AWS re:Invent

TLC303

How Vodafone's Intelligent Care platform utilizes AWS

George Rammos

Customer Solutions Manager
Amazon Web Services

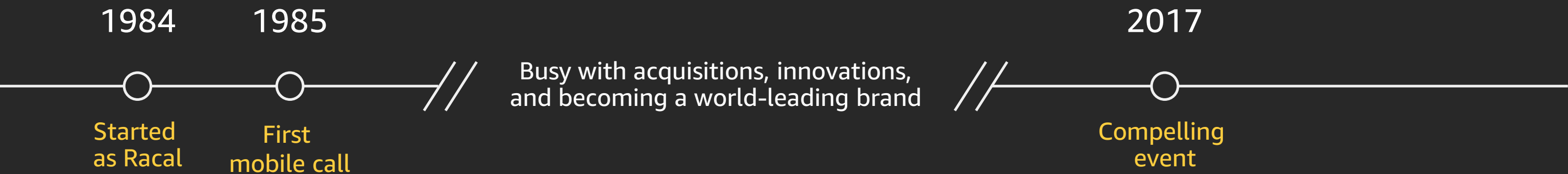**Mark Farbrace**

Senior Manager
Accenture Applied Intelligence

Karl Woodrow

Big Data Technology Lead
Vodafone UK

aws

AWS at Vodafone UK
What got us here today

1984 — Started as Racal

1985 — First mobile call

Busy with acquisitions, innovations, and becoming a world-leading brand

2017 — Compelling event

AWS at Vodafone UK
How it all began

Before 2017

Shadow IT
Dev/Test
Limited best practice
No landing zone
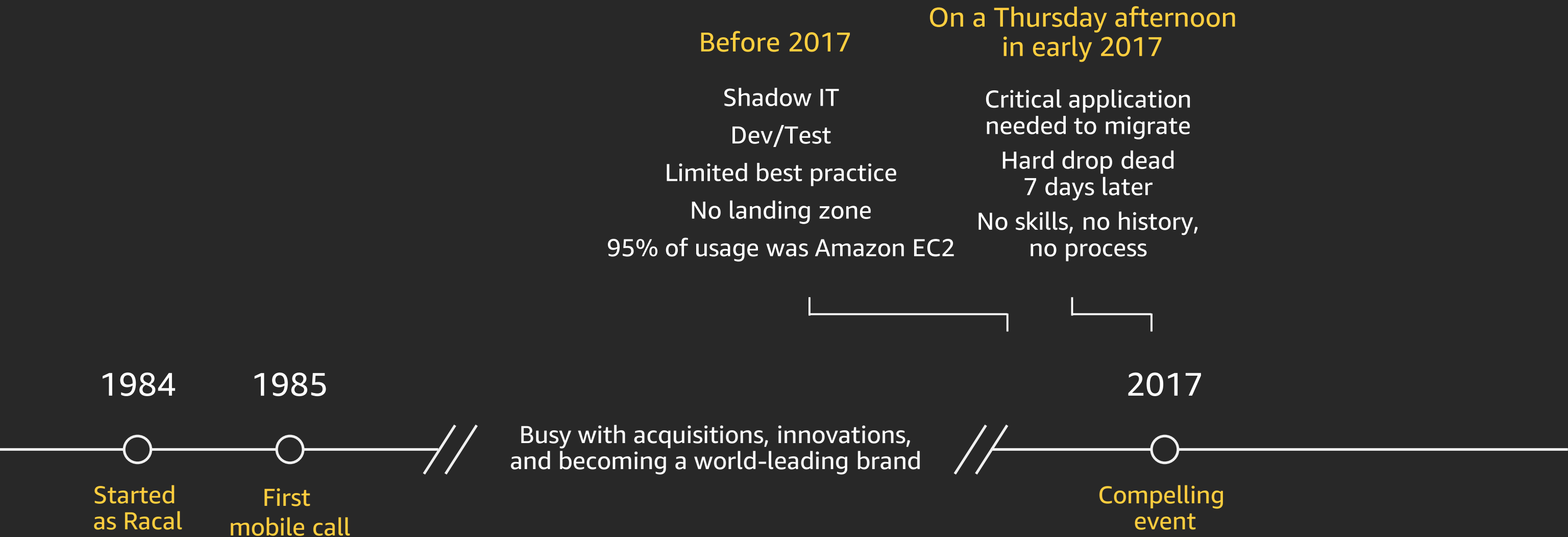95% of usage was Amazon EC2

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Critical application needed to migrate

Hard drop dead 7 days later

No skills, no history, no process

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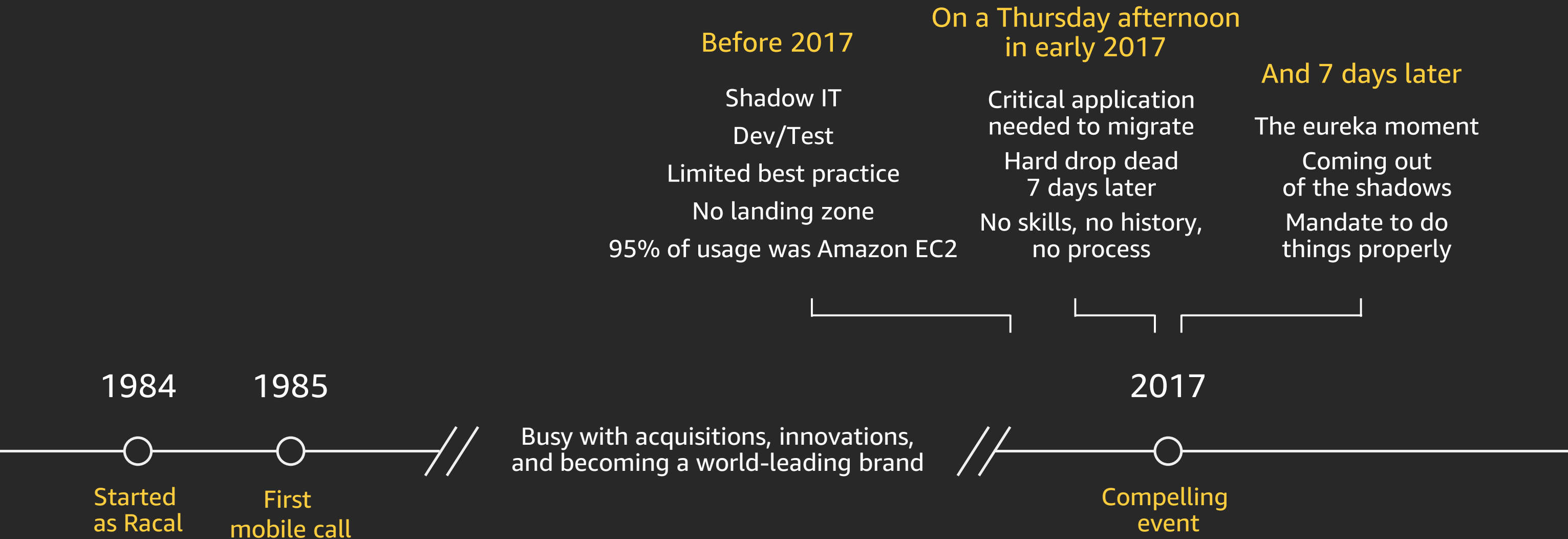
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And 7 days later

The eureka moment

Coming out of the shadows

Mandate to do things properly

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Compelling event

AWS at Vodafone UK
What happened since

Completed Enterprise Acceleration Programme (EAP)

Over 300 people educated

Deep dives into security

Deep dives into higher platform services

Cost optimization

Enterprise support

Over 60 Gbps of Direct Connect links in place

Architecture reviews and learning the ropes

CloudFactory churning out secure, scalable, cost-optimized designs

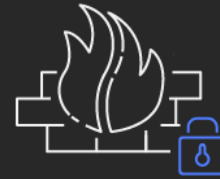# AWS is the new normal

aws

AWS at Vodafone UK
What happens now

Digital front ends

Customer applications
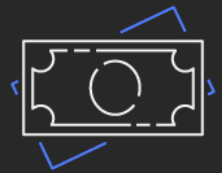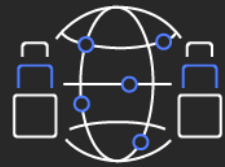
Digital microservices

Firewalls

Communications offerings

Dev/test/perf

Billing platforms
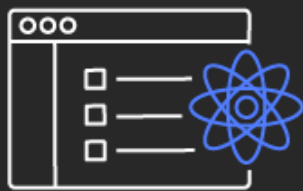
Middleware

Dev pipelines

Customer care

Network analytics

Network planning

Digital front ends

Customer care

Network analytics

Communications offerings

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Billing platforms

Middleware
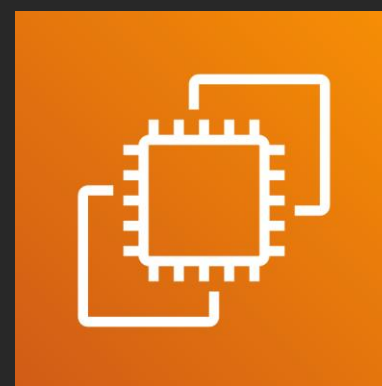
Dev pipelines

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AWS at Vodafone UK
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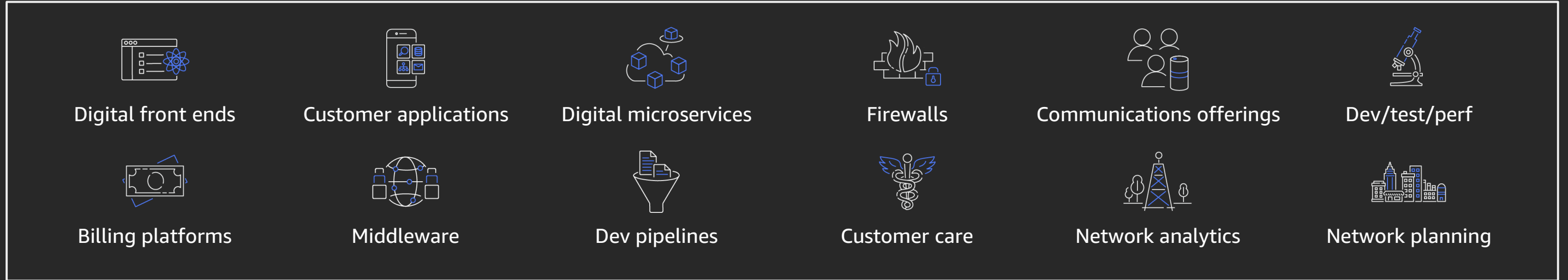
Network planning
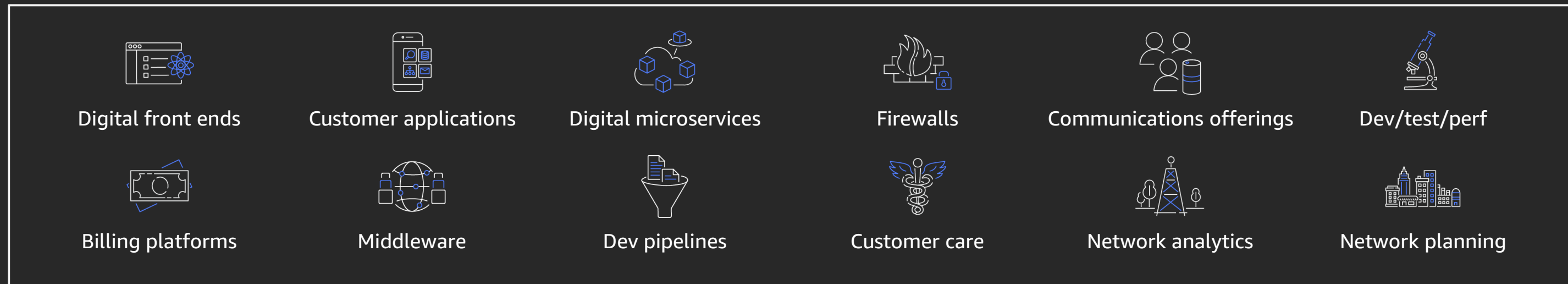
>95%

Amazon Elastic
Compute Cloud
(Amazon EC2)

AWS at Vodafone UK

What happens now

Digital front ends   Customer applications   Digital microservices   Firewalls   Communications offerings   Dev/test/perf

Billing platforms   Middleware   Dev pipelines   Customer care   Network analytics   Network planning

Amazon GuardDuty

Amazon Simple Notification Service (Amazon SNS)

Amazon Simple Queue Service (Amazon SQS)

AWS Cost & Usage Report

AWS Cost Explorer

Amazon EMR

Reserved Instance Reporting

Amazon EC2

Amazon Kinesis

Amazon Elastic Container Service (Amazon ECS)

AWS Lambda

AWS Glue

Amazon Athena

Amazon CloudWatch

Amazon Elasticsearch Service (Amazon ES)

AWS Config

Amazon Redshift

AWS CloudFormation

Amazon Textract

Amazon ElastiCache

AWS CloudTrail

AWS Identity and Access Management (IAM)

Amazon SageMaker

AWS Secrets Manager

AWS Direct Connect

Amazon VPC

Amazon Aurora

AWS Transfer for SFTP

AWS Key Management Service

AWS Transit Gateway

Amazon Relational Database Service (Amazon RDS)

AWS Shield

Amazon DynamoDB

The challenge

The business dreamland

- Excellence in customer experience
- Holistic view of customer
- Granular understanding of the customer
- Proactive upsell
- Lower cost of serving customer

The technology constraints

- Security – No desktop solutions
- Scalability – On-premises Hadoop environment restricted due to physical hardware (+ high cost)
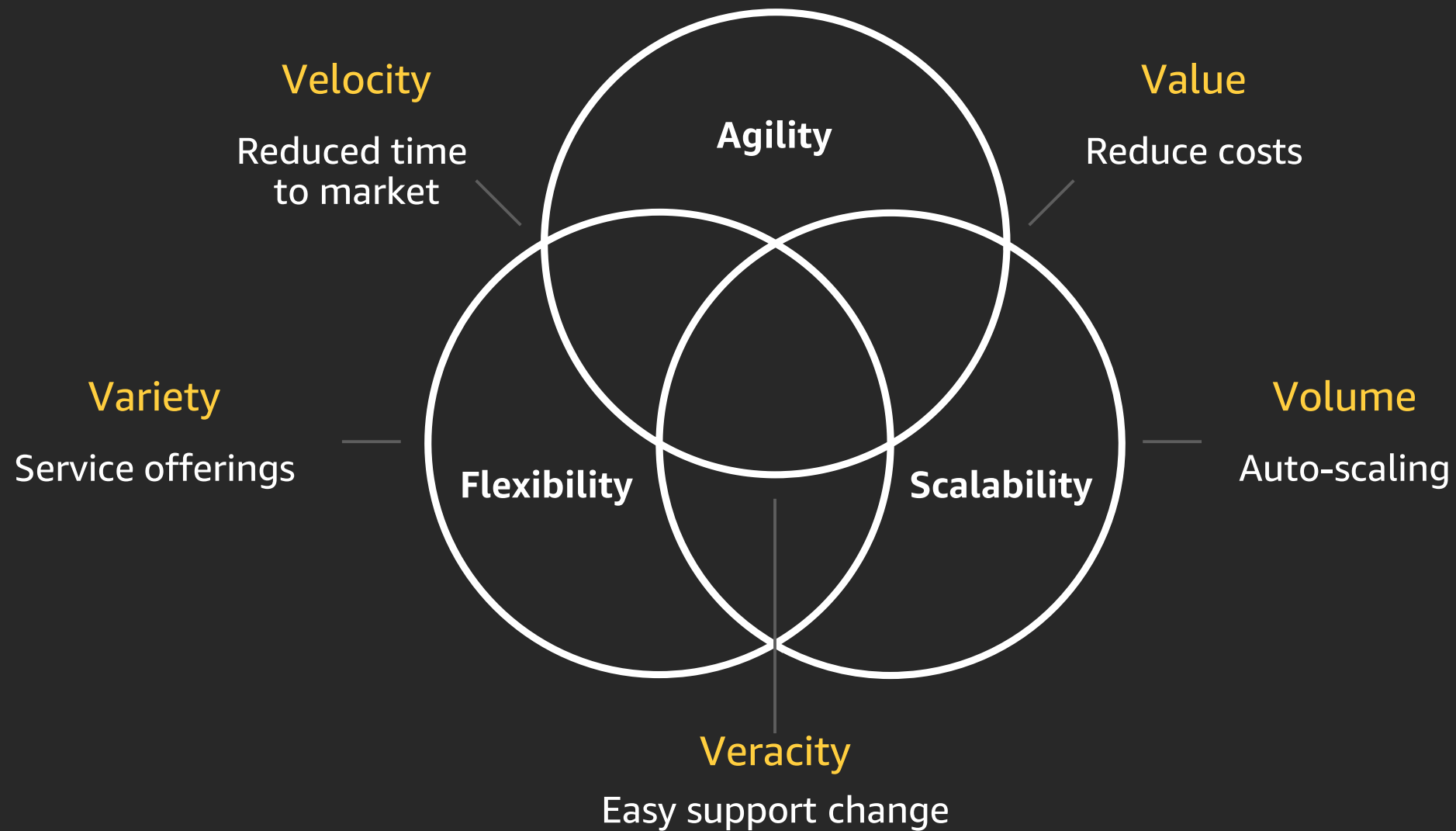- Operability – Manage clusters and upgrades
- Availability – Multi-tenant shared environment leading to resource clashes such as Spark context availability

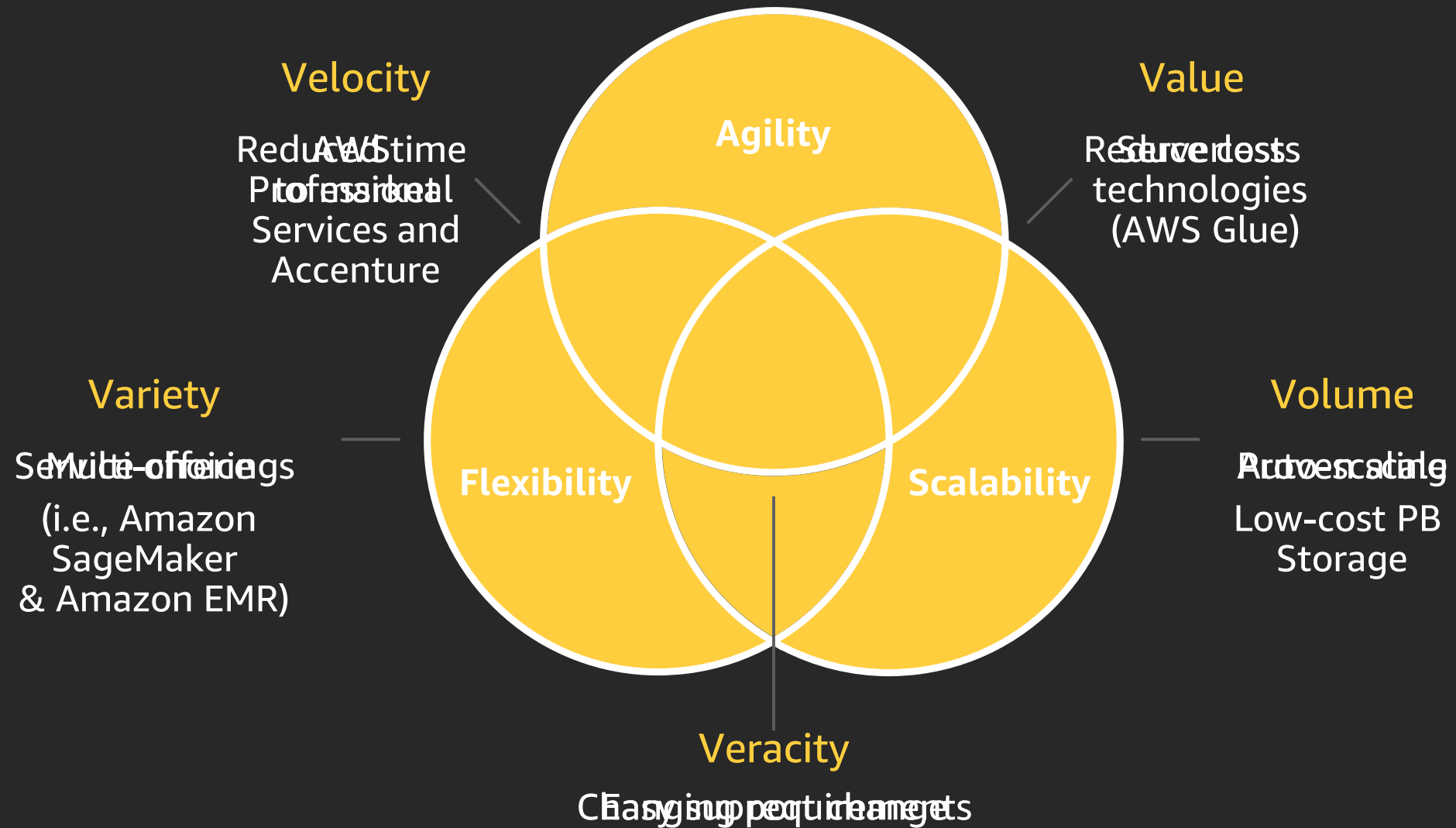# Building the cloud analytics platform

Building the cloud analytics platform
Value of going to the cloud

Velocity
Reduced time to market

Value
Reduce costs

Variety
Service offerings

Volume
Auto-scaling

Veracity
Easy support change

Agility

Flexibility

Scalability

Building the cloud analytics platform
Value of building to the cloud with AWS

Velocity
Reduced time to market
AWS Professional Services and Accenture

Value
Reduced costs
Serverless technologies
(AWS Glue)

Agility

Variety
Multi-offerings
Service choice
(i.e., Amazon SageMaker
& Amazon EMR)

Flexibility

Scalability

Volume
Auto-scaling
Process data
Low-cost PB
Storage

Veracity
Easy support changes
Changing requirements

Knowledge & community →

Building the cloud analytics platform

"In three months, I want an end-to-end production use case running in a secure, scalable AWS analytics platform."

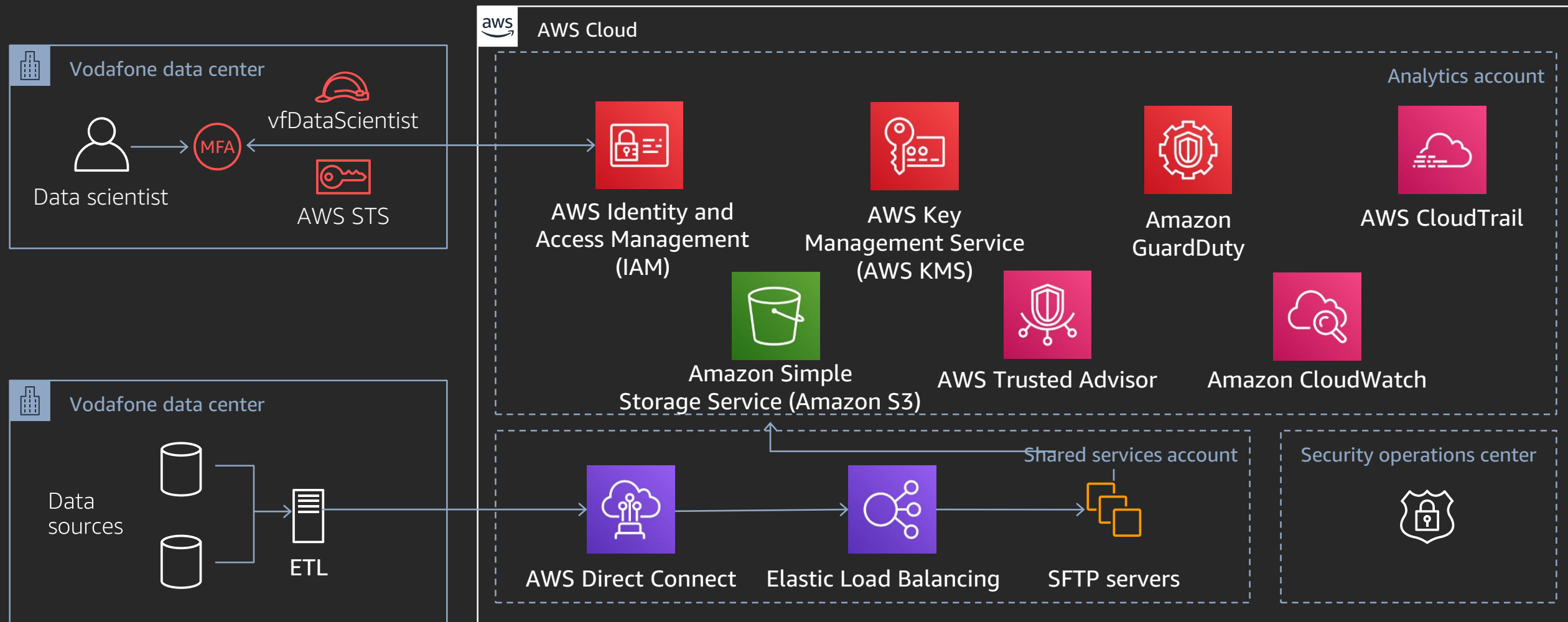—**Head of Big Data**
Vodafone UK

Executive objective—Phase 1
Building the cloud analytics platform

Oct 2018   Design | Security & privacy sign off | Secure infrastructure delivered   Nov 2018
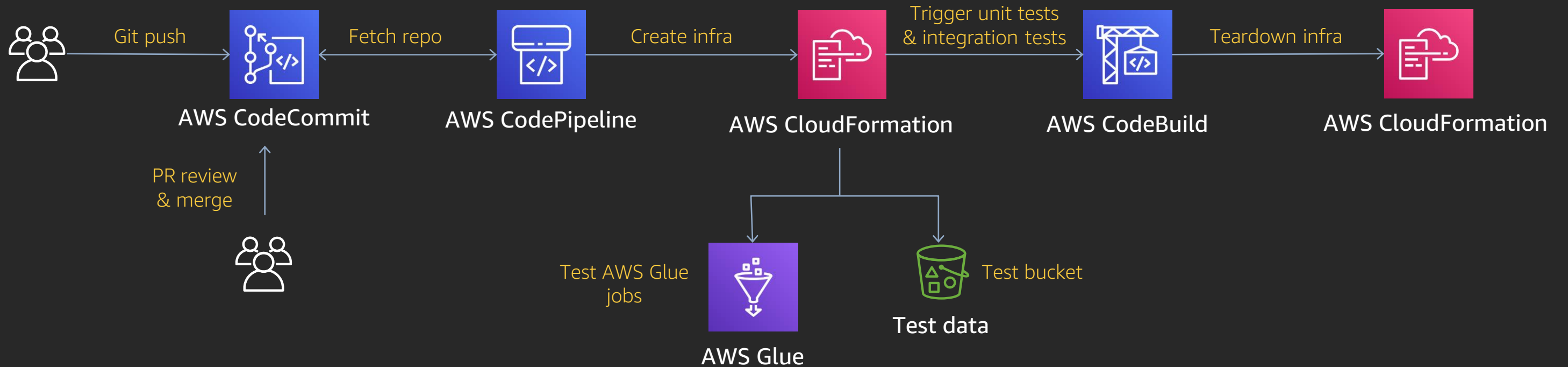
Executive objective—Phase 1
Building the cloud analytics platform

Nov 2018 CI/CD pipeline for AWS Glue jobs | Modelling POC with Amazon SageMaker | Data ingest orchestration using AWS Lambda   Dec 2018
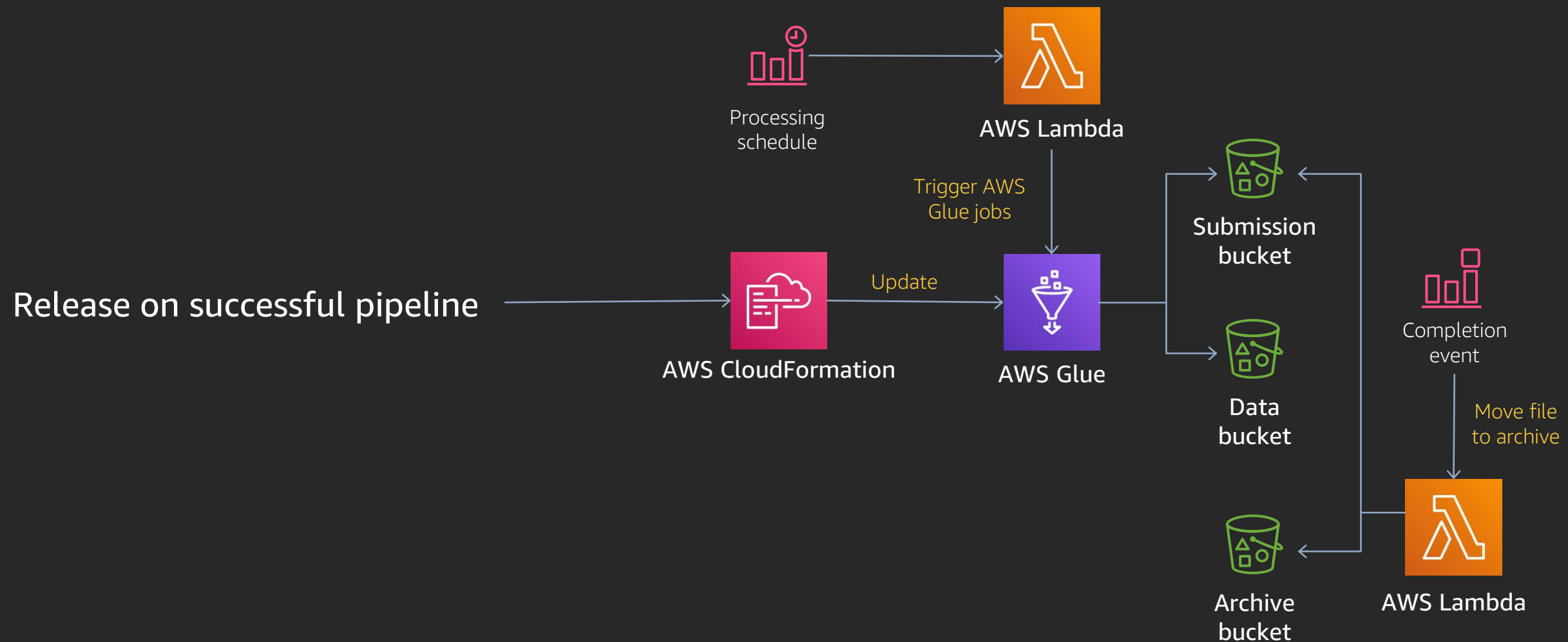
Executive objective—Phase 1
Building the cloud analytics platform

Dec 2018   Live data feeds and processing enabled | Model training on partial data set   Jan 2019

Processing schedule

AWS Lambda

Trigger AWS Glue jobs

Release on successful pipeline

AWS CloudFormation   Update   AWS Glue

Submission bucket

Data bucket

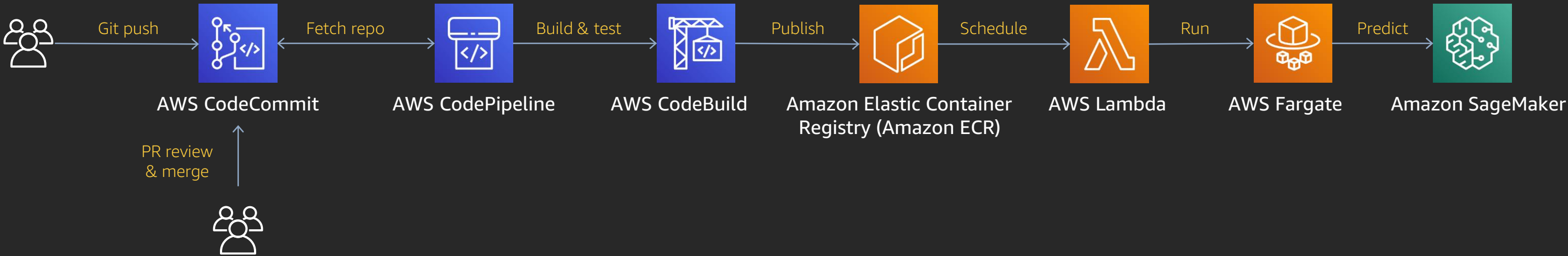Completion event

Move file to archive

Archive bucket

AWS Lambda

Executive objective—Phase 1
Building the cloud analytics platform

Jan 2019   Model prediction run fed back to marketing tooling | Data scientist self-service via AWS Service Catalog

Building the cloud analytics platform

"I want all existing models to be migrated to the Cloud Data Analytics Platform by the end of September."

—**Head of Big Data**
Vodafone UK

Executive objective—Phase 2

Building the cloud analytics platform
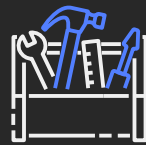
Apr 2019   May 2019   June 2019
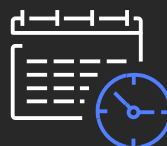
aws
Professional Services

- Why AWS Professional Services?
- Working together
- Customer-focused design sessions
- ML pipeline delivered incrementally over six sprints
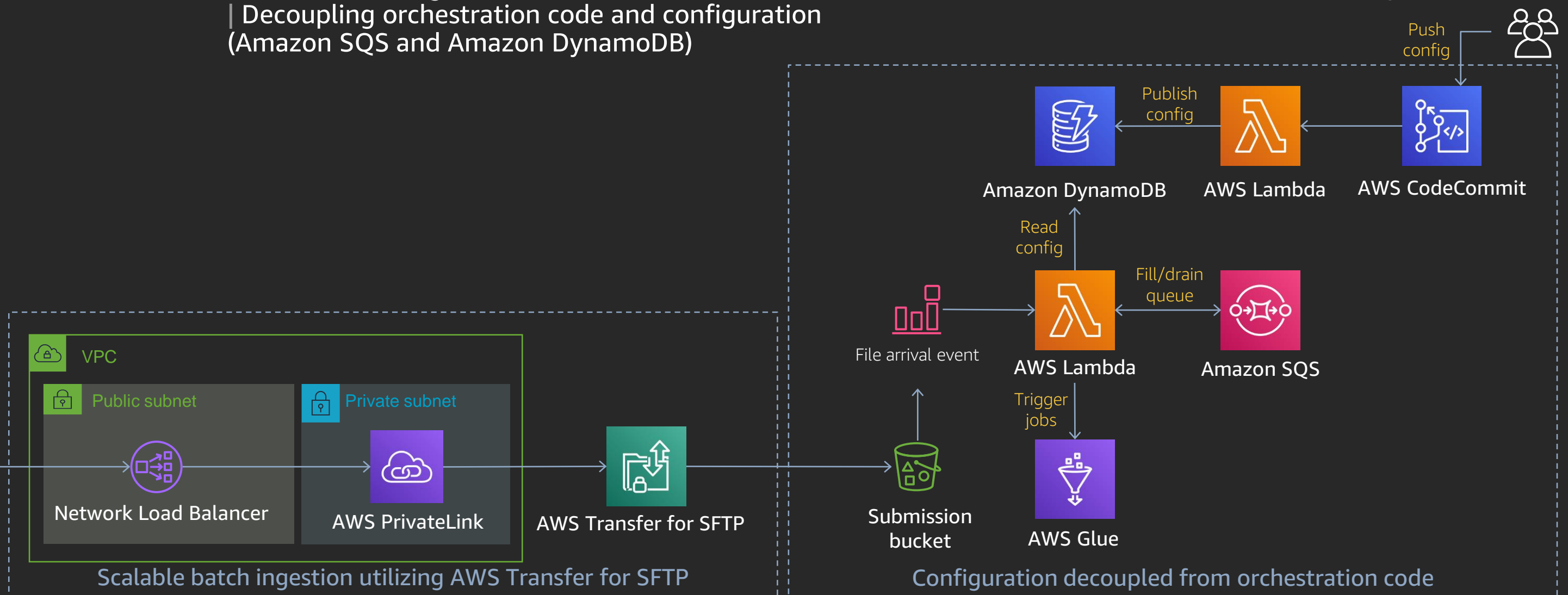
London, UK

Vodafone UK launches AWS Cloud-based analytics platform

Executive objective—Phase 2
Building the cloud analytics platform

Apr 2019 — Scalable batch ingestion—AWS Transfer for SFTP
| Decoupling orchestration code and configuration
(Amazon SQS and Amazon DynamoDB)

May 2019

Push config

Publish config

Amazon DynamoDB ← AWS Lambda ← AWS CodeCommit

Read config

Fill/drain queue

File arrival event → AWS Lambda ← Amazon SQS

Trigger jobs

VPC

Public subnet   Private subnet

Network Load Balancer → AWS PrivateLink → AWS Transfer for SFTP → Submission bucket → AWS Lambda

AWS Glue

Scalable batch ingestion utilizing AWS Transfer for SFTP

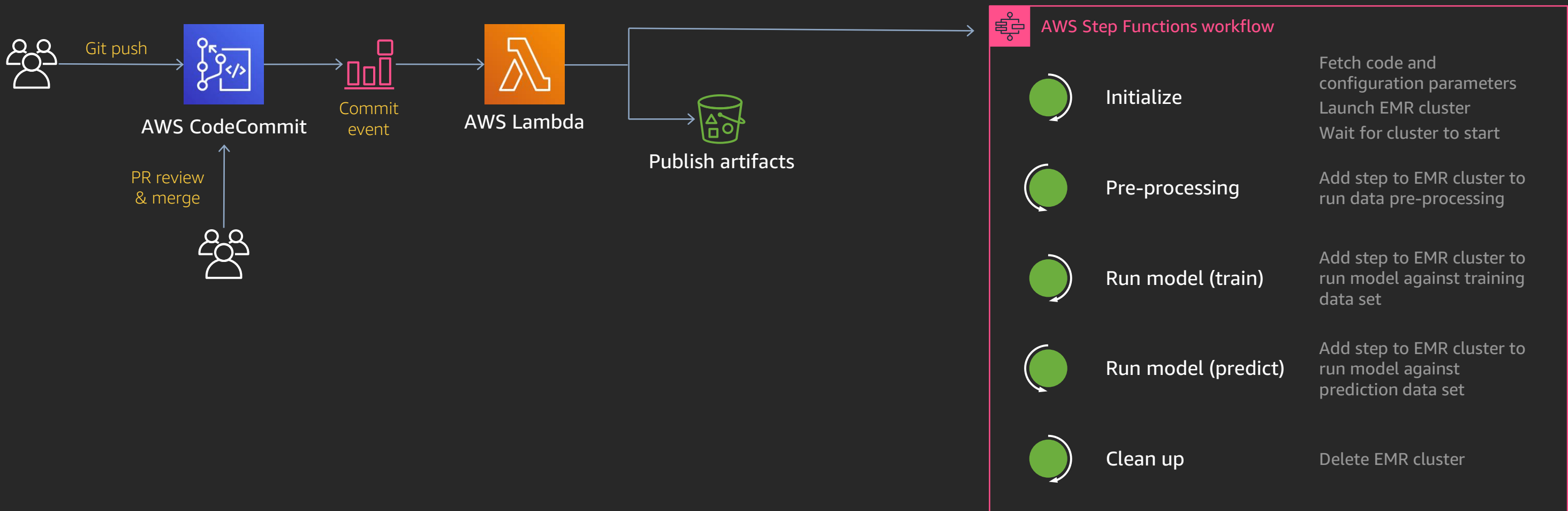Configuration decoupled from orchestration code

Executive objective—Phase 2
Building the cloud analytics platform

May 2019 ML pipeline design – AWS Step Functions & Amazon EMR
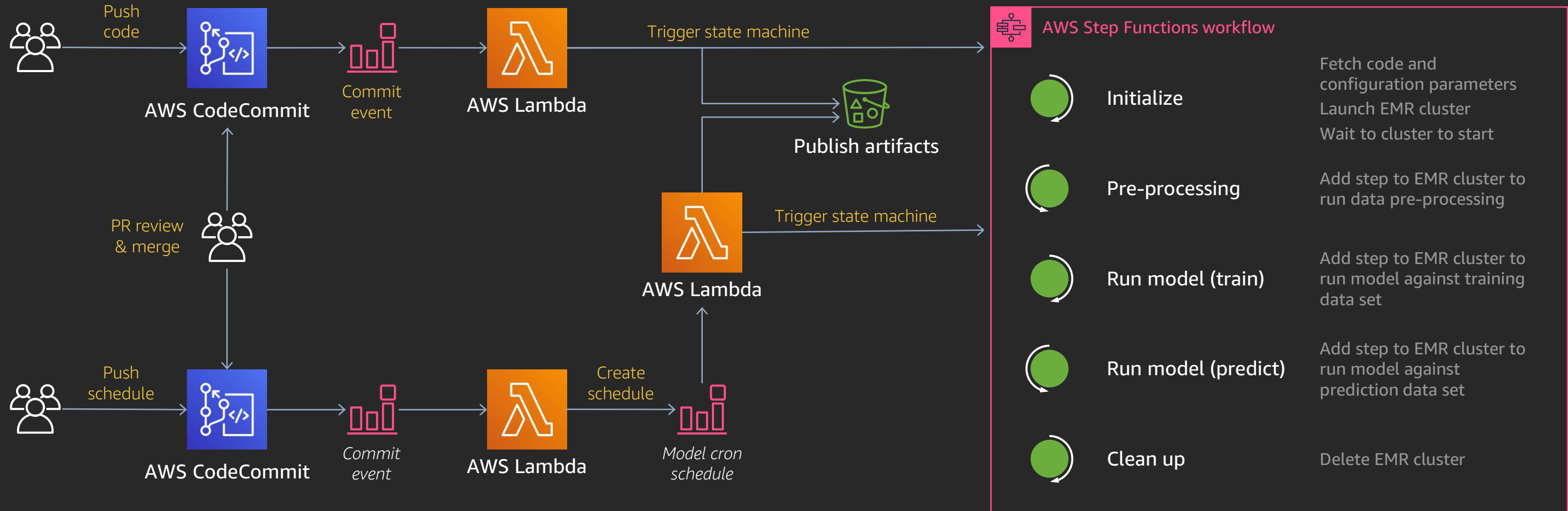| ML pipeline scheduling automation

June 2019

Git push

AWS CodeCommit

Commit event

AWS Lambda

Publish artifacts

PR review & merge

AWS Step Functions workflow

Initialize — Fetch code and configuration parameters
Launch EMR cluster
Wait for cluster to start

Pre-processing — Add step to EMR cluster to run data pre-processing

Run model (train) — Add step to EMR cluster to run model against training data set

Run model (predict) — Add step to EMR cluster to run model against prediction data set
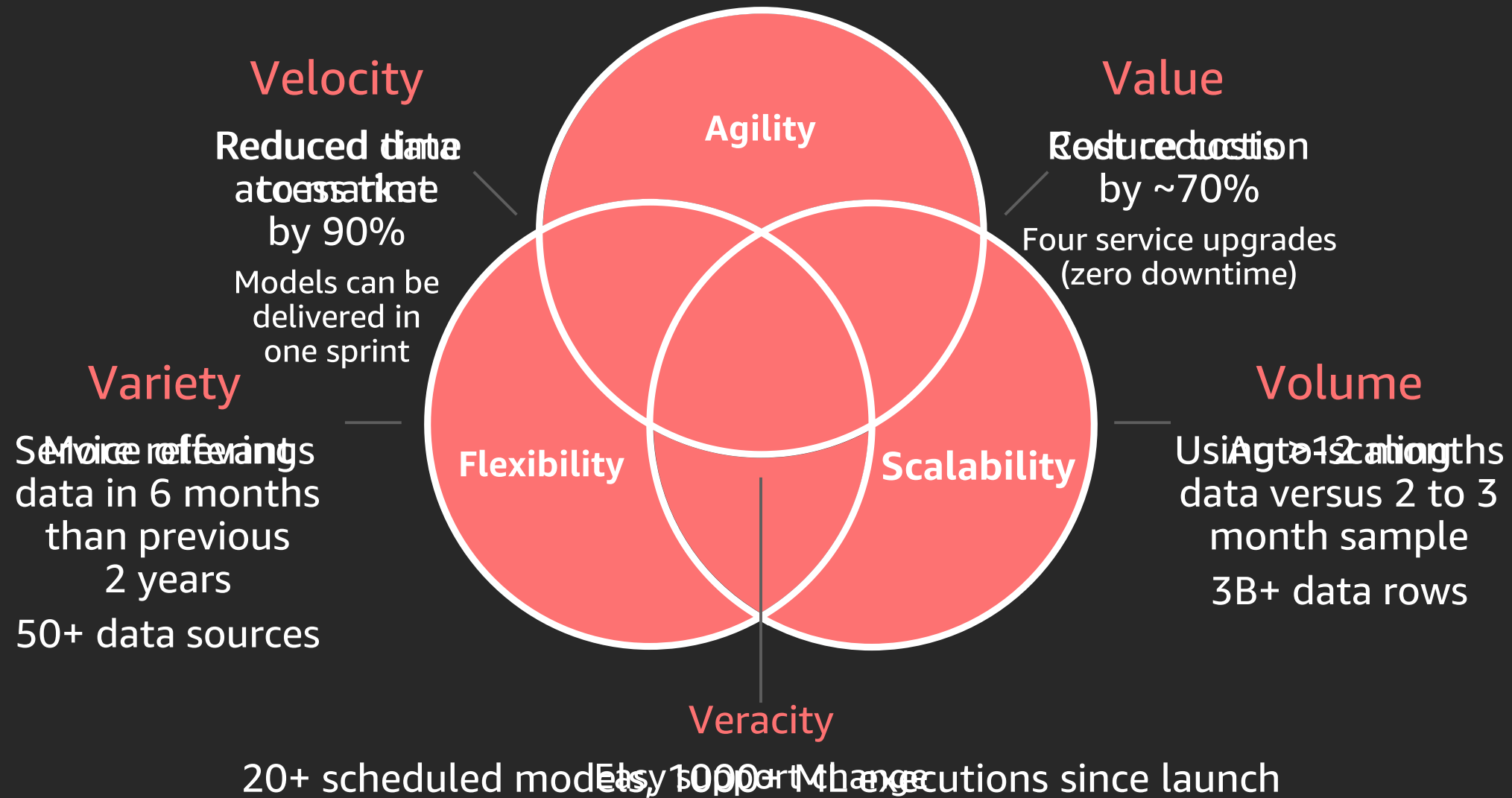
Clean up — Delete EMR cluster

Executive objective—Phase 2
Building the cloud analytics platform

June 2019 ML pipeline user acceptance testing | ML pipeline go-live

Push code

AWS CodeCommit

Commit event

AWS Lambda

Trigger state machine

Publish artifacts

PR review & merge

Push schedule

AWS CodeCommit

Commit event

AWS Lambda

Create schedule

Model cron schedule

AWS Lambda

Trigger state machine

AWS Step Functions workflow

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Clean up — Delete EMR cluster

Building the cloud analytics platform
Outcomes

Velocity

Reduced time to market by 90%

Models can be delivered in one sprint

Value

Reduced cost by ~70%

Four service upgrades (zero downtime)

Variety

More relevant data in 6 months than previous 2 years

50+ data sources

Volume

Agate 12 months data versus 2 to 3 month sample

3B+ data rows

Veracity

20+ scheduled models, 1000+ M1 executions since launch

Agility

Flexibility

Scalability

Bringing value to the business

What is intelligent care?

Connecting predictive power and intelligent channel steering to deliver a personalized end-to-end customer experience

The journey	Traditional care	▶▶	Intelligent care	▶▶	Today

Relentless focus on fixing the basics

Focus on in-channel optimization & automation to improve experience and reduce cost

Analytical predictive capability focused on deflection

Driving cost reduction through intelligent steering of customers to digital channels

The experience

1. We take large unstructured data →
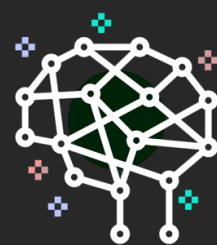
I understand where you are on your journey and your recent interactions with us

The brain

2. To create structured personalized experiences →

At every touchpoint I understand your intent. I use analytics to calculate the best route for your journey
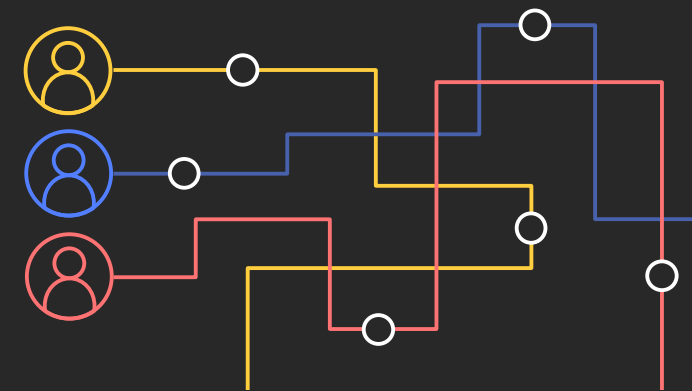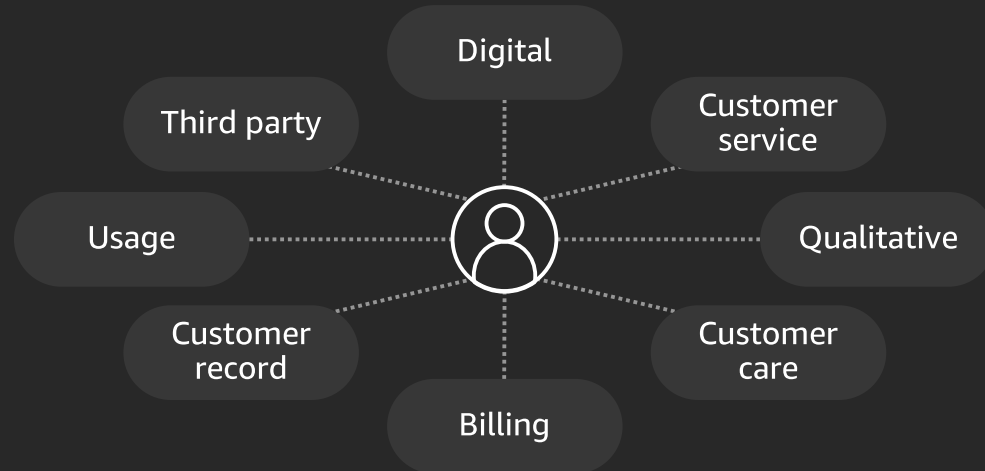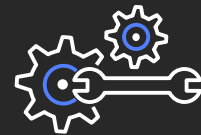
3. Industry-led customer experiences

I personalize your experience to your situation
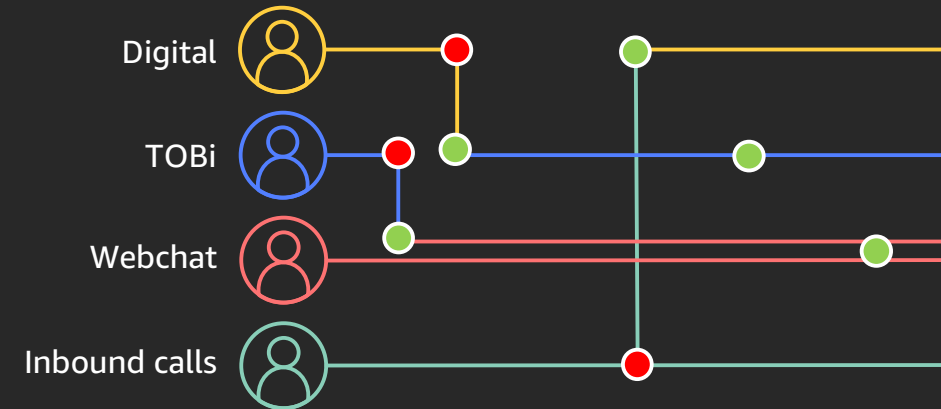
A market-leading ML capability

CAR – Customer Analytic Record

- Digital
- Customer service
- Third party
- Qualitative
- Usage
- Customer care
- Customer record
- Billing

400+ features

JAR – Journey Analytic Record

- Digital
- TOBi
- Webchat
- Inbound calls

10 sources

Track customers moving between channels & intents

Identify underperforming journeys

Early warning system for problem journeys

Interpret the reasons/cause for potential journeys

Single view of the customer

Enabling

Enhancement opportunities

Provide agents with the **context of customer interactions**

Understand where a customer is on their **journey**

Personalize a customer's experience, e.g., different customers have a different experience for the same intent

Identify areas of **optimization** within **existing journeys**

Ability to **recommend sales and service treatments** at all journey steps
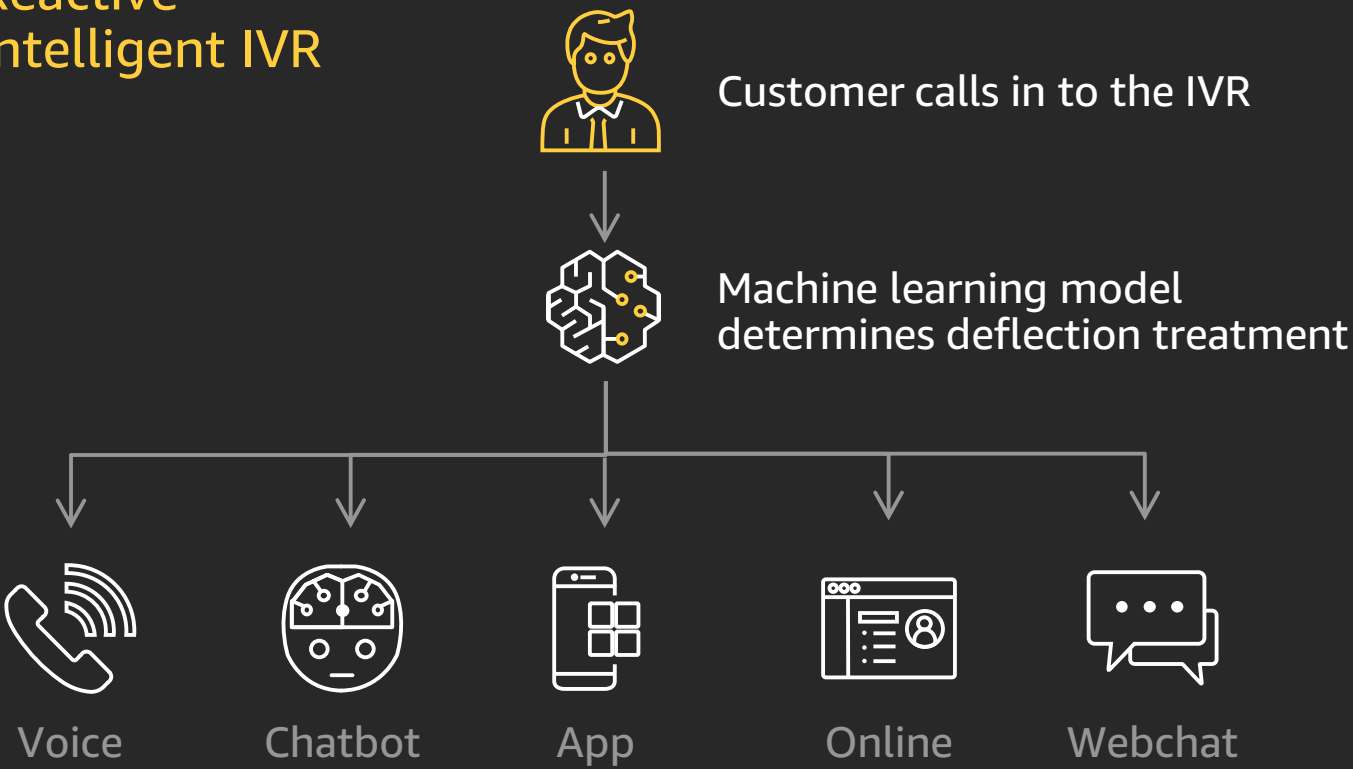
What does intelligent care mean for the customer?

A customer could interact with Predictive Care either through a **proactive** outbound SMS or through the **IVR**, resulting in receiving a deflection SMS
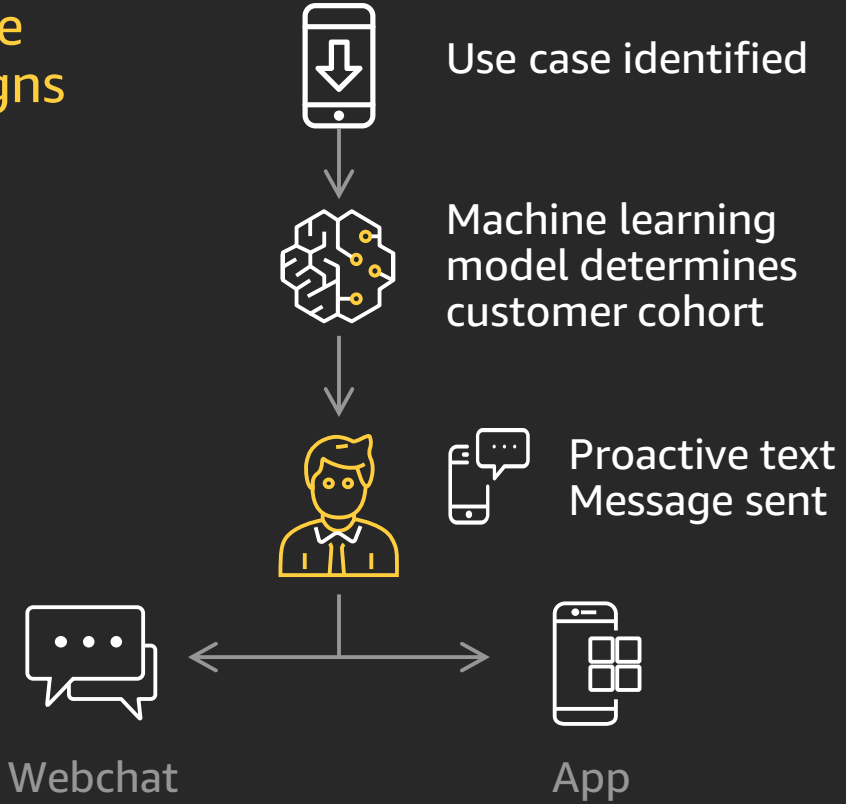
BDC

CAR

JAR

Personalized customer experiences
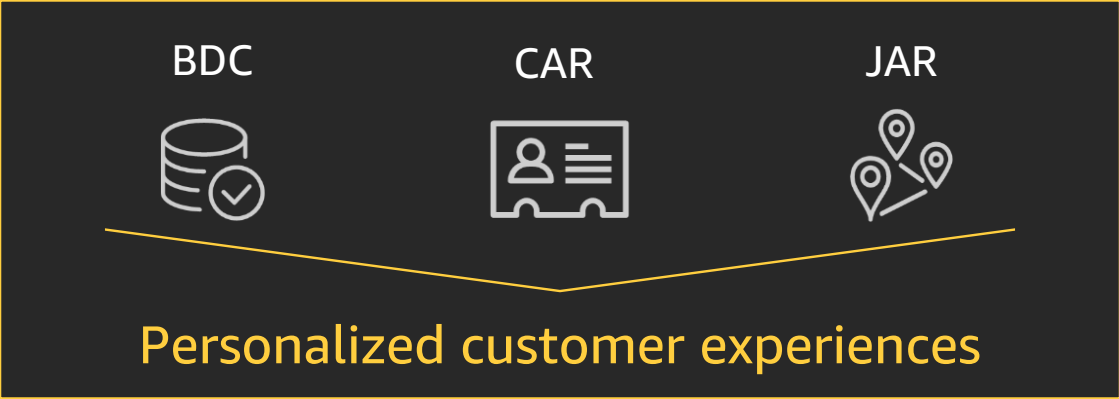
The AI capability enables the campaigns to select the right customers to target and offer them personalized treatments

Reactive Intelligent IVR

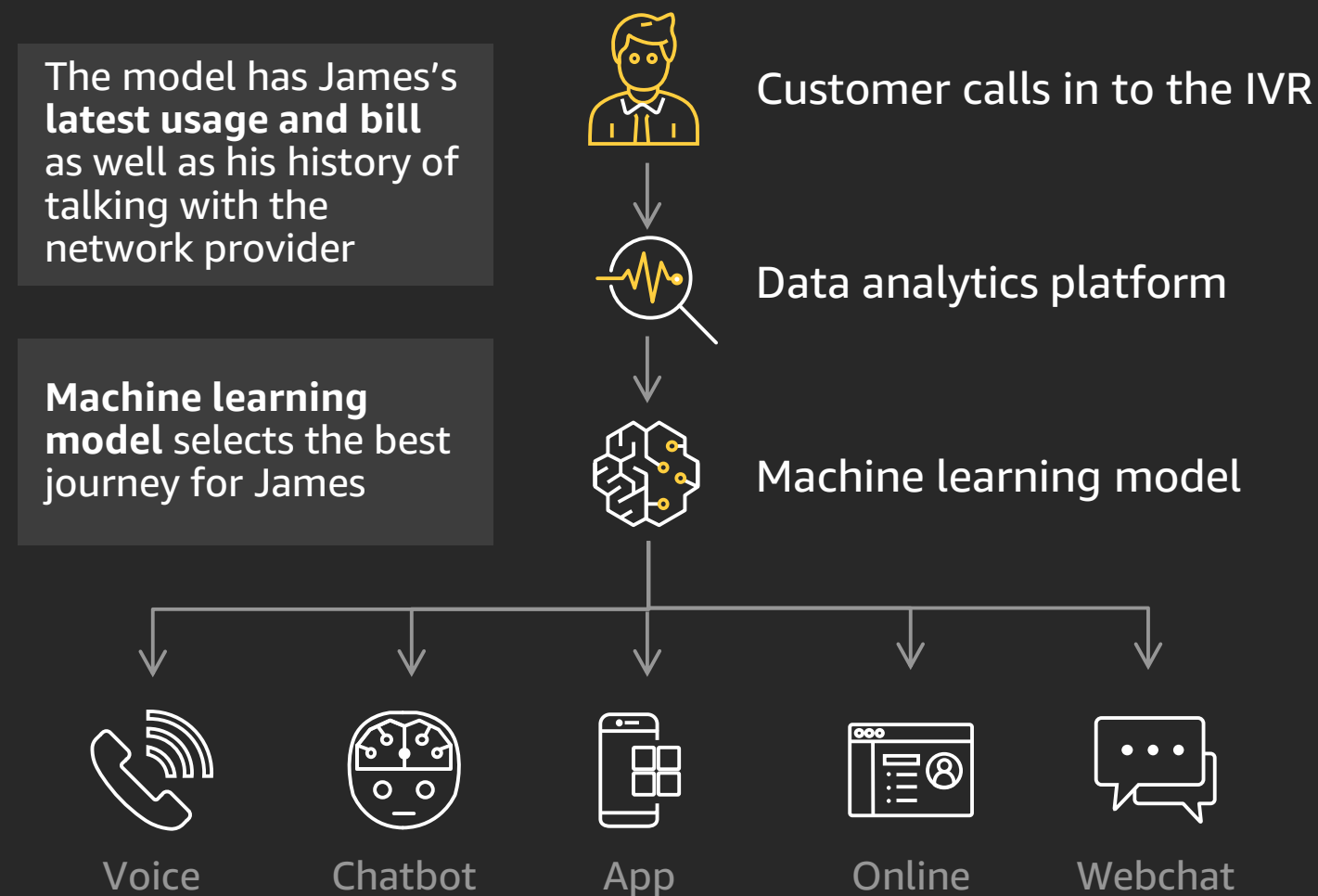Customer calls in to the IVR

Machine learning model determines deflection treatment

Voice

Chatbot

App

Online

Webchat

Proactive Campaigns

Use case identified

Machine learning model determines customer cohort

Proactive text Message sent

Webchat

App

Intelligent IVR
Capability to offer customers personalized deflection messages in the IVR

IVR: Model-driven deflection

The model has James's **latest usage and bill** as well as his history of talking with the network provider

Machine learning model selects the best journey for James

Customer calls in to the IVR

Data analytics platform

Machine learning model

Voice   Chatbot   App   Online   Webchat

Results

Experience driven
Deployed in May

Model driven
Deployed in June

~15%
Deflection increase

+

~40%
Net deflection

Annualized savings

1.2M calls deflected

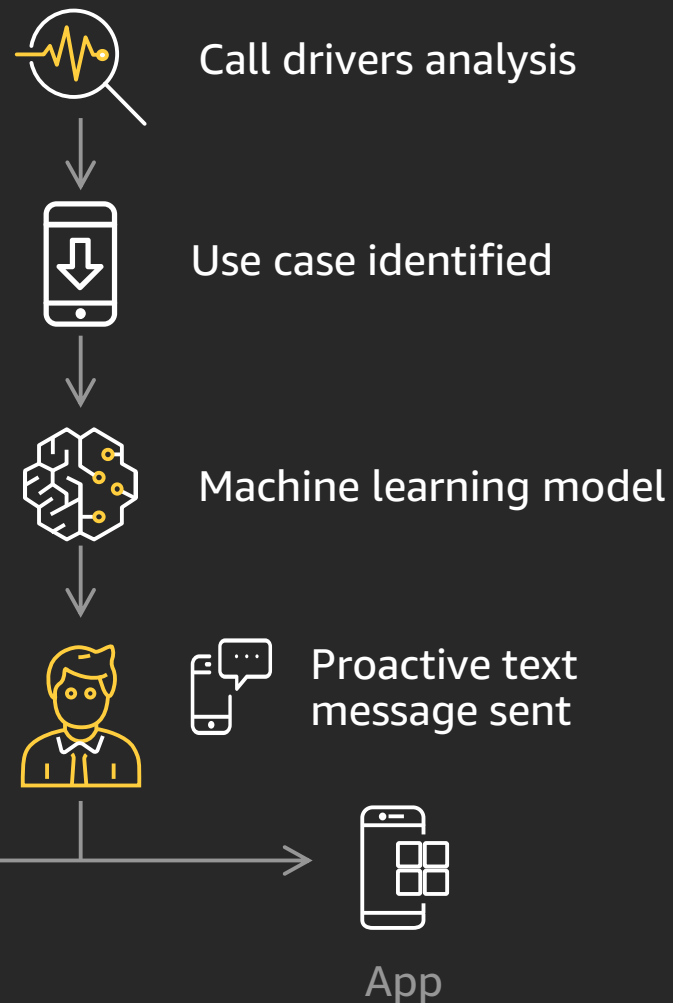Increased CSAT

Proactive campaigns
An SMS sent to targeted customers to steer them to digital channels

Proactive campaigns

Model example:
Usage charges

80k customers per day have a usage charge

Machine learning model predicts 800 customers per day likely to call **and** likely to be steered to digital

Call drivers analysis

Use case identified

Machine learning model

Proactive text message sent

Webchat ← → App

Results

16%
Average deflection

Annualized benefit

Increased CSAT

Payment reminder — An SMS sent to non-direct debit customers two days before their bill is due to prevent them incurring a late payment fee

Bill shock education — An SMS sent to customers with usage charges to educate them on other ways to contact VF, e.g., Webchat/App

Usage charges — Sent to customers with usage charges the day before their bill to inform them of the charges and steer them to Webchat

Post-upgrade queries inc. proration — Campaign sent to customers who have recently upgraded, steering them to Webchat for any queries

Accelerating the journey

Flexibility

Agility

Scalability

Please join us
for a meet and greet!

Telecom Lounge

MGM | Level 3 | Pre-Function Foyer

Q&A

Thank you!

AWS re:Invent

aws

Please complete the session survey in the mobile app.