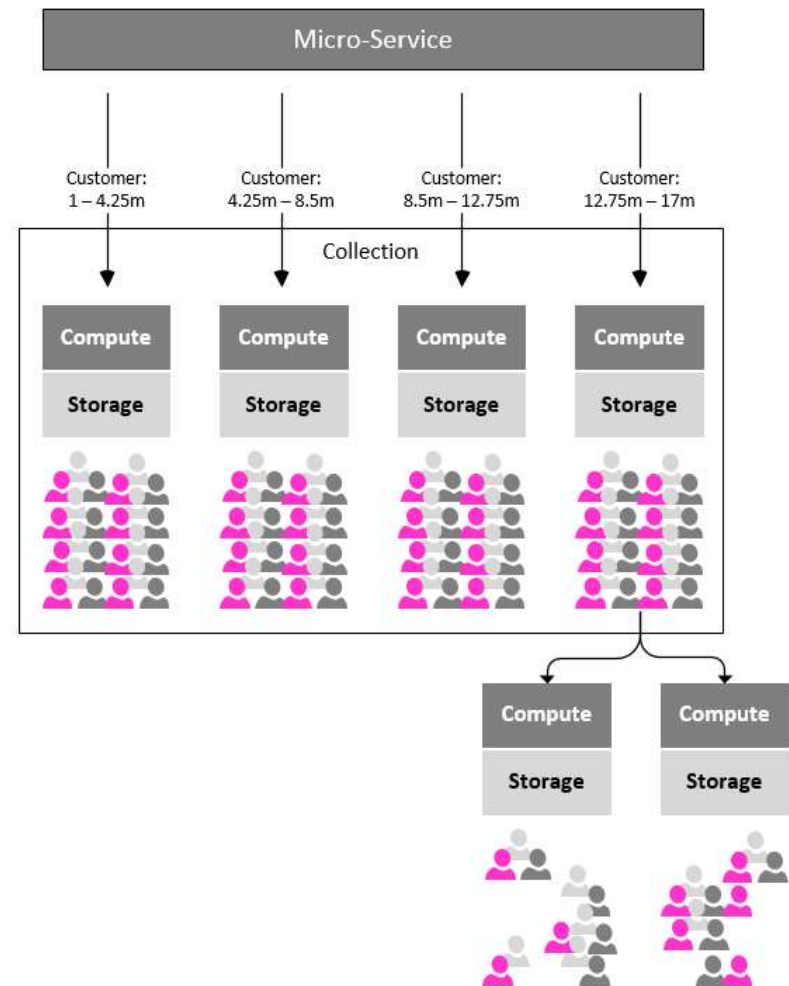
Event Sourcing

Centralised state

- Some of our systems use Event Sourcing

- We developed an Open-Source library for implementing Event Sourcing with Cosmos DB

- Event Sourcing gives you a complete audit log of every operation that took place

- It allows you to test and rebuild behaviour in a different environment

- The state of an aggregate is determined from the hydration of the event stream

- Ideal for systems that orchestrate

Order Booked · Discount Applied · Payment Guaranteed · Order Accepted · Buyer's Remorse Expired · Fraud Check Passed · Order Ready for Fulfilment

Order event stream

GitHub

https://github.com/ASOS/SimpleEventStore

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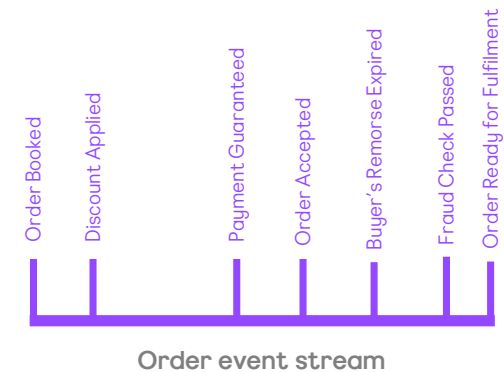
Durable Functions

Distributed state

▲ We have also started building nano services

▲ In an event-driven architecture, much functionality requires you to wait for more than one event to occur, e.g. *StockAllocated* AND *PaymentReceived*

▲ Durable Functions abstract more logic and infrastructure away from building stateful services

▲ Very scalable: our Durable Services have been able to process high number of requests per second

Order Booked
Payment Guaranteed
Order Fulfilment Authorised

Order Booked
Payment Guaranteed
Order Fulfilment Authorised

Fulfilment Entity

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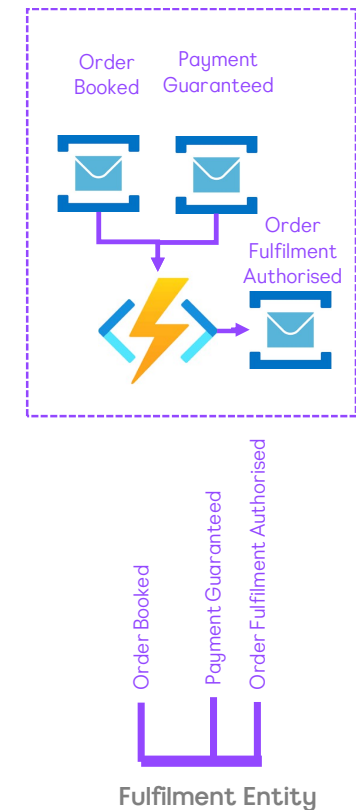
Kubernetes and Functions

AKS is now our default compute platform

We invested significant engineering into building common pipeline and monitoring, certificate rotation, etc.

Containiseration allows you to operate a production-like service on your laptop

We perform container scanning to look for out-of-date software and security threats

AKS offers us density and faster scaling; compared to Cloud Services or App Services

Currently each platform operates its own cluster, but we are considering grouping platforms in the future

We are adopting Istio as a service mesh

The Functions runtime can be hosted on AKS although most of ours are hosted on the Functions Hosting plan

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Managing our tech

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Cloud Operations

- Azure tagging is helping us identify mission critical services and data classifications

- Policies help us do the right thing

- PowerShell helps us enumerate our resources to determine what doesn't comply with architectural policy

- We use Backstage as a service catalogue
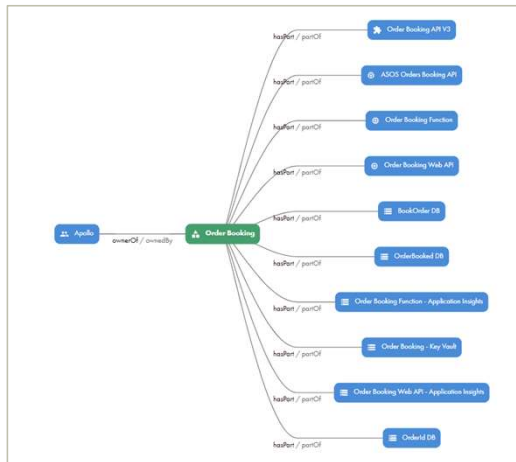
Tags

System Dependencies
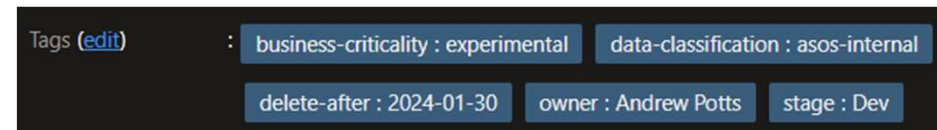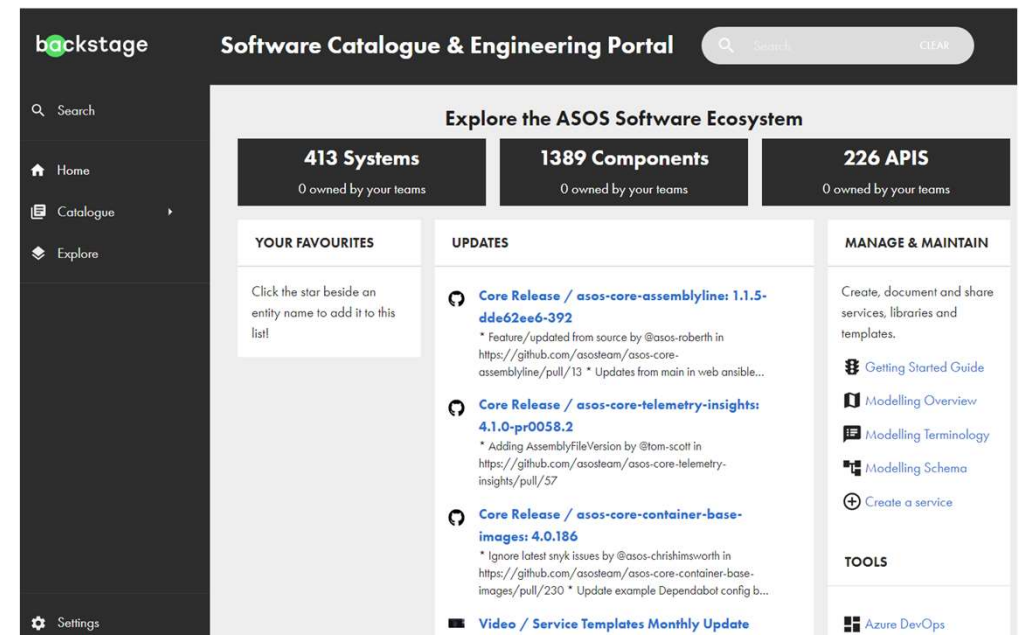
Backstage

Monitoring

- We have centralised monitoring subscription where all data is coalesced

- Tools like Vizceral give us a near real-time view of communication and errors

- Our support teams have a rich view of the system health

System Health

Vizceral

Looking
to the future

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What's Next?
Data, Data, Data

We strive to be a data-driven organisation, making high-quality data accessible to everyone

We have a growing Data Science team and are using ML & AI for many use cases:

- Recommendations
- Fashion Assistant
- Pricing and Promotions
- Studio and content creation

AI STYLIST

Hi Andrew, how can I help you today?

Here are some of the things I can help with:

1. I can suggest trending styles you might be into - like leather or leather-look coats.
2. I can help you dress for an occasion.
3. I can help you find the right size and fit for any items you like.

Help us improve the experience by sharing your feedback here.

What to wear for date night   Show me the latest cozy fits   Show me most loved trainers

Ask me anything...

You May Also Like

Data Workflow

You May Also Like builds models from data captured from our customers and uses that to serve recommendations live on the Website

YOU MIGHT ALSO LIKE

£25.00 Columbia £25.00 Columbia £27.00 Columbia £25.00 Columbia £25.00 Columbia
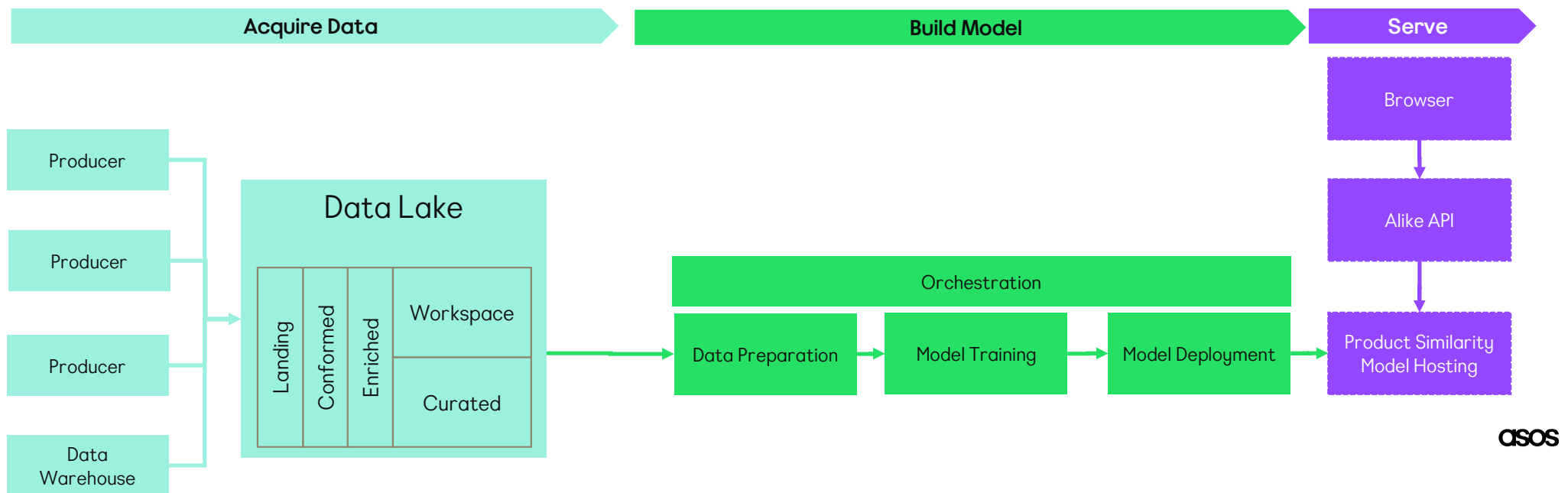
Acquire Data   **Build Model**   **Serve**

Producer

Producer

Producer

Data Warehouse

Data Lake

Landing | Conformed | Enriched | Workspace / Curated

Orchestration

Data Preparation → Model Training → Model Deployment

Browser → Alike API → Product Similarity Model Hosting
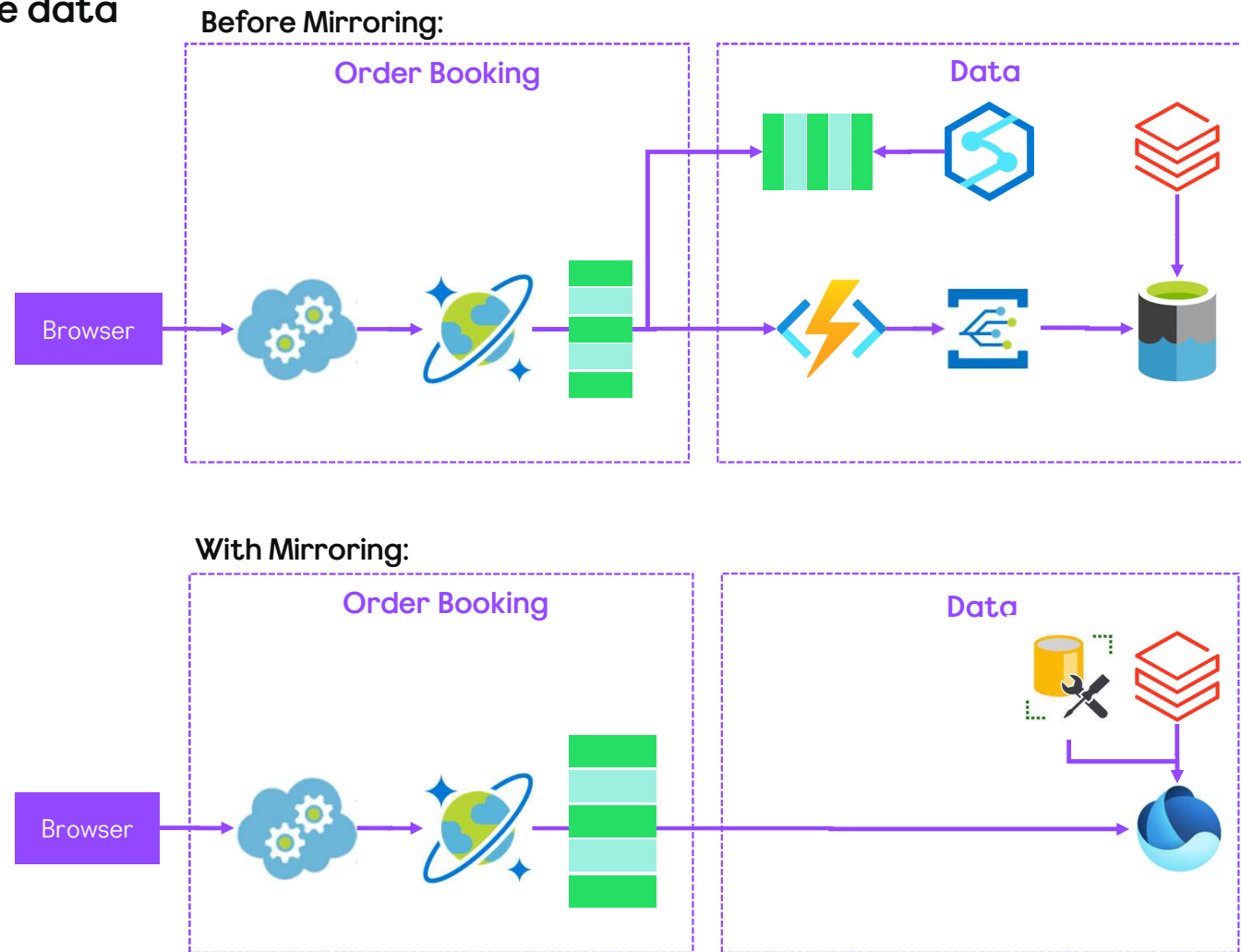
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Azure Fabric Mirroring

Reducing infrastructure to capture data

▲ Database Mirroring can reduce the complexity of ingesting data into the Data Lake

▲ Data is replicated using built-in Change Data Capture

▲ The data can be queried using a SQL endpoint

▲ Delta parquet files are also written to storage, allowing processing in notebooks

▲ Azure Fabric offers great interoperability and will reduce the effort in consuming your data

Before Mirroring:

Order Booking — Browser — Data

With Mirroring:

Order Booking — Browser — Data

Thank you

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