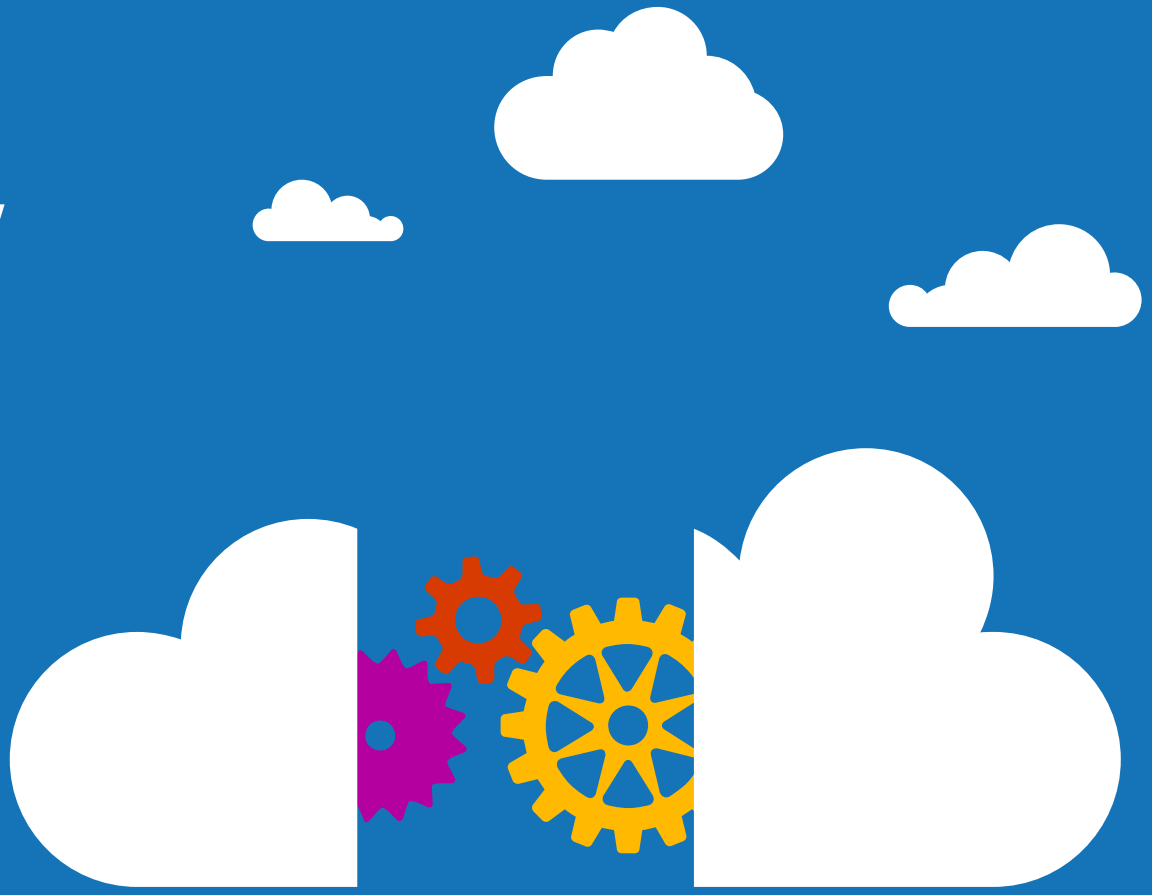
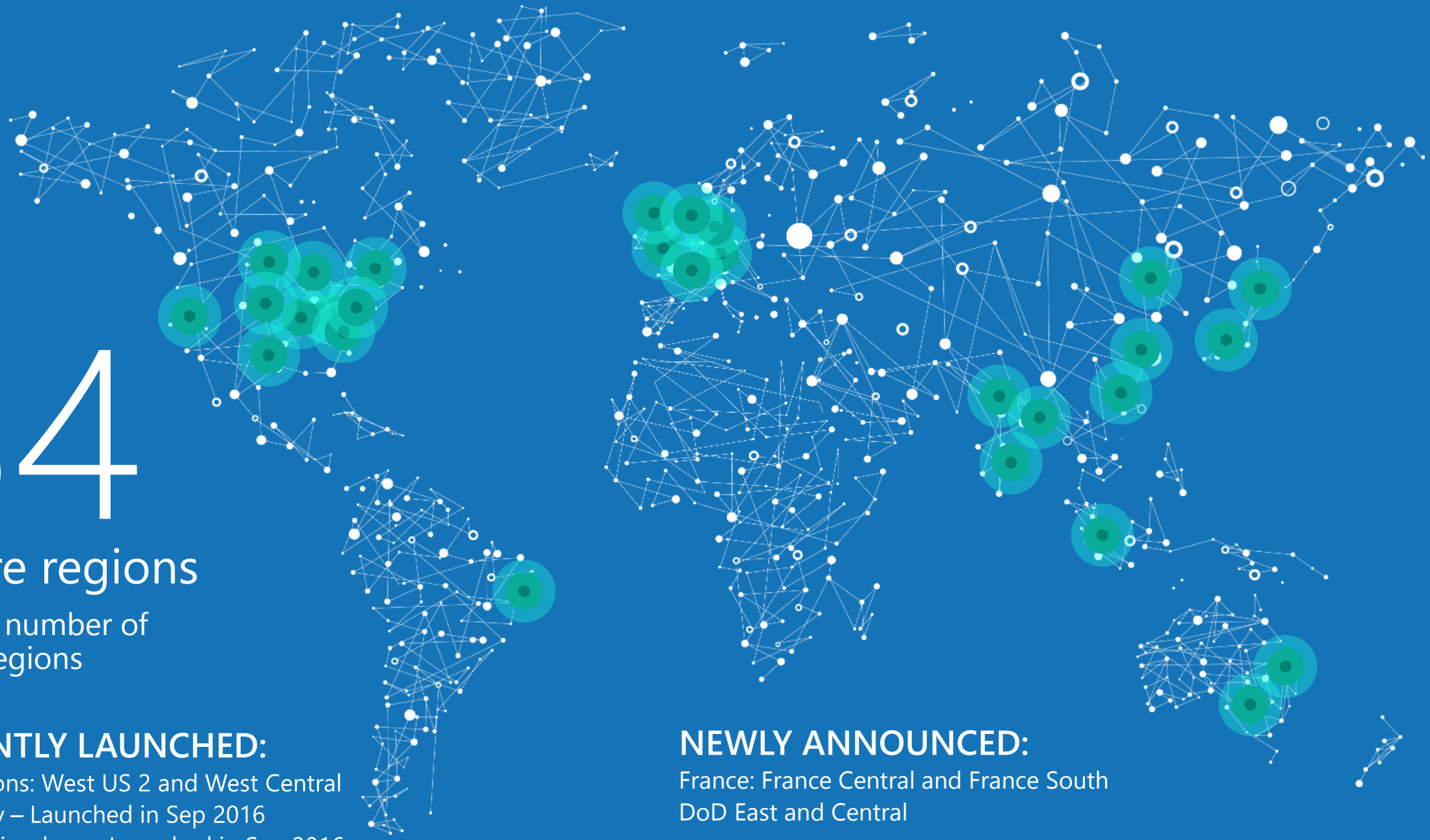
Microsoft Azure Technical Overview



Giulio Santoli
Cloud Solution Architect

Microsoft

Azure is Global



34

Azure regions

2X the number of
AWS regions

RECENTLY LAUNCHED:

US Regions: West US 2 and West Central
Germany – Launched in Sep 2016
United Kingdom – Launched in Sep 2016
Korea: Launched in Feb 2017

NEWLY ANNOUNCED:

France: France Central and France South
DoD East and Central

Azure as Innovation Enabler

Architectural Evolution

Spaghetti Architecture

Cut & Paste
(1990's)

Lasagna Architecture

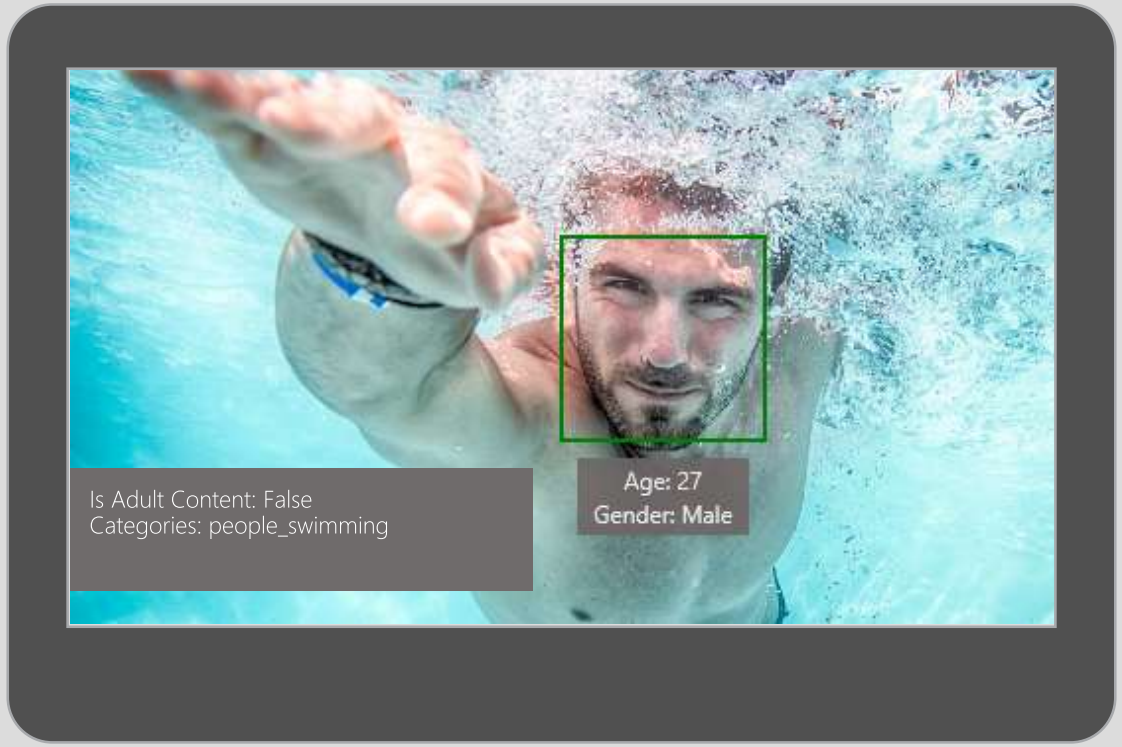
Layered Monolith
(2000's)

Ravioli Architecture

Microservices
(2010's)

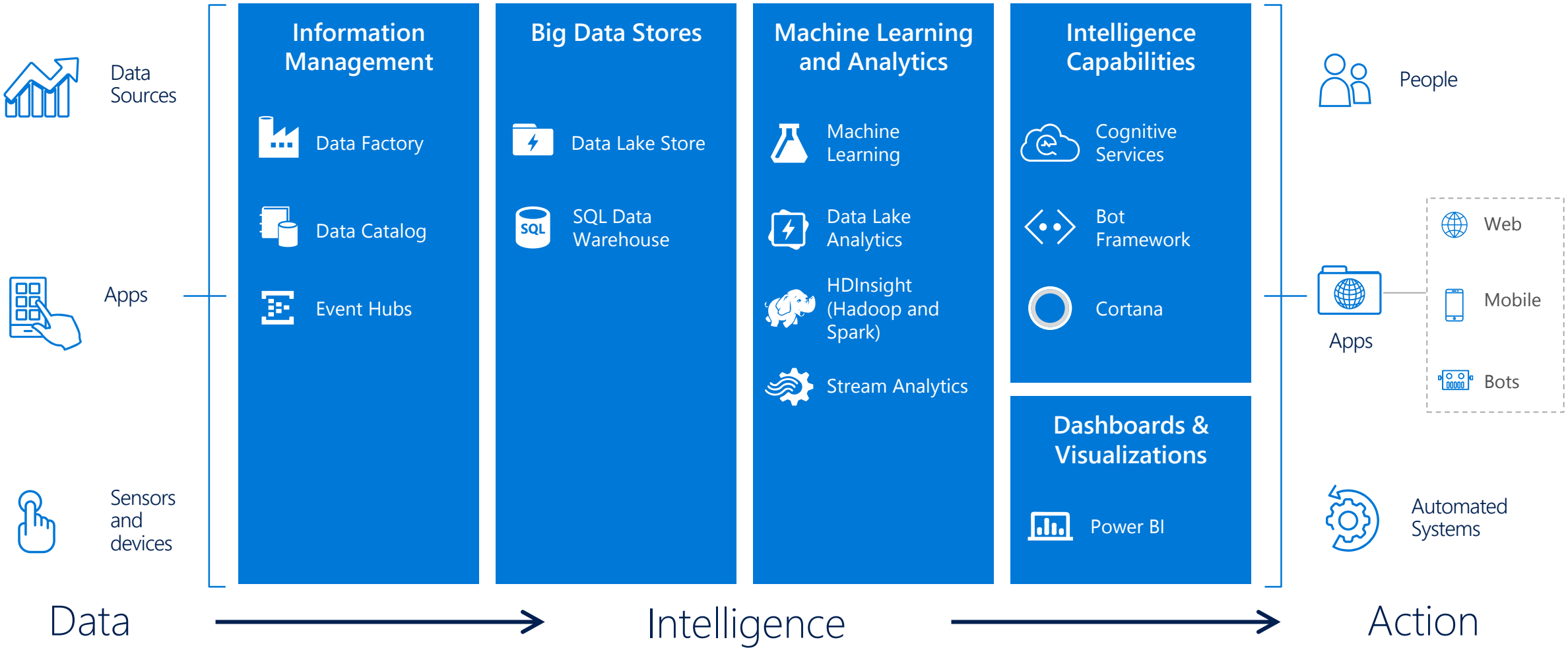
Learn and Engage

Cognitive services



Bot framework

Data Driven Innovation



Platform Services

http://aka.ms/azposterapp

Security & Management

- Service Creation & Configuration
- User/Group Directory Store
- Identity Sign-Up and sign-in
- Multi-Factor Authentication
- Scheduled Service Management
- Task Scheduler
- Encryption Key Store
- Software/Solution Marketplace
- Pre-Build VM Images

Services Compute

- Stateless Compute
- Distributed Compute
- Scheduled Compute Jobs
- Virtual App Streaming

Integration

- Simple Queuing
- B2B Integration
- Hybrid Connections
- Pub/Sub Queuing

Media & CDN

- Live & OD Media Streaming
- Content Delivery Network (CDN)

Web and Mobile

- Web Apps Infrastructure
- API App Infrastructure
- Mobile Backends
- Business Process Automation
- API Management
- Push Notifications

Developer Services

- Development Tools
- Software Development Kits
- Software Lifecycle Management
- Application Instrumentation

Data

- Relational SQL Database
- Data Warehouse
- Document Database Service
- Distributed In-Memory Cache
- Search
- Simple Key/Value Store

Analytics & IoT

- Big Data Analytics
- Predictive Analytics
- Data Stream Analytics
- Big Data Storage
- Data Pipelines
- Device Data Collection
- Data Source Management
- IoT Device Management
- Mobile Analytics

Hybrid Operations

- Directory Health Monitoring
- Privileged Identity Management
- Domain Join & Policy Management
- Server Data Backup
- Operational Analytics
- Bulk Data Import And Export
- Disaster Recovery
- Hybrid/Intelligent Data Backup

Infrastructure Services

OS/Server Compute

- Virtual Servers
- Containers

Storage

- Disk based Object/File Storage
- Shared Storage
- SSD based Object/File Storage

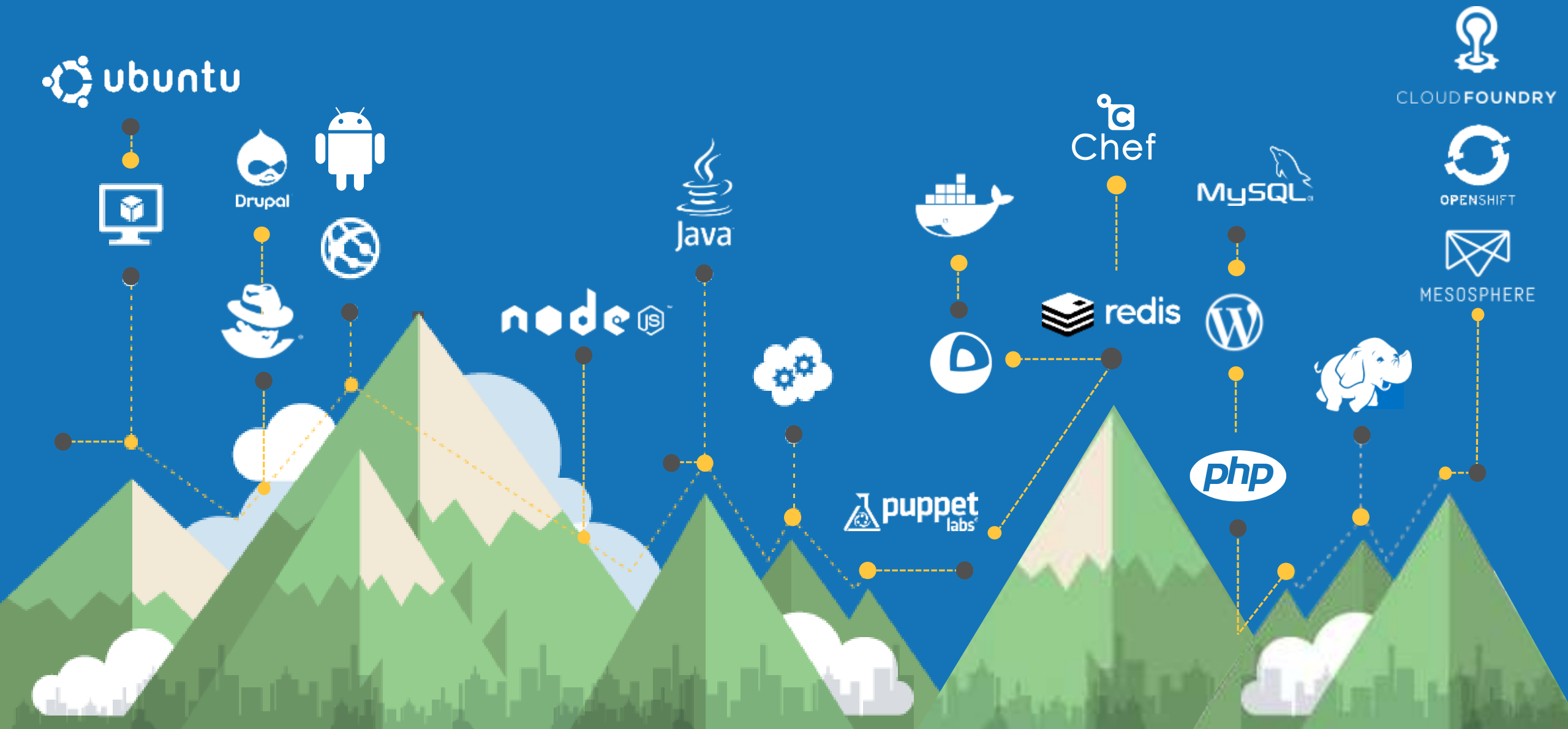
Networking

- Virtual Network
- VM Load Balancer
- DNS
- Direct Network Connections
- Traffic Distribution
- VPN Gateway
- HTTP Load Balancer

Datacenter Infrastructure (34 Regions, more than any other cloud provider)

Azure is Open

Microsoft Azure: an Open Ecosystem



Azure is Control

Overview

Log Search

My Dashboard

Solutions Gallery

2.7GB
Servers and Usage

AD Assessment

4
Servers Assessed

3
High Priority Recommendations

6
Low Priority Recommendations

72
Passed Checks

Malware Assessment

1
Servers with Active Threats

38
Servers with Inadequate Protection

Capacity Planning

23.6 %
Available Cores

62.3 %
Available Memory

42.5 %
Available Storage

Backup

ITPRodBackup

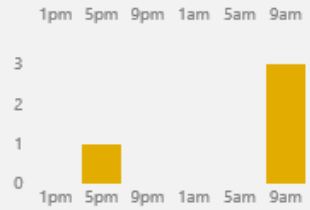
13
Servers backed up

3 TB
Backup data

Alert Management

0
Active critical alerts in the last 24 hours

4
Active warning alerts in the last 24 hours



Automation

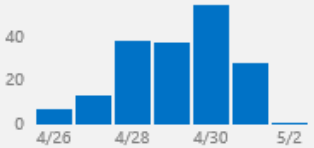
ITAutomation

9
Runbooks

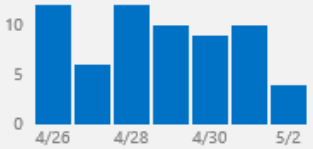
15
Jobs in the last 7 days

Change Tracking

20
Software changes in the last 24 hours



6
Windows service changes in the last 24 hours (excludes Status)

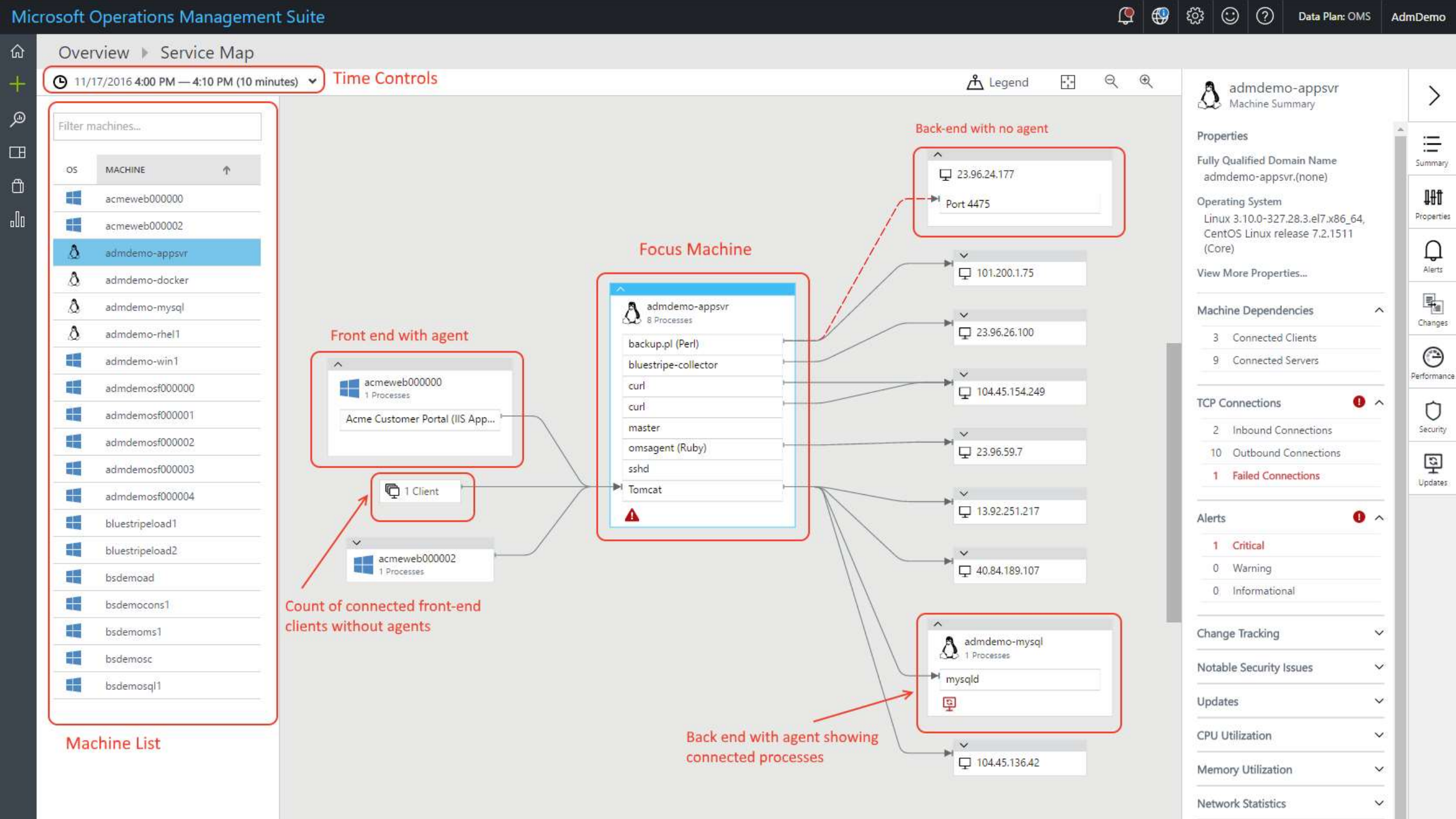


Security and Audit

95 ↘ 1
Active Computers in the last 24 hours

64 ↗ 1
Accounts Authenticated in the last 24 hours

Feedback


Microsoft Operations Management Suite
Data Plan: OMS
AdmDemo
Overview
Service Map
11/17/2016 4:00 PM — 4:10 PM (10 minutes)
Time Controls
Legend
Filter machines...
OS
MACHINE
acmeweb000000
acmeweb000002
admdemo-appsvr
admdemo-docker
admdemo-mysql
admdemo-rhel1
admdemo-win1
admdemosf000000
admdemosf000001
admdemosf000002
admdemosf000003
admdemosf000004
bluestripeload1
bluestripeload2
bsdemoad
bsdemocons1
bsdemoms1
bsdemosc
bsdemosql1
Machine List
Front end with agent
acmeweb000000
1 Processes
Acme Customer Portal (IIS App...
1 Client
acmeweb000002
1 Processes
Count of connected front-end clients without agents
Focus Machine
admdemo-appsvr
8 Processes
backup.pl (Perl)
bluestripe-collector
curl
curl
master
omsagent (Ruby)
sshd
Tomcat
Back-end with no agent
23.96.24.177
Port 4475
101.200.1.75
23.96.26.100
104.45.154.249
23.96.59.7
13.92.251.217
40.84.189.107
admdemo-mysql
1 Processes
mysqld
104.45.136.42
Back end with agent showing connected processes
admdemo-appsvr
Machine Summary
Properties
Fully Qualified Domain Name
admdemo-appsvr.(none)
Operating System
Linux 3.10.0-327.28.3.el7.x86_64, CentOS Linux release 7.2.1511 (Core)
View More Properties...
Machine Dependencies
3 Connected Clients
9 Connected Servers
TCP Connections
2 Inbound Connections
10 Outbound Connections
1 Failed Connections
Alerts
1 Critical
0 Warning
0 Informational
Change Tracking
Notable Security Issues
Updates
CPU Utilization
Memory Utilization
Network Statistics
Summary
Properties
Alerts
Changes
Performance
Security
Updates

Security Center

Filter

PREVENTION

Resources health

Virtual Machines
Networking
SQL
Applications

Recommendations

12 TOTAL

Security policy

QUICKSTART

HIGH SEVERITY 14
MEDIUM SEVERITY 26
LOW SEVERITY 2

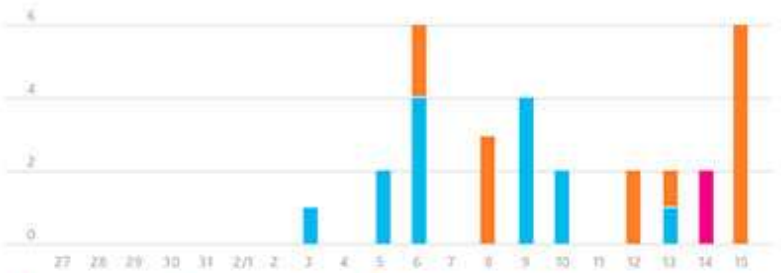
DETECTION

Security alerts

HIGH SEVERITY 2
MID SEVERITY 14
MID SEVERITY 14

Security alerts

Filter



HIGH SEVERITY 2
MEDIUM SEVERITY 14
LOW SEVERITY 14

ALERT	COUNT	DETECTED BY	DATE	STATE	SEVERITY
Suspicious process found	6	Microsoft	7/15	Open	
Traffic to malicious IP 90.150.112.27	1	Microsoft	7/14	Open	
Brute force attempts were detecte...	1	Microsoft	7/14	Open	
SQL injection attempt from 90.15...	1	Barracuda WAF	7/13	Open	
A user account password has been...	1	Microsoft	7/13	Open	
Critical malware action failed	1	Trend micro	7/12	Open	
Exploitable process detected (sql-s...	1	Microsoft	7/12	Open	
Non-critical malware action failed	1	Trend micro	7/10	Open	
Traffic to malicious IP 104.12.112.1...	1	Microsoft	7/10	Open	
SQL injection attempt from 103.33...	4	Microsoft	7/9	Open	
Traffic to malicious IP 121.14.112.3...	1	Microsoft	7/8	Open	
Brute force attempts were detect.e..	2	F5 Network	7/8	Open	
DDOS attack from 103.14.120.12.3...	2	Barracuda WAF	7/6	Open	
SQL injection attempt from 103.3...	4	Barracuda WAF	7/6	Open	
Non-critical malware action failed	2	Trend micro	7/5	Open	
Traffic to malicious IP 103.14.120.9...	1	Microsoft	7/3	Open	

Traffic to malicious IP 90.150.112.27

VIRTUAL MACHINE 1

Traffic to malicious IP 90.150.112.27 was detected originating from IP 138.91.9.51 (Virtual Machine 1). IP 90.150.112.27 is known to be part of the Simda botnet. Remediate by running an anti-virus scan and blacklisting IP 90.150.112.27 in the ACL

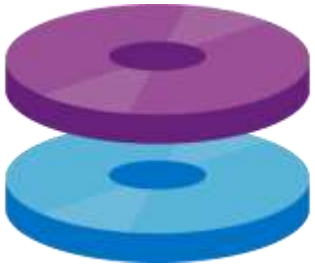
ALERT	Traffic to malicious IP 90.150.112.27
TIMESTAMP	Tuesday, July 14th, 2015 12:03:55 AM
COUNT	1
DETECTED BY	Microsoft
SEVERITY	High
ACTION TAKEN	Detected
ATTACKED RESOURCE	Virtual Machine 1
RESOURCE VIP	138.91.9.51
RESOURCE LOCATION	West US
ATTACKER IP	90.150.112.27
ATTACKER LOCATION	Russia

Threat map

Infrastructure as a Service

Compute

Storage



Network

Virtual Machine Sizes

Dev/Test and entry-level workloads

Earliest generation, HDD

100 ACU/core

Good combination of memory, SSD for most common production applications

Memory-intensive variants

210 ACU/core

Compute-intensive apps like Gaming, Analytics

More CPU to memory ratio

210 ACU/core

Large VMs for large databases requiring fast Storage

Intel Haswell processor with 0.5TB RAM

180 ACU/core

Cattle vs Pets

Virtual Machine

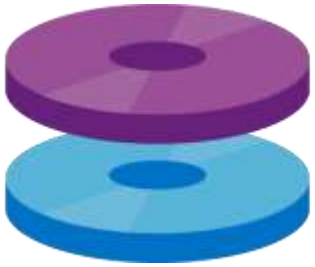
Single machine that must be individually managed.

Virtual Machine Scale Set

Identical machines to easier build large-scale services targeting big compute, big data, and containerized workloads..

Basic Storage Services

Managed Disk



Simplified disk (HDD or SDD) management for VMs.

Storage Account

Tables, Queues, Files, Blobs and Azure virtual machine disks.

Network Components

Virtual Network

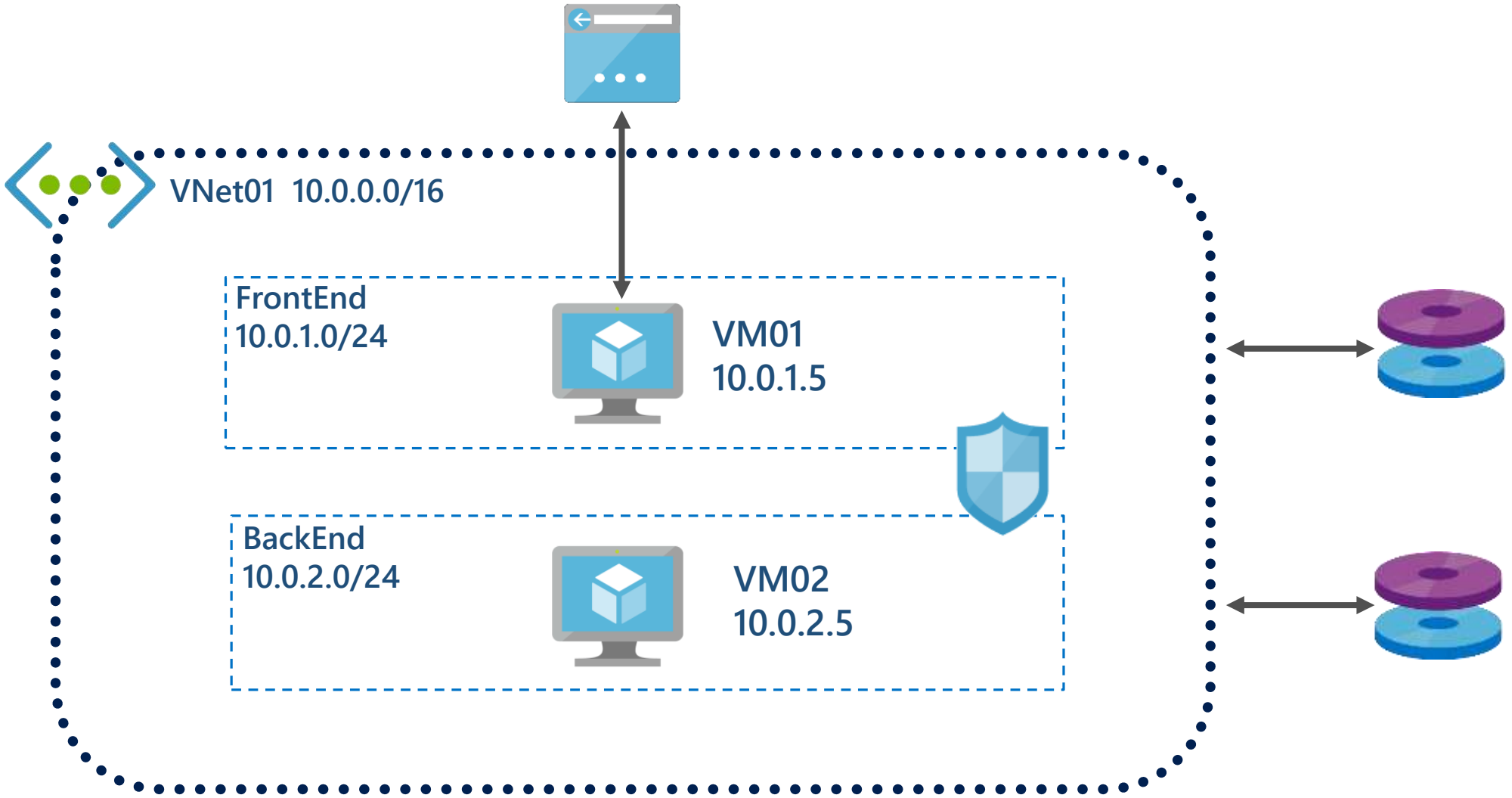
Network Card

Public IP

Network Security Group

Route Table

Example


VNet01 10.0.0.0/16
FrontEnd
10.0.1.0/24
VM01
10.0.1.5
BackEnd
10.0.2.0/24
VM02
10.0.2.5

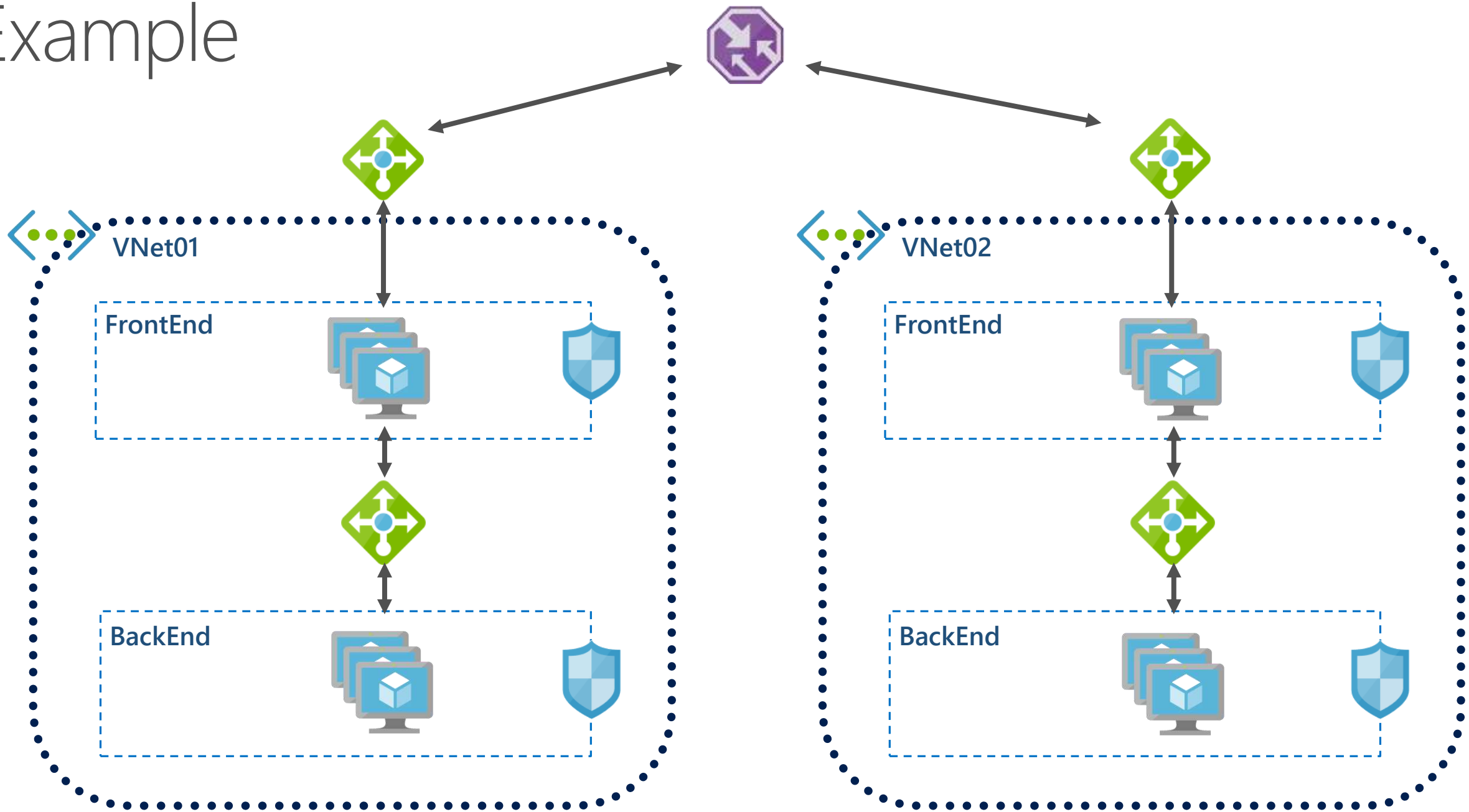
More Network Components

Traffic Manager

Application Gateway

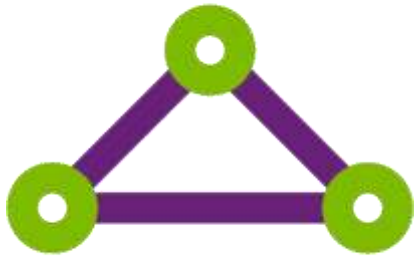
Load Balancer

Example

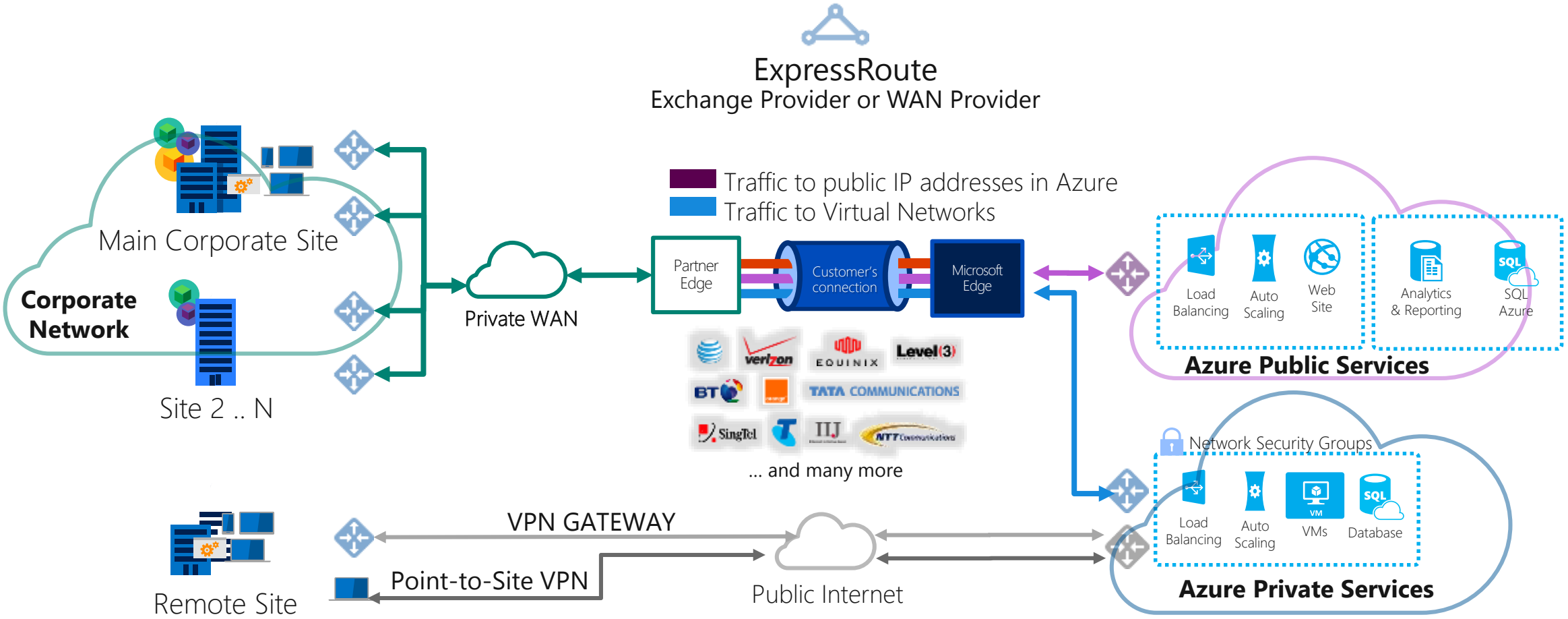


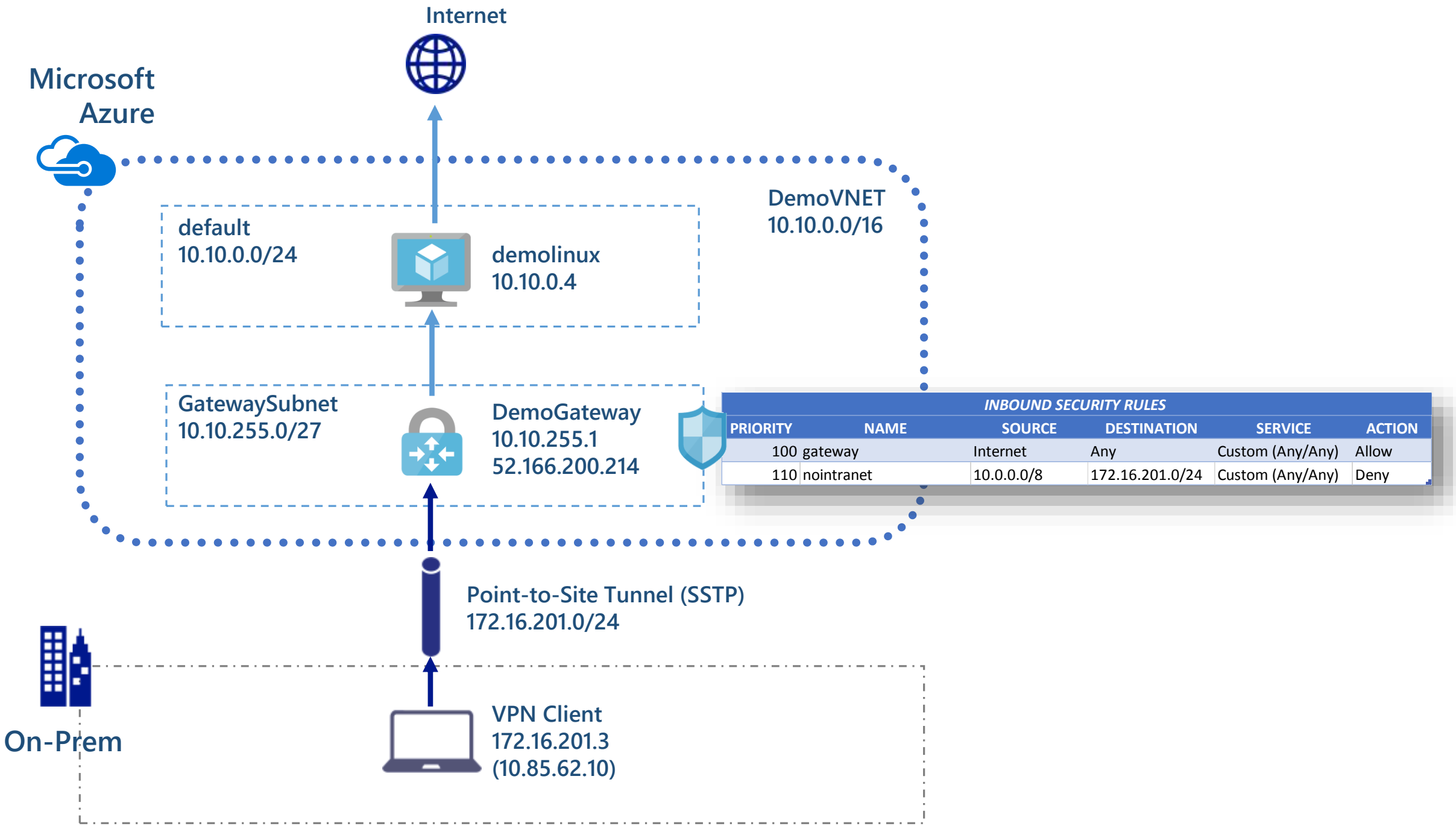
Hybrid Connections

ExpressRoute Site-to-Site Point-to-Site



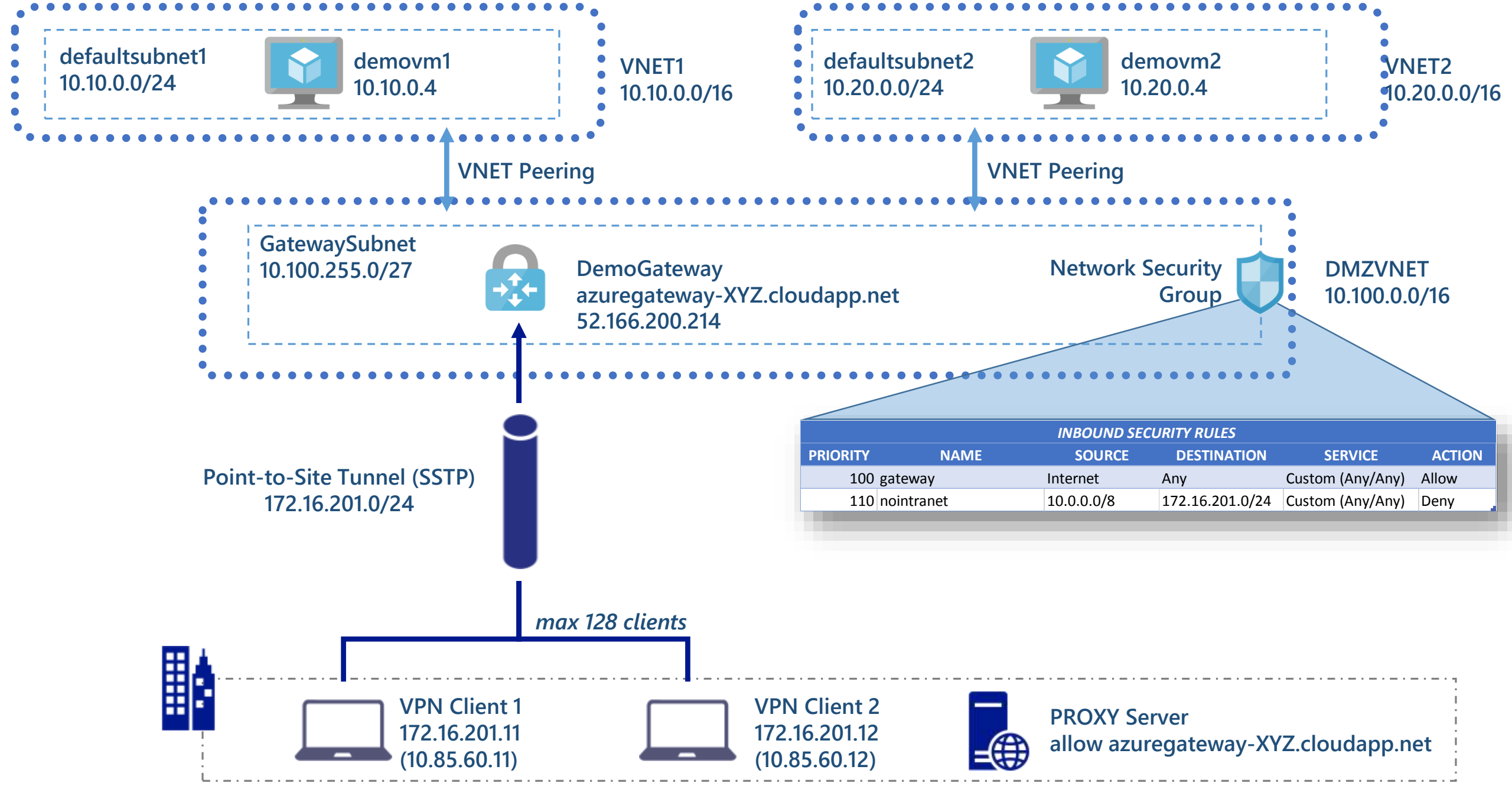
Big Picture


ExpressRoute
Exchange Provider or WAN Provider
Traffic to public IP addresses in Azure
Traffic to Virtual Networks
Main Corporate Site
Corporate Network
Site 2 .. N
Private WAN
Partner Edge
Customer's connection
Microsoft Edge
... and many more
Load Balancing
Auto Scaling
Web Site
Analytics & Reporting
SQL Azure
Azure Public Services
Network Security Groups
Load Balancing
Auto Scaling
VMs
Database
Azure Private Services
VPN GATEWAY
Point-to-Site VPN
Public Internet
Remote Site

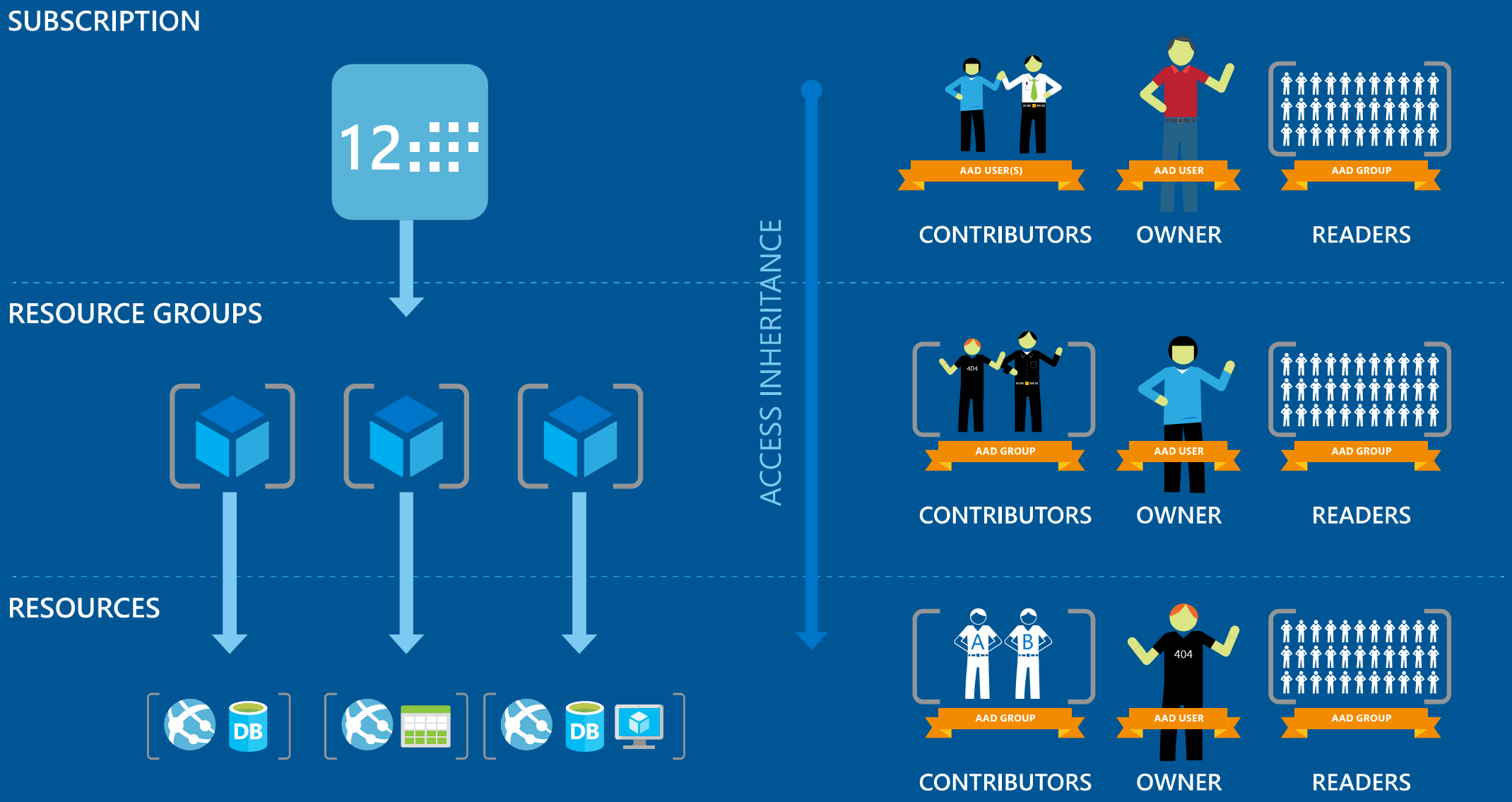


INBOUND SECURITY RULES

PRIORITY	NAME	SOURCE	DESTINATION	SERVICE	ACTION
100	gateway	Internet	Any	Custom (Any/Any)	Allow
110	nointranet	10.0.0.0/8	172.16.201.0/24	Custom (Any/Any)	Deny


defaultsubnet1
10.10.0.0/24
demovm1
10.10.0.4
VNET1
10.10.0.0/16
defaultsubnet2
10.20.0.0/24
demovm2
10.20.0.4
VNET2
10.20.0.0/16
VNET Peering
VNET Peering
GatewaySubnet
10.100.255.0/27
DemoGateway
azuregateway-XYZ.cloudapp.net
52.166.200.214
Network Security Group
DMZVNET
10.100.0.0/16
INBOUND SECURITY RULES
PRIORITY NAME SOURCE DESTINATION SERVICE ACTION
100 gateway Internet Any Custom (Any/Any) Allow
110 nointranet 10.0.0.0/8 172.16.201.0/24 Custom (Any/Any) Deny
Point-to-Site Tunnel (SSTP)
172.16.201.0/24
max 128 clients
VPN Client 1
172.16.201.11
(10.85.60.11)
VPN Client 2
172.16.201.12
(10.85.60.12)
PROXY Server
allow azuregateway-XYZ.cloudapp.net

Role Based Access Control (RBAC)



Platform as a Service

aPaaS

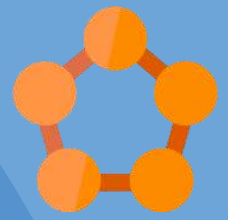
iPaaS

DBaaS

The **Continuum** from IaaS to PaaS

Cloud Foundry

Mesos



Service Fabric

Web App

Function App

VM Scale Set

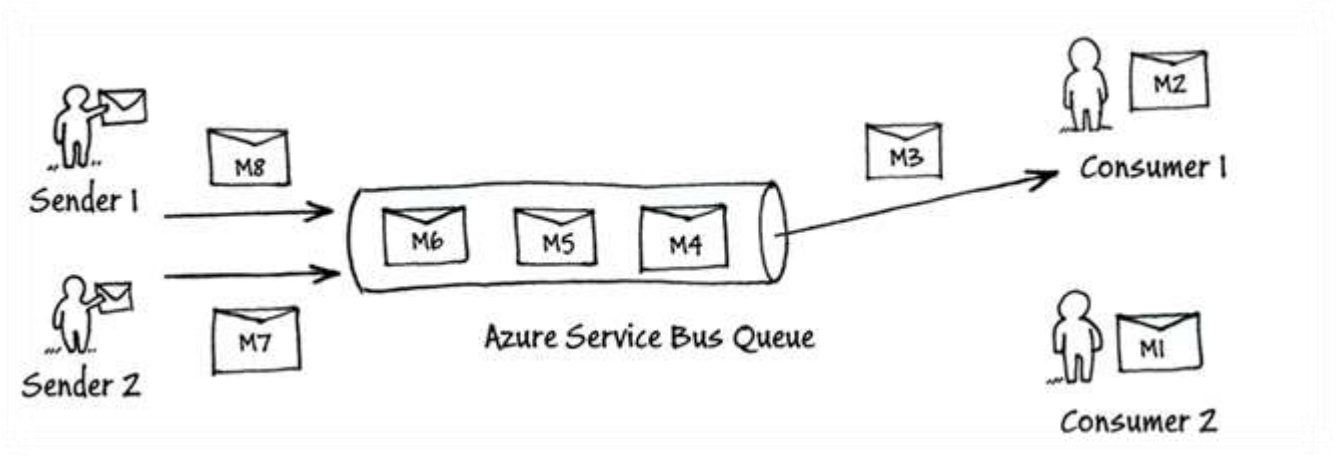
Docker Swarm

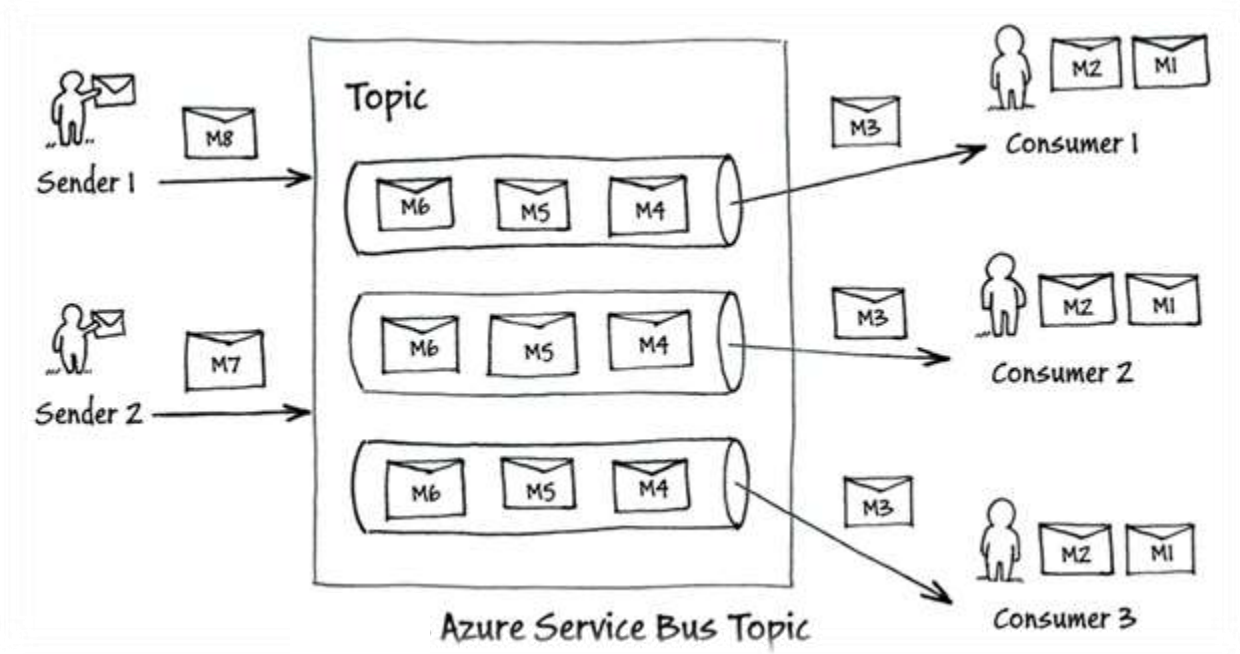
VM

Kubernetes

Microsoft

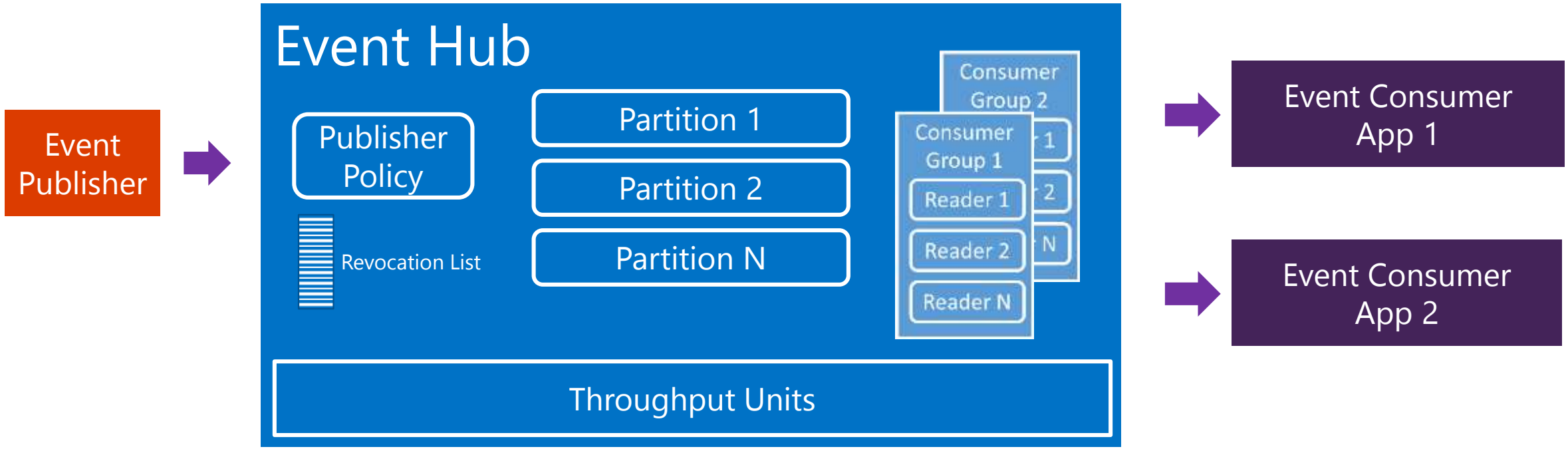
Azure Service Bus





Event Hub

- Event Ingestor – events only flow one way
- Partitioned consumer pattern
- Publish-subscribe via Consumer Groups



DBaaS

Azure SQL

Relational database service for mission-critical workloads.

Azure DocumentDB

NoSQL database service for fast, high availability, elastic scaling and global distribution.

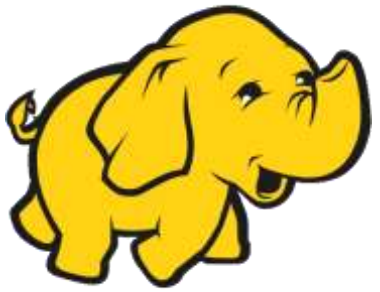
Azure SQL Data Warehouse

Massively parallel processing, scale-out, relational database for massive volumes of data.

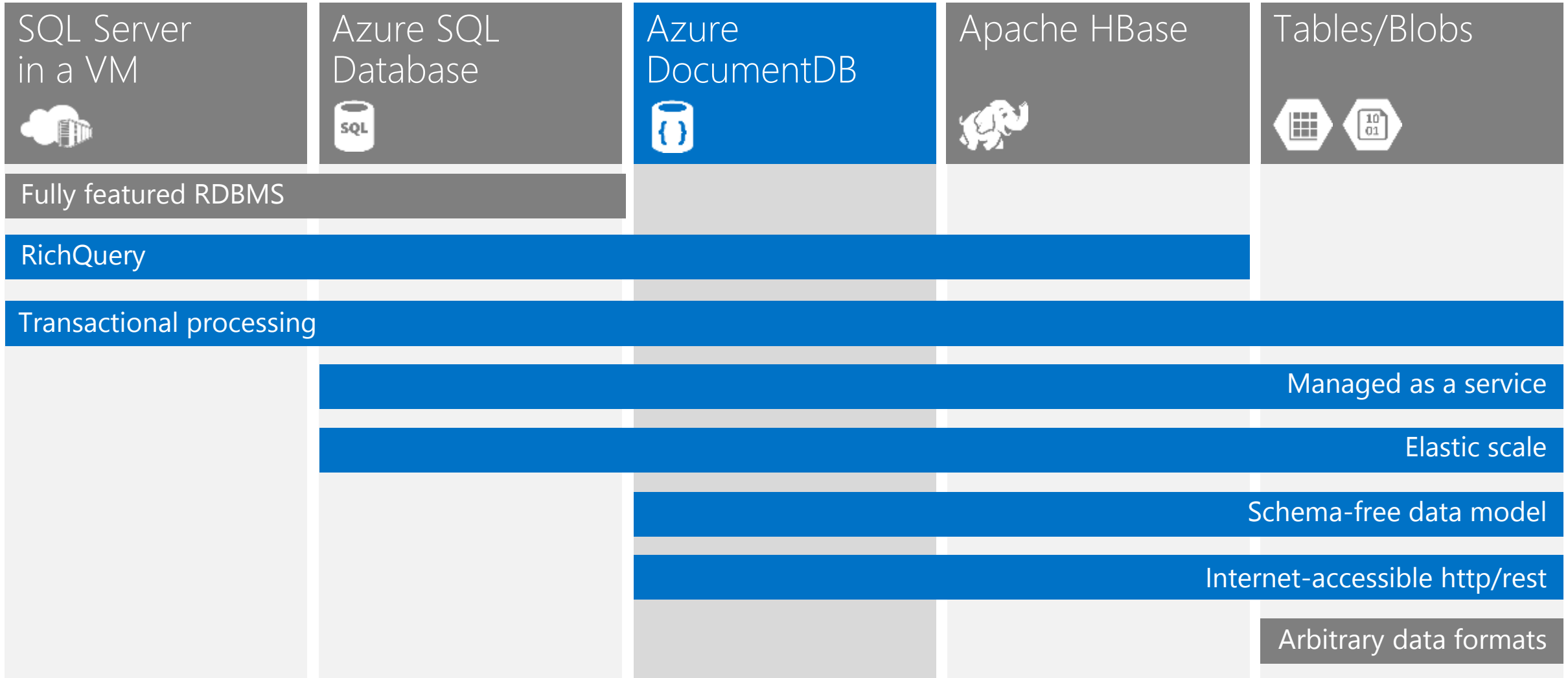
More DBaaS

Azure Redis Cache

HBase on HDInsight



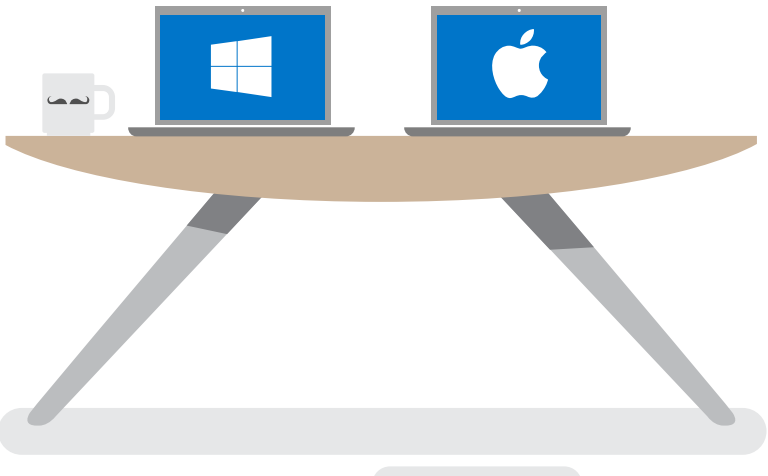
SQL and NoSQL: each has its place



Storage Comparison

With Azure, you have many managed data store options and you can use the right store for the job

When you need....	Because...	But not for...	Use ...
Relational store	Transactions, joins, structured data, familiar SQL query	Quickly changing data schemas	**SQL Database**
NoSQL key-value pair store	Low-cost, fast, massive scale	Rich query	**Tables**
NoSQL JSON document store	Flexible schema, familiar SQL query, low latency	Complex joins	**DocumentDB**
NoSQL wide-column store	Open-source, integration with Hadoop analytics	Operational simplicity	**HBase on HDInsight**
Cache	Increasing speed of an app	Primary data store	**Redis Cache**
Search service	Integrating search into an app	Primary data store	**Azure Search**



Container as a Service

PaaS too high

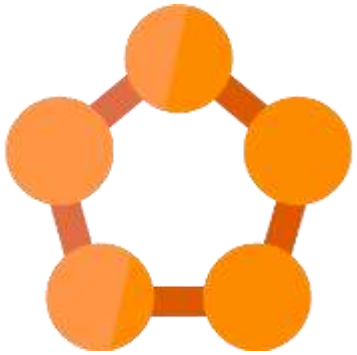
IaaS too low

CaaS just right

Goldilocks and the Three Bears by Jan Brett

Microsoft

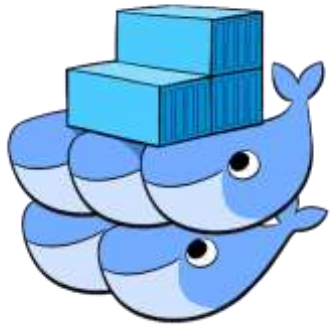
Containers Orchestration on Azure



Microsoft Service Fabric

Kubernetes (Open Shift)

Mesosphere DC/OS



Docker Swarm

Cloud Foundry (Pivotal & OSS)

Azure Container Services

ONE CLOUD TO RUN THEM ALL

Microsoft

More Docker Integration on Azure

Docker Engine
on Windows

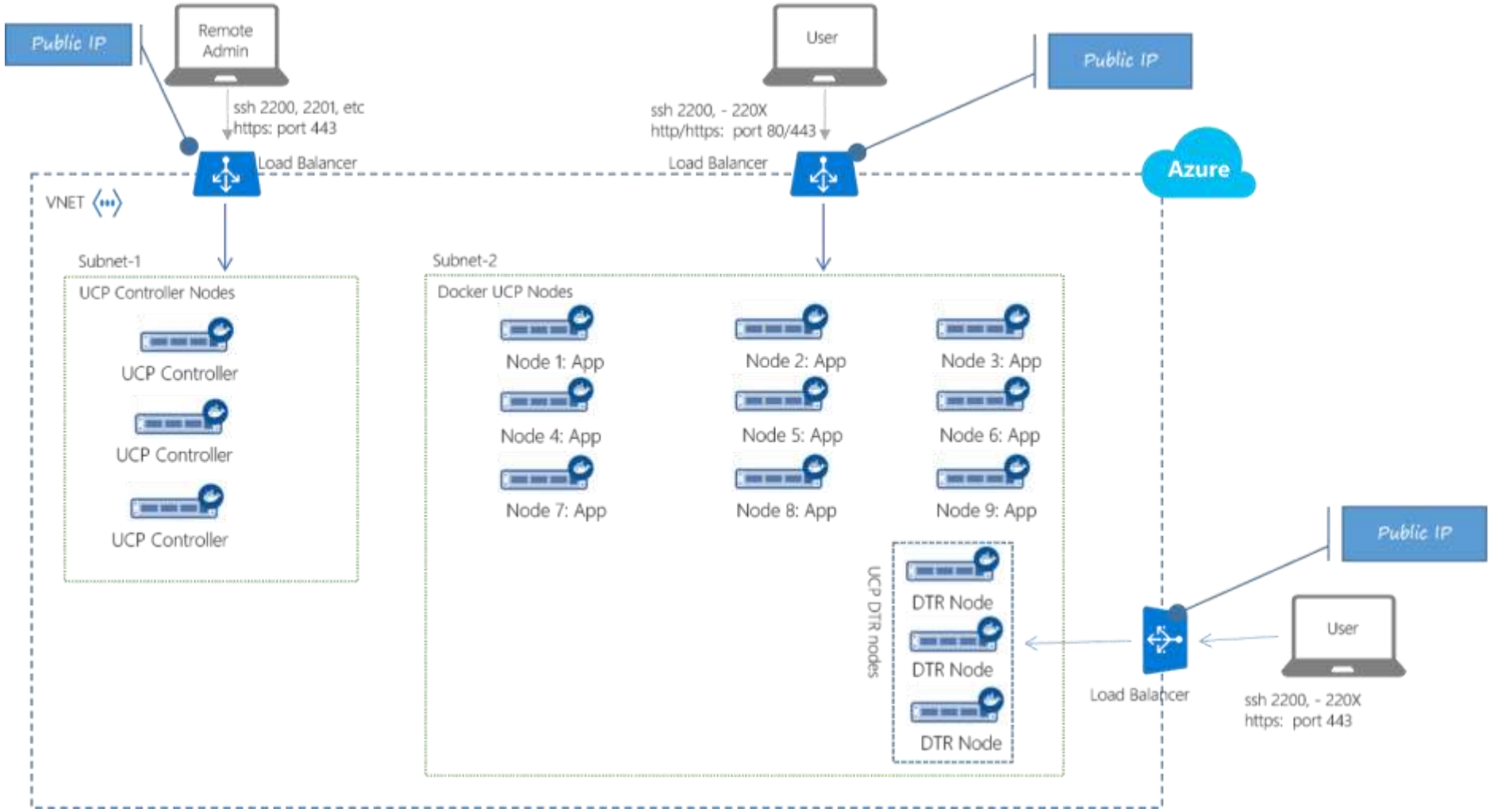
Docker
Machine

Docker
Registry

Docker
Datacenter

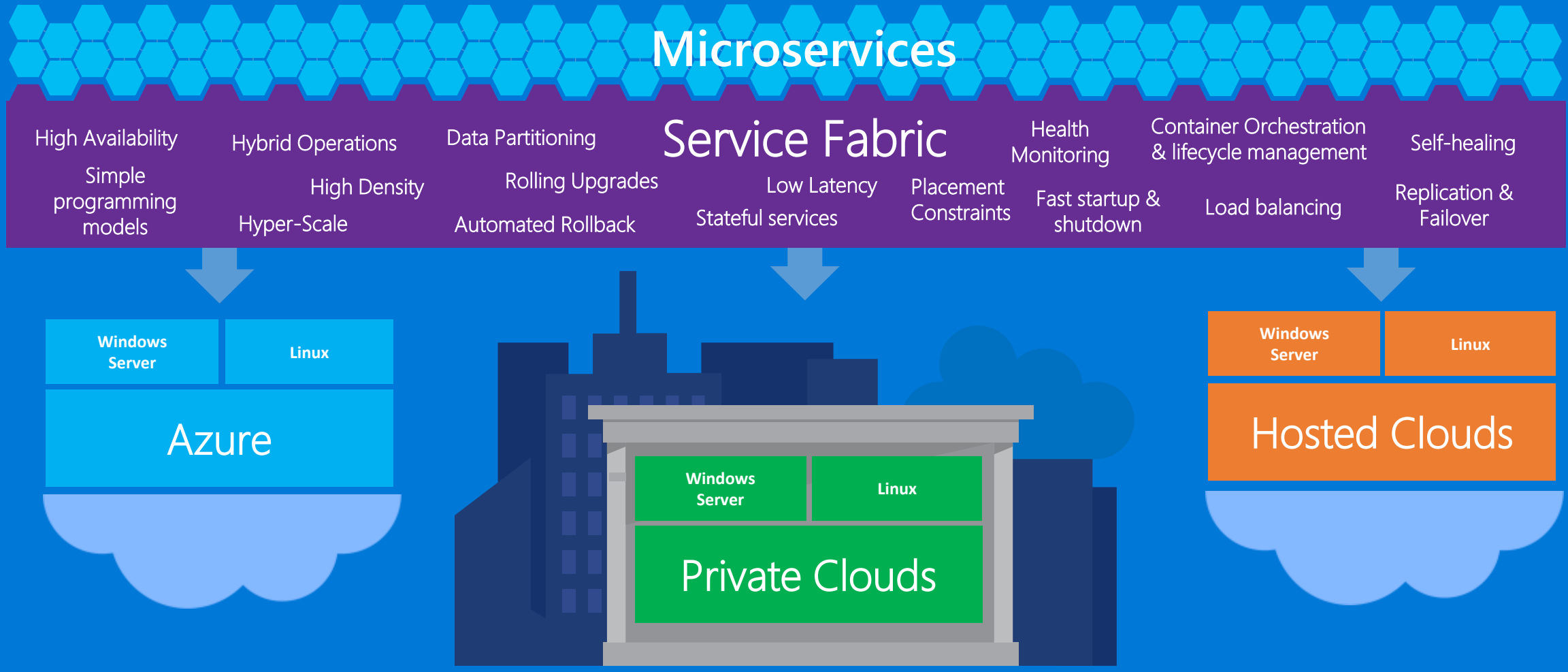
Docker Datacenter on Azure

Enterprise grade cluster management for Docker

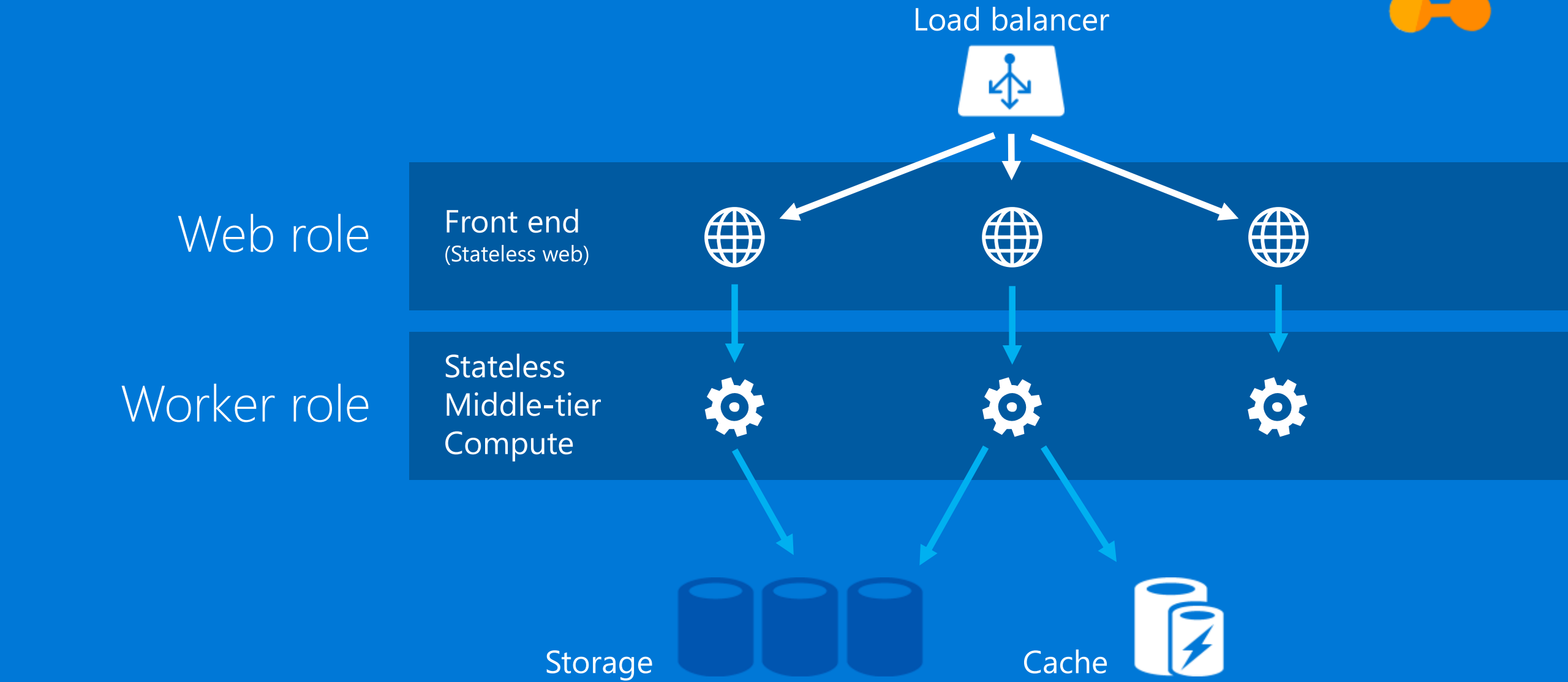


Microsoft Azure Service Fabric

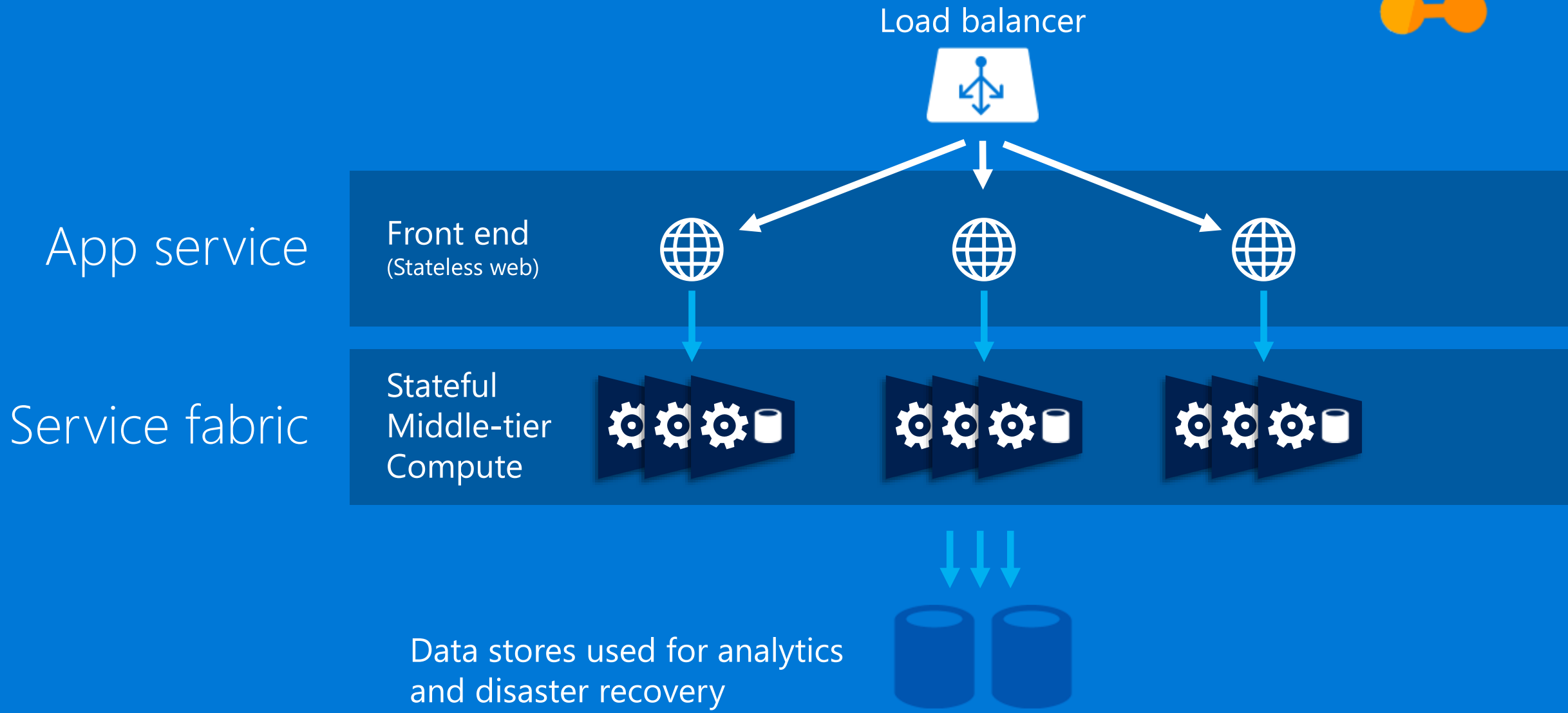
A platform for reliable, hyperscale, microservice-based applications



Stateless Application Architecture



Stateful Application Architecture



Rise of DevOps: “The Phoenix Project”

Gene Kim’s novel, The Phoenix Project, has become a de facto icon of the need for Enterprise DevOps.

The Three Ways

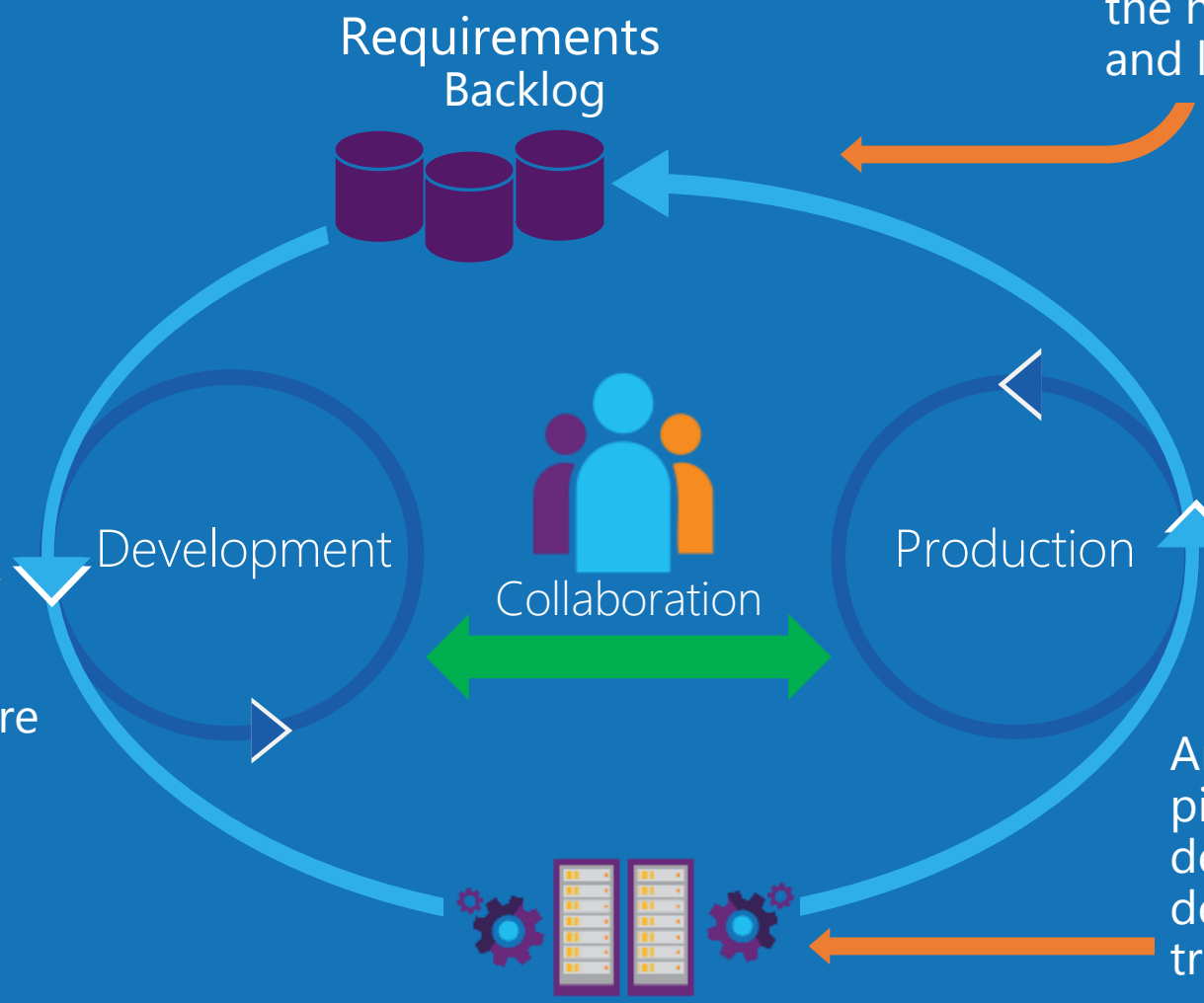
1. Maximize Flow
2. Amplify Feedback loops
3. Continual improvement

“Until code is in production, no value is actually being generated”

Gene Kim

Microsoft

DevOps lifecycle



Usage should determine the next set of priorities and learnings

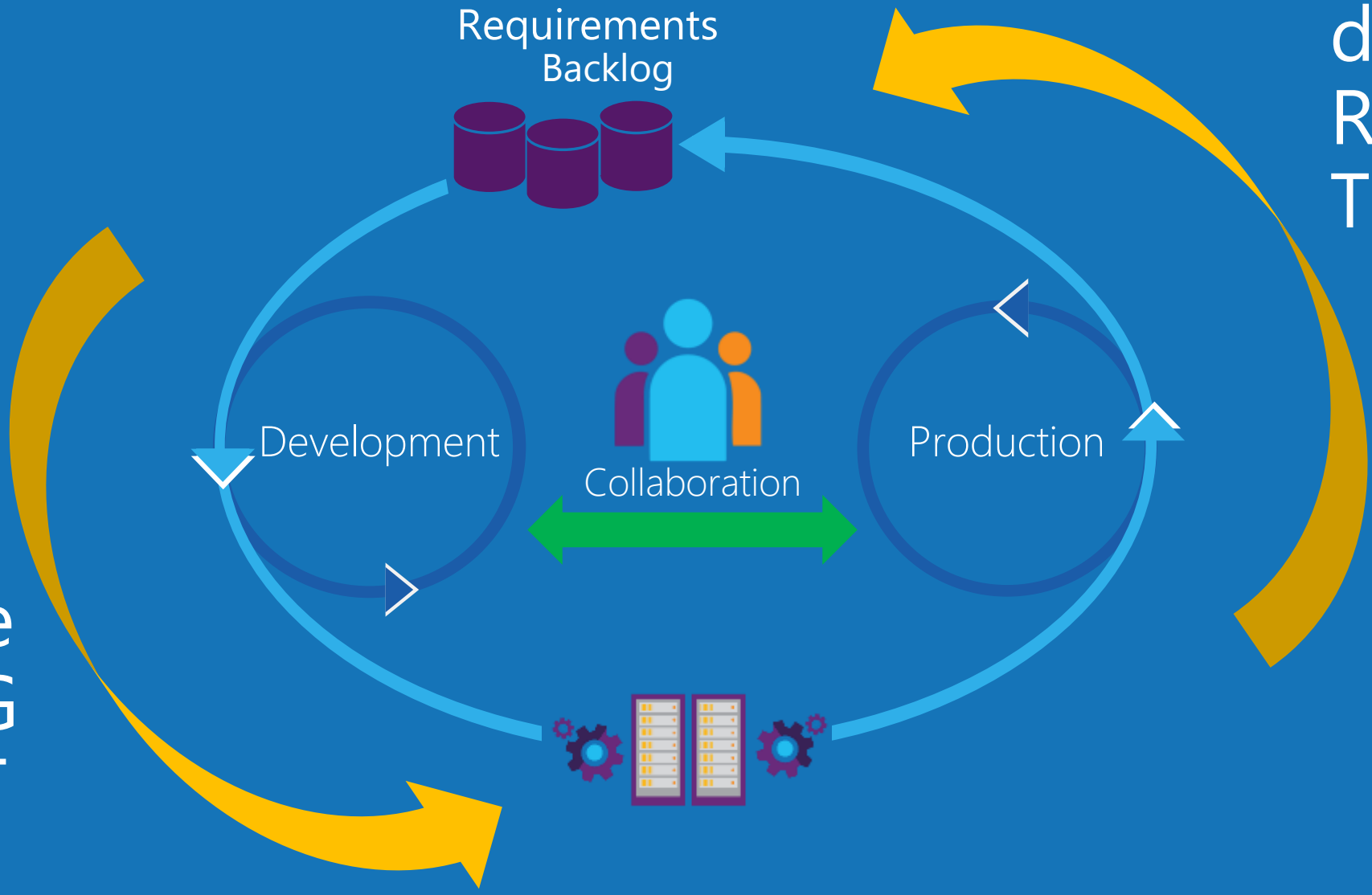
Availability and performance issues are hard to troubleshoot in this fast-changing world with distributed applications

The agile methodologies are accelerating the construction process

An automated release pipeline is needed to deliver at the pace of development with full traceability

Microsoft

DevOps lifecycle



do the RIGHT THING

do the THING RIGHT

Mixed Ecosystem

People | Process | Tools

01

Develop

Developer Workstation

Team Collaboration

GitHub

CodePlex

Workstations - On-Premises | Hybrid | Cloud

02

Build & Test

Build/CI

gradle

GRUNT

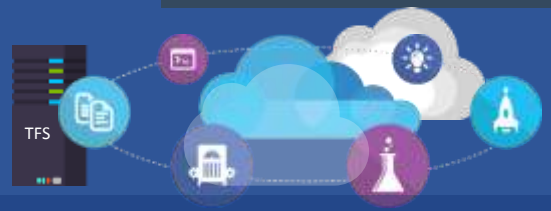
Jenkins

Hudson

Test

gradle

GRUNT



ALM Services - On-Premises | Hybrid | Cloud

03

Deploy

Configuration

puppet labs

CHEF

Release

gradle

GRUNT

Jenkins

Hudson

VAGRANT

Environments - On-Premises | Hybrid | Cloud

04

Monitor & Learn

Monitor

Nagios

ZABBIX

Monitoring - On-Premises | Hybrid | Cloud

This graphic shows OSS and partner products that are integrated with Microsoft products and tools

Microsoft Ecosystem

People | Process | Tools

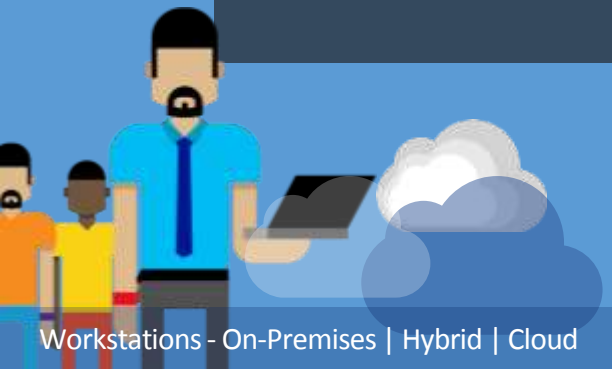
01

Develop

Developer Workstation

Team Collaboration

TFS / VSTS



Workstations - On-Premises | Hybrid | Cloud

02

Build & Test

Build/CI

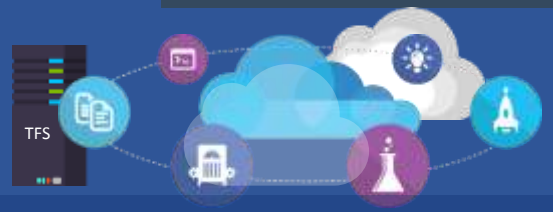
TFS / VSTS

Release Management for Visual Studio

Test

TFS / VSTS

Microsoft Test Manager



ALM Services - On-Premises | Hybrid | Cloud

03

Deploy

Release

Microsoft System Center

Release Management for Visual Studio

Automation Service

PowerShell | WAML

Azure Resource Management

xPlat Command Line

Environments - On-Premises | Hybrid | Cloud

04

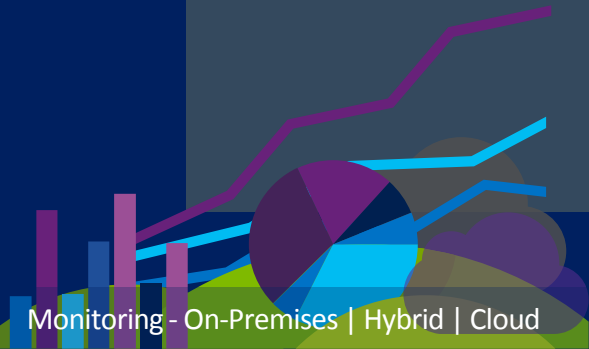
Monitor & Learn

Monitor

Microsoft System Center

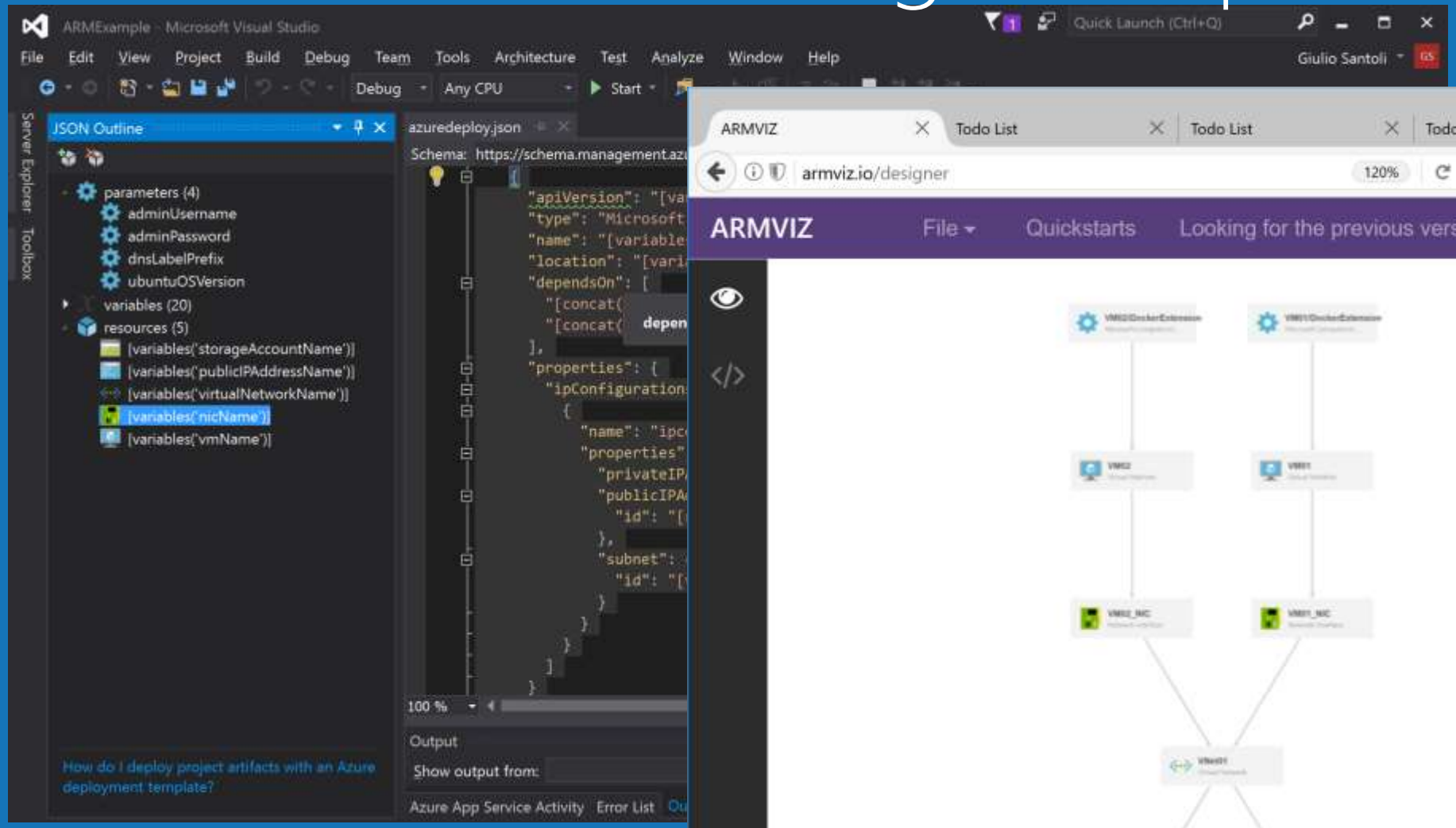
VSTS

Application Insights



Monitoring - On-Premises | Hybrid | Cloud

Azure Resource Manager Templates



Visual Studio

Web Editor

Desired State Configuration (PowerShell DSC)

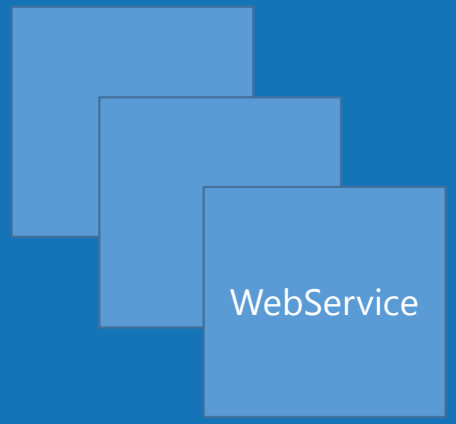
Configuration

```
Configuration SharePoint {

  Node WebService {

    #Install the IIS Role
    WindowsFeature IIS {
      Ensure = "Present"
      Name = "Web-Server"
    }

    #Install ASP.NET 4.5
    WindowsFeature ASP {
      Ensure = "Present"
      Name = "Web-Asp-Net45"
    }

  }
}
```

1…N of these

Compiled

Node Configurations
(.MOF config document)



1…N of these per configuration

(+ checksum files for each)

Applied To:

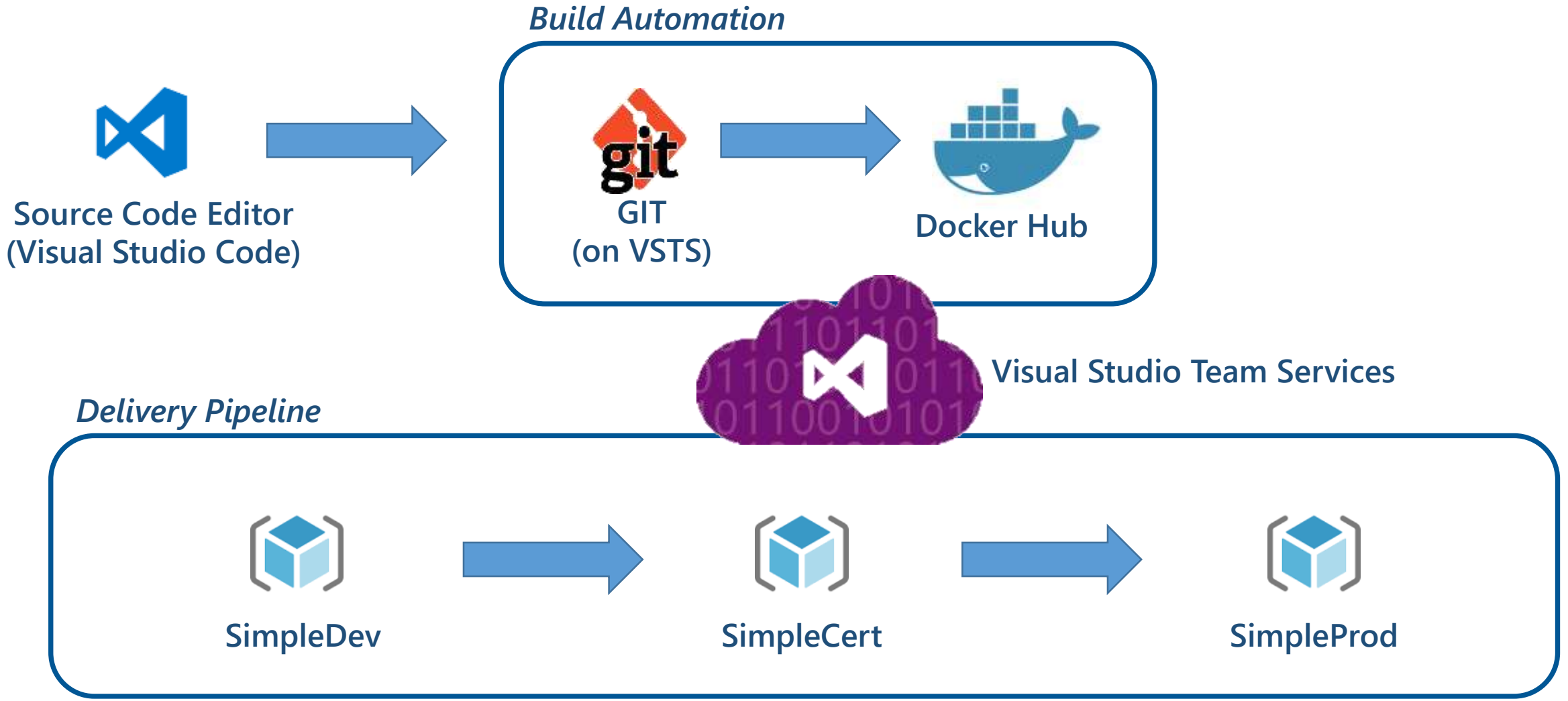
Via Push
or Pull

Nodes

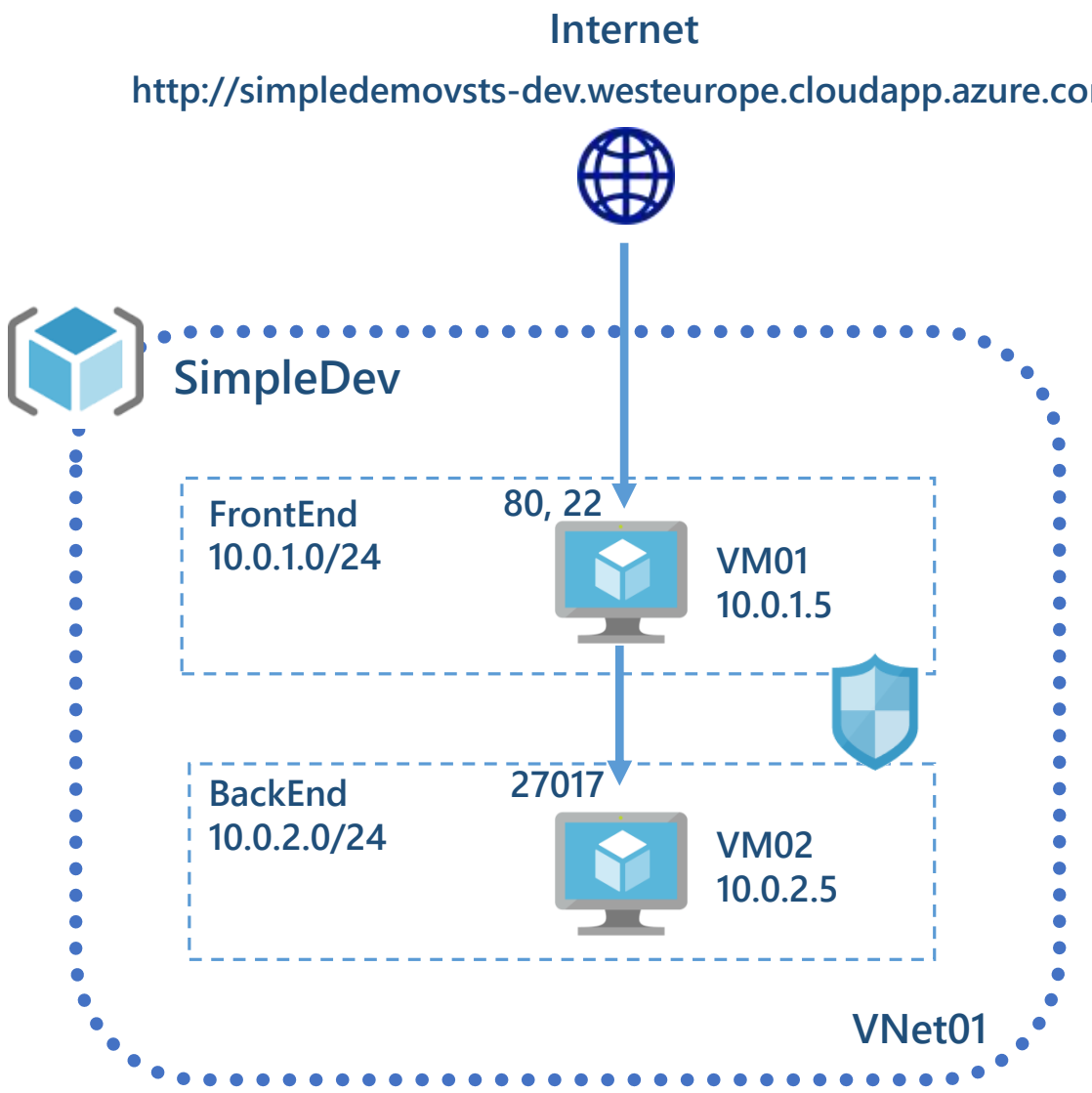
1…N of these per node configuration

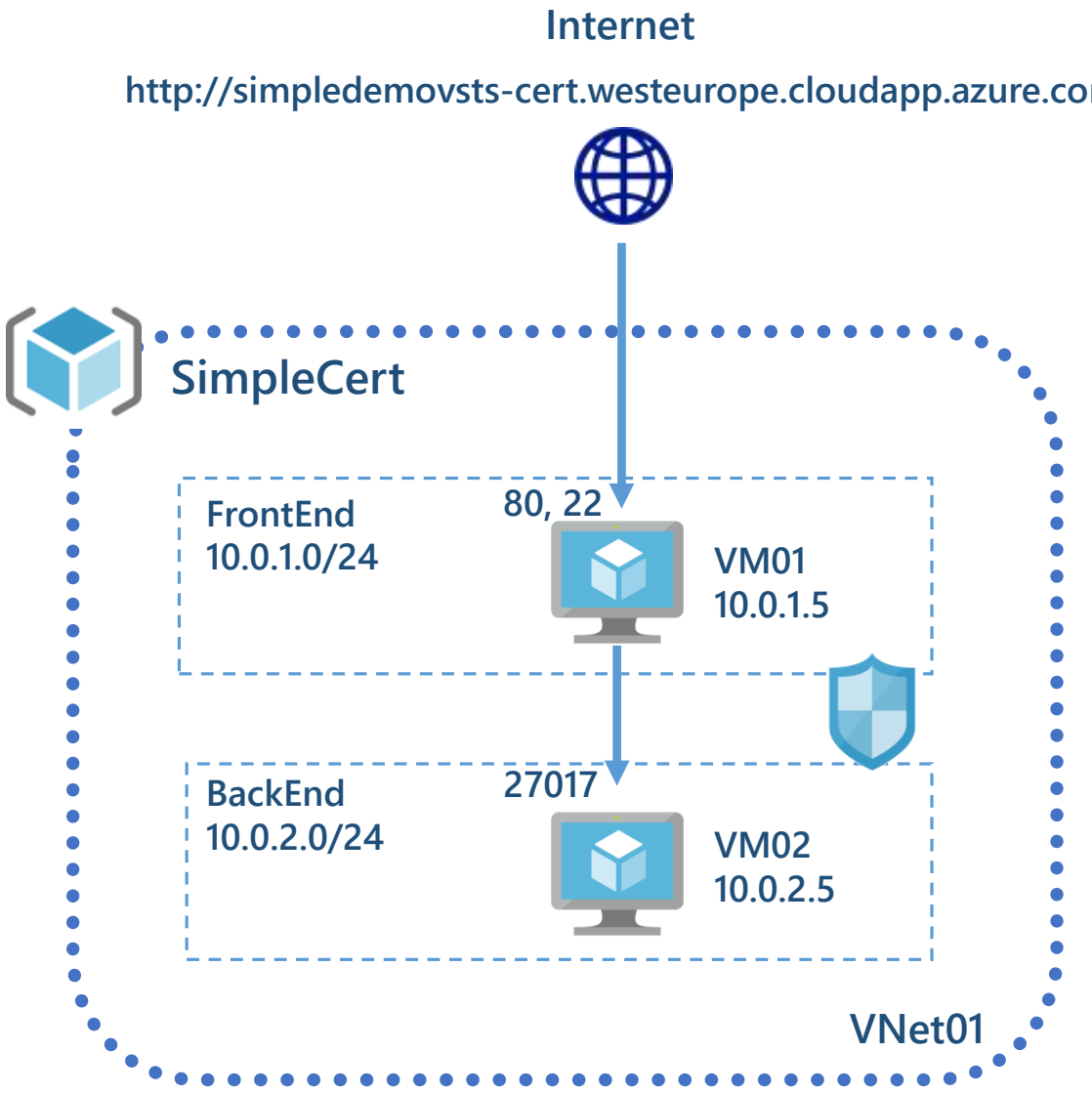
Microsoft

Demo Overview

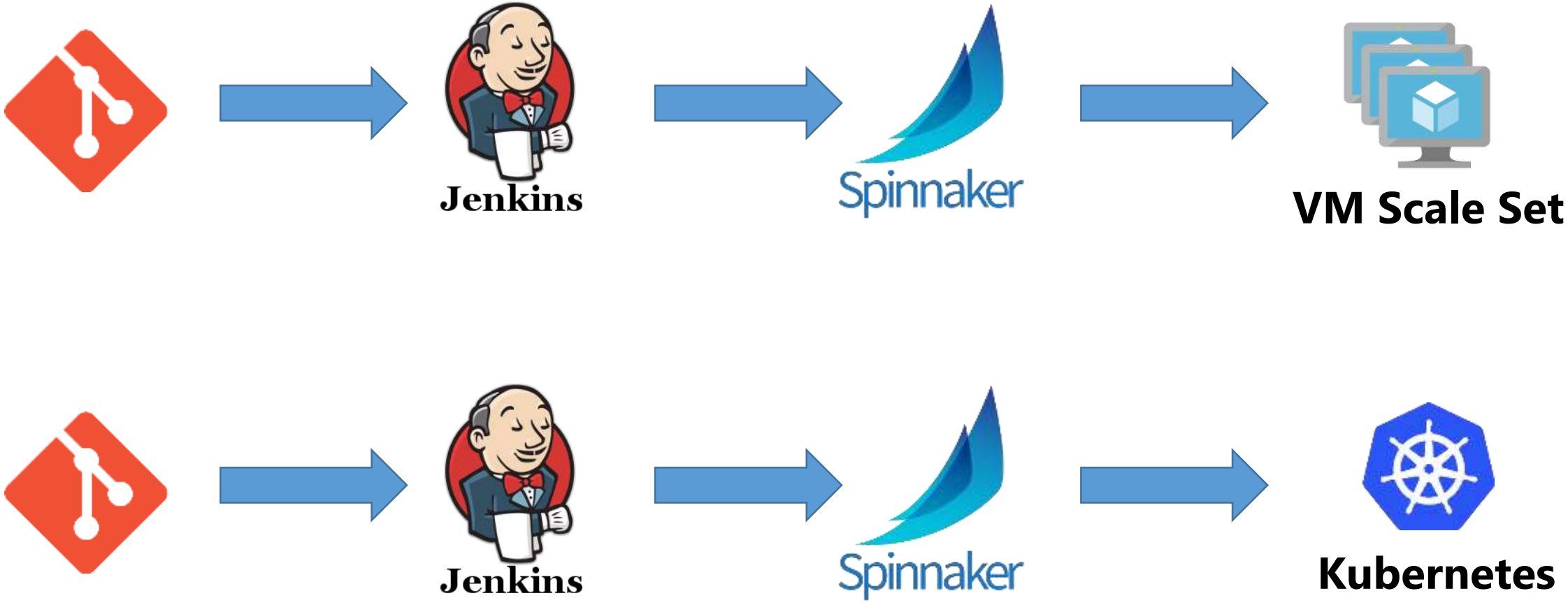


Demo Resource Groups





Delivery Pipeline with Spinnaker



https://github.com/Azure/azure-quickstart-templates/tree/master/spinnaker-vm-simple

“If you can’t measure it, you can’t improve it.”

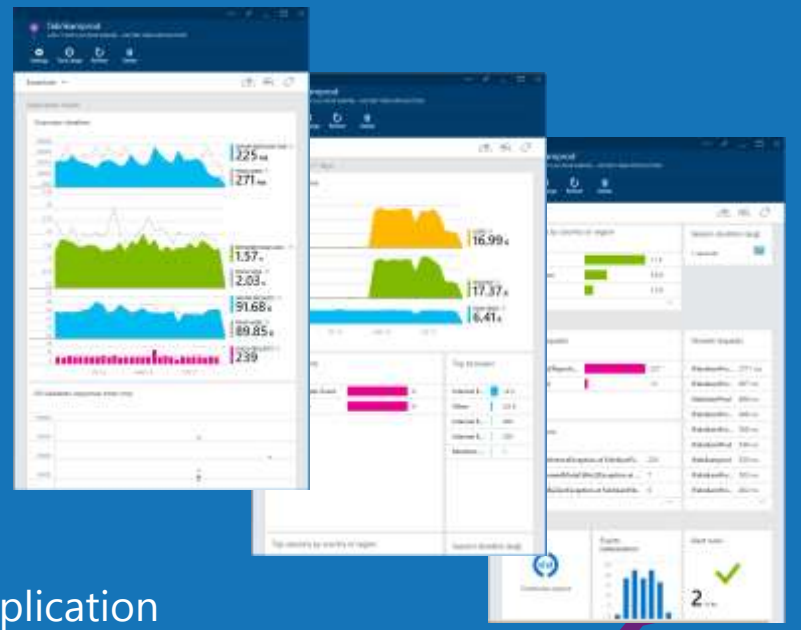
Lord Kelvin

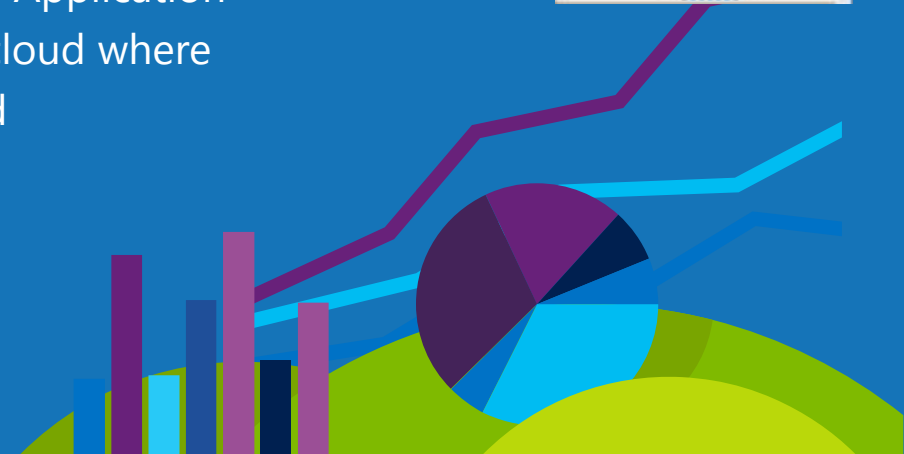
What is Application Insights?

1 Telemetry is collected at each tier: mobile applications, server applications and browser

2 Telemetry arrives in the Application Insights service in the cloud where it is processed & stored

3 Get a 360° view of the application including availability, performance and usage patterns





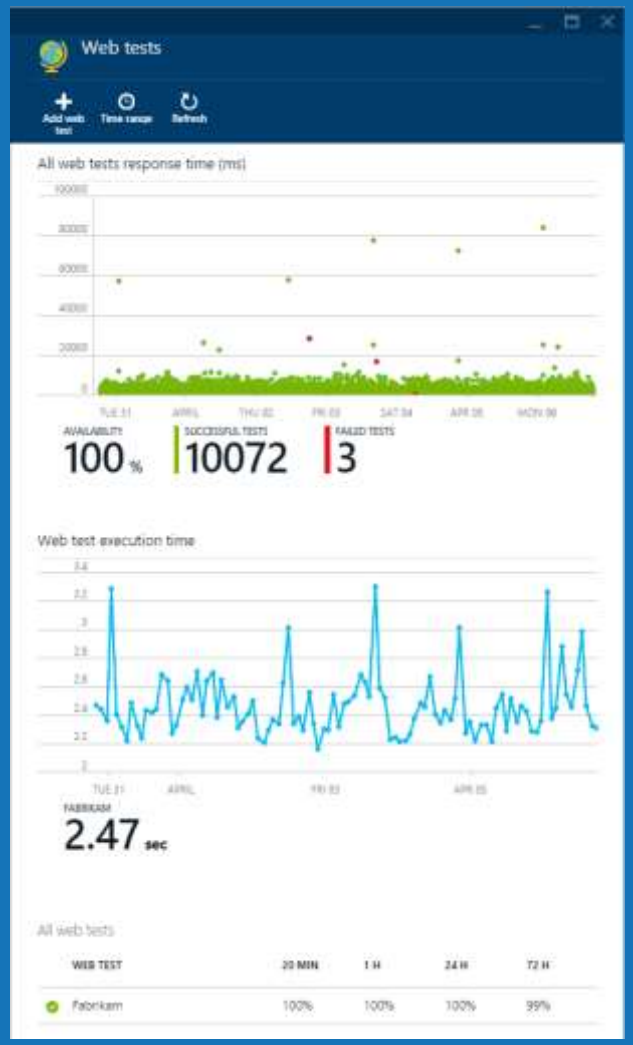
Identify & Triage issues. Availablity

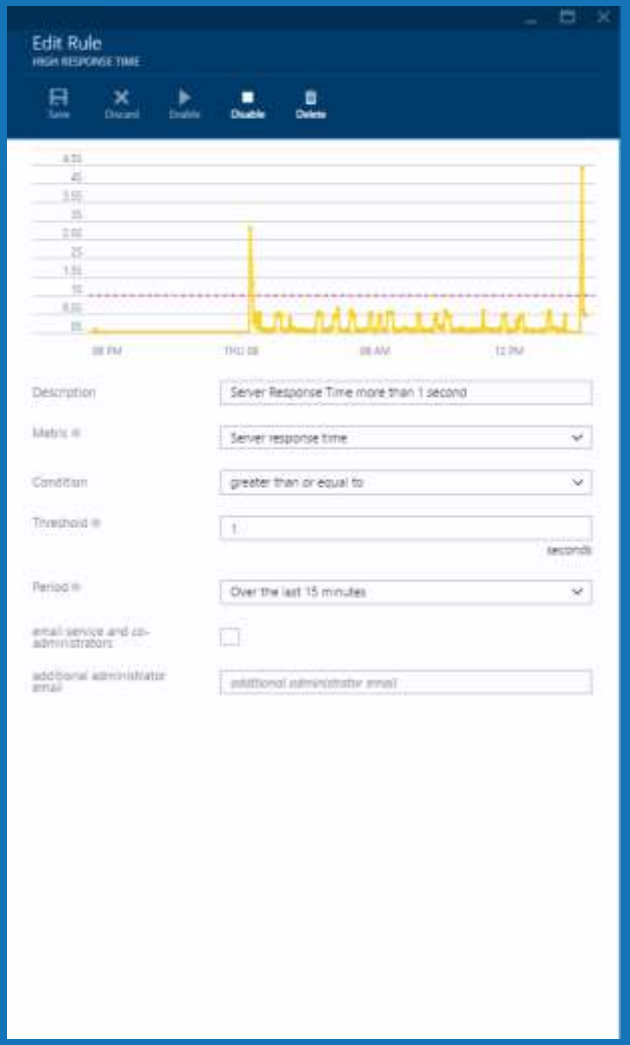
Challenges

- Visibility to application health?
- Visibility to application outages to minimize customer impact?
- Hard to get information to determine impact of issue?

Solutions

- Reduce ‘Mean Time to Detect’
- Ensure service availability with 16 global points of presence
- URL ping tests and rich multi-step web tests
- Threshold based alerts on metrics and perf. counters
- Real time alerts via email





Microsoft

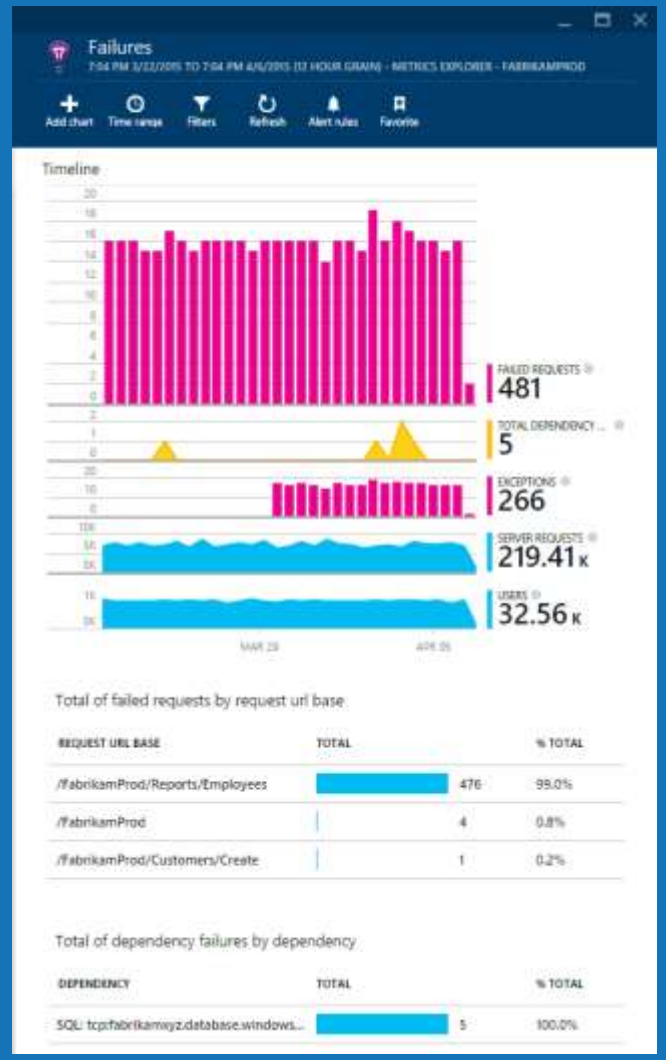
Diagnose & Solve problems: Performance

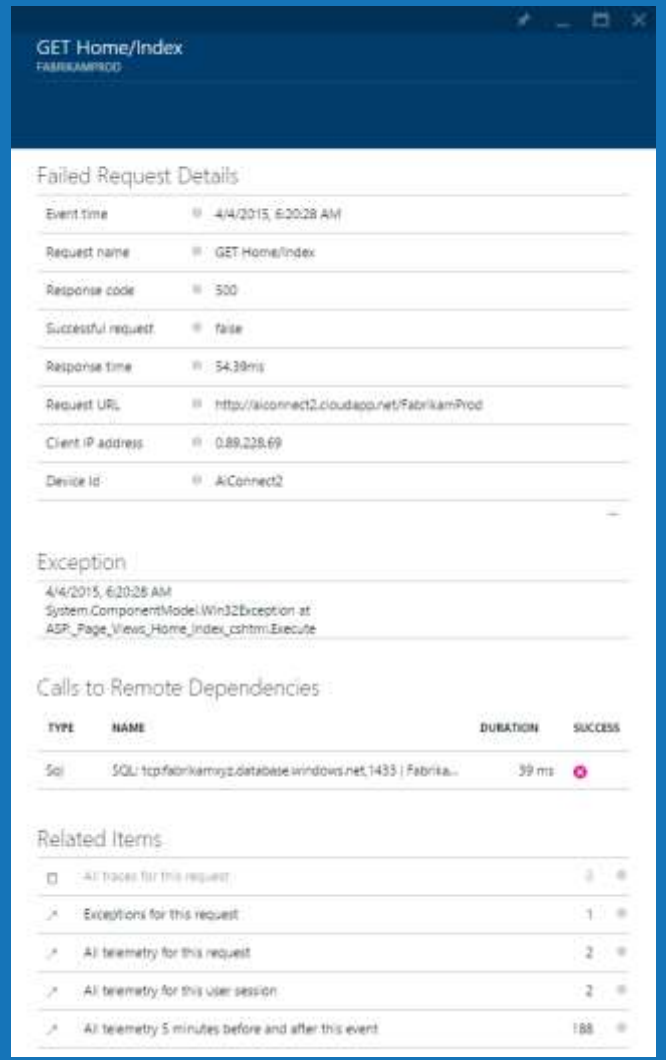
Challenges

- Uncover root cause of issues in production?
- Quickly resolve app crashes?
- Monitor app responsiveness?

Solutions

- Reduce ‘Mean Time to Resolve’
- Identify issues with request rate & dependency response times
- Multi-dimensional analyses over custom & default metrics
- Drill through exceptions & failed requests with traces and runtime telemetry





Microsoft

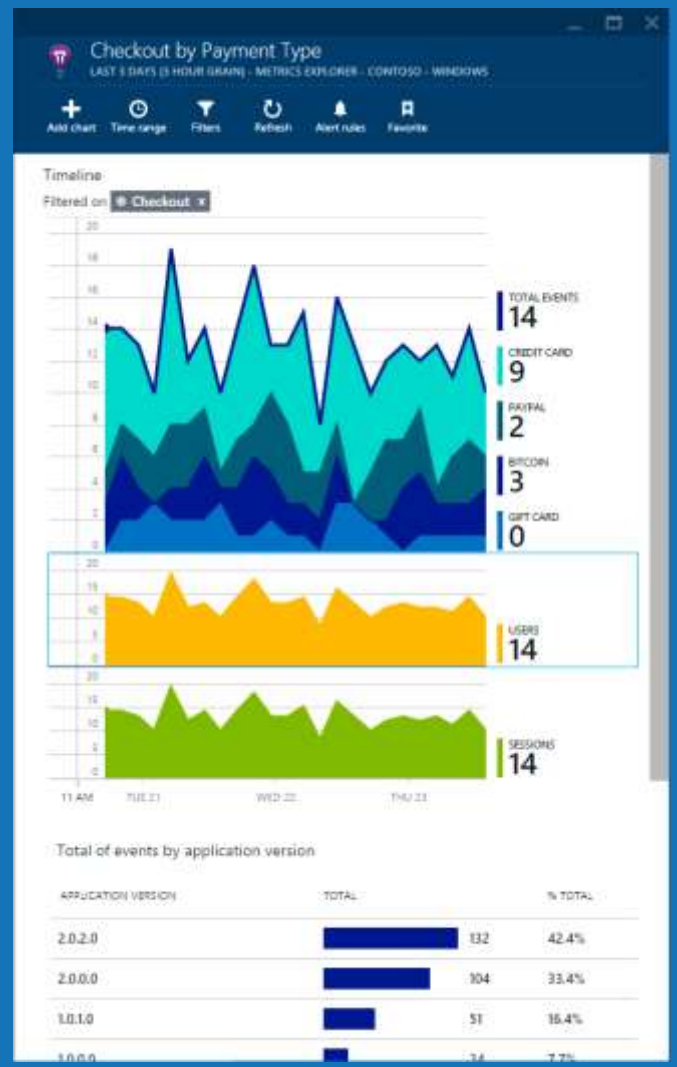
Learn & Improve continuously: Usage

Challenges

- Unable to correlate with other data sources?
- Lack of information to prioritize future investments?

Solutions

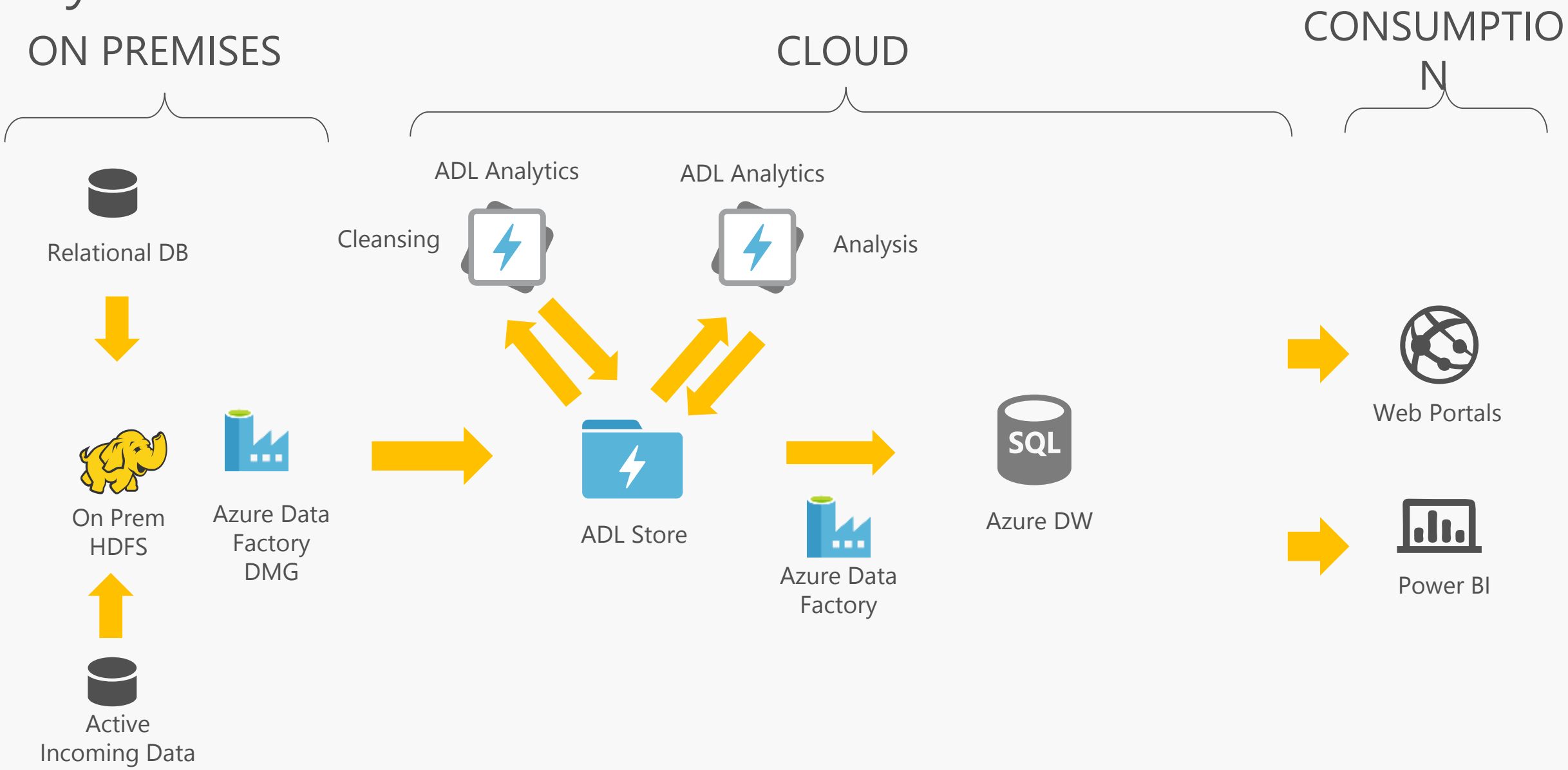
- Understand key adoption trends
- Prioritize investments & support specific client environments
- Custom event instrumentation & client page views
- Complete usage with perf. telemetry for 360° view
- Export data to manually correlate with external data sources



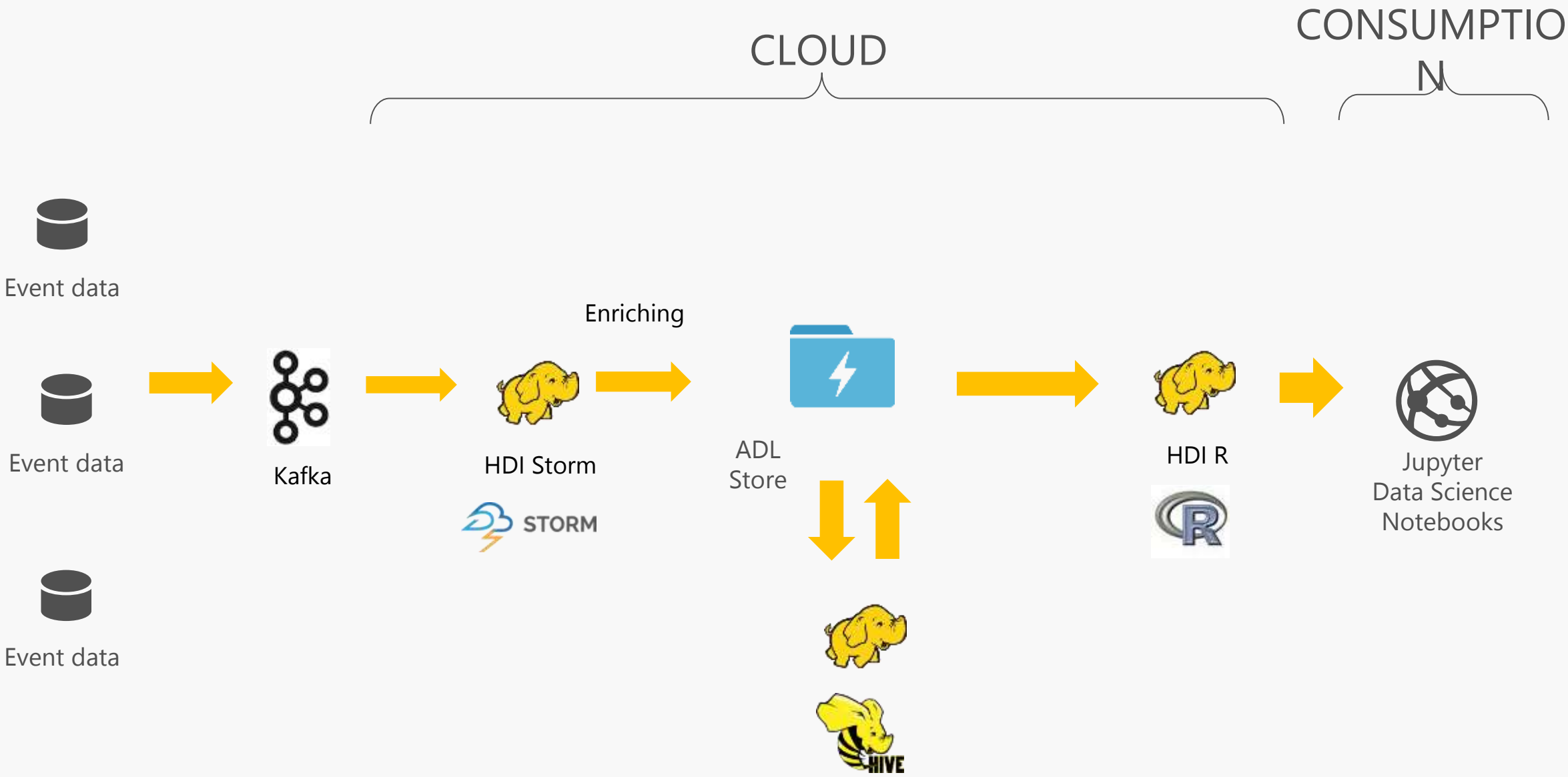
Microsoft

Data Lake, Machine Learning and Analytics

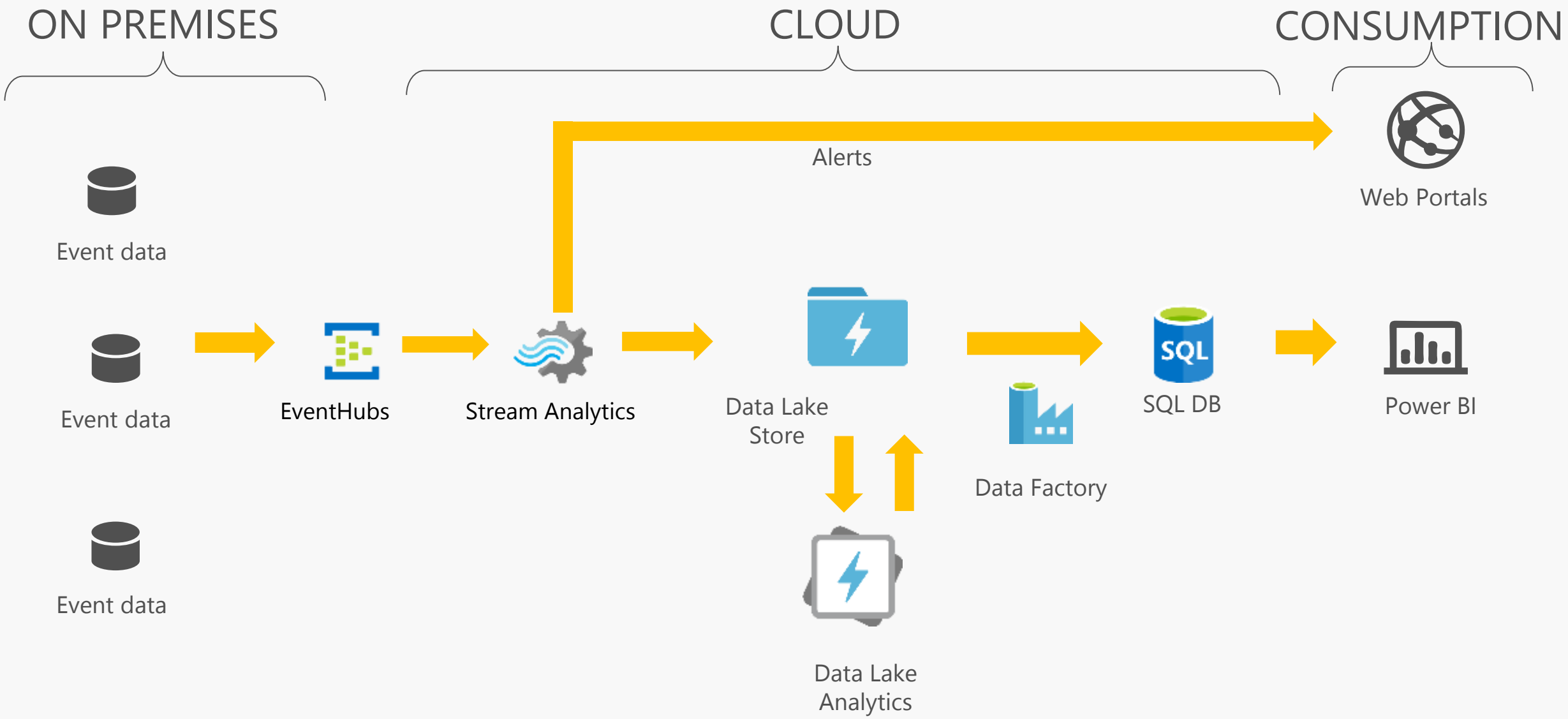
Hybrid


ON PREMISES
CLOUD
CONSUMPTION
Relational DB
On Prem HDFS
Active Incoming Data
Azure Data Factory DMG
ADL Analytics
Cleansing
ADL Analytics
Analysis
ADL Store
Azure Data Factory
SQL
Azure DW
Web Portals
Power BI

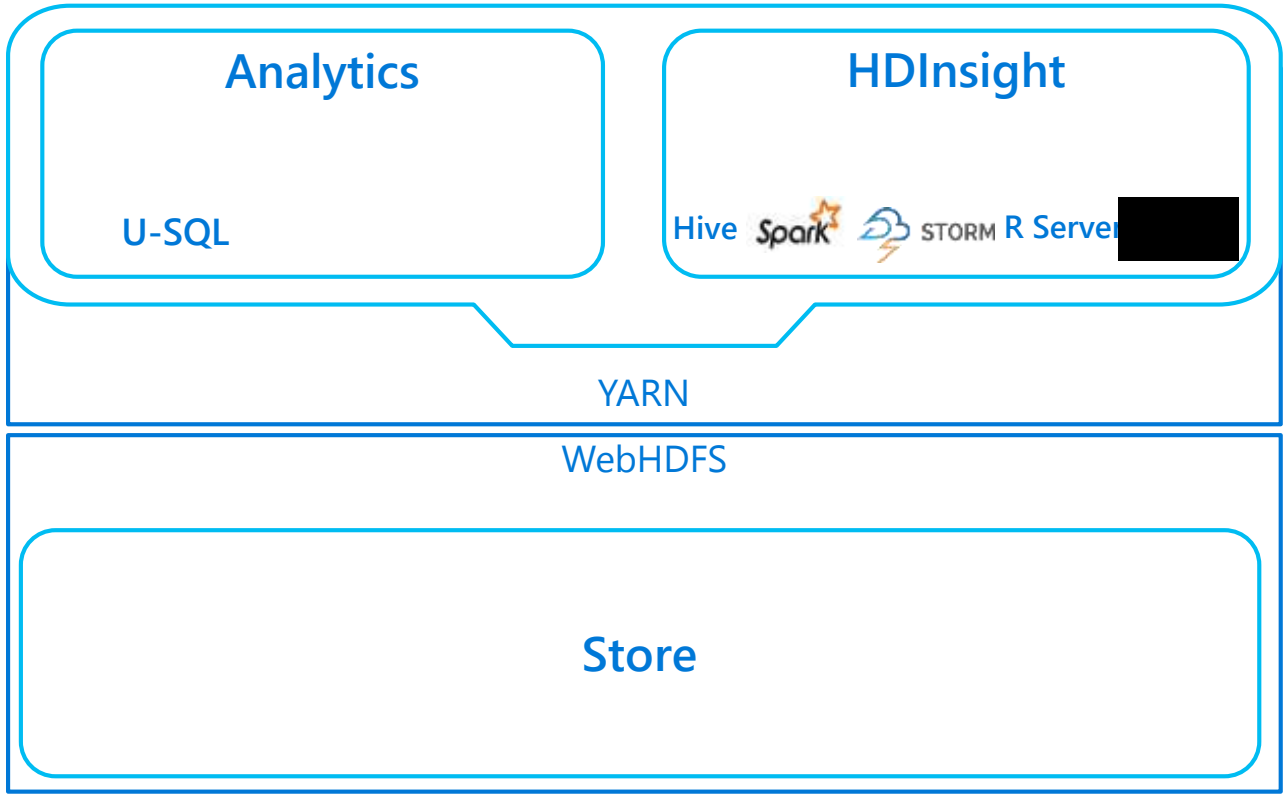
Real-time data analysis



Lambda architecture



Azure Data Lake



Store and analyze data of any kind and size

Develop faster, debug and optimize smarter

Interactively explore patterns in your data

No learning curve

Managed and supported

Dynamically scales to match your business priorities

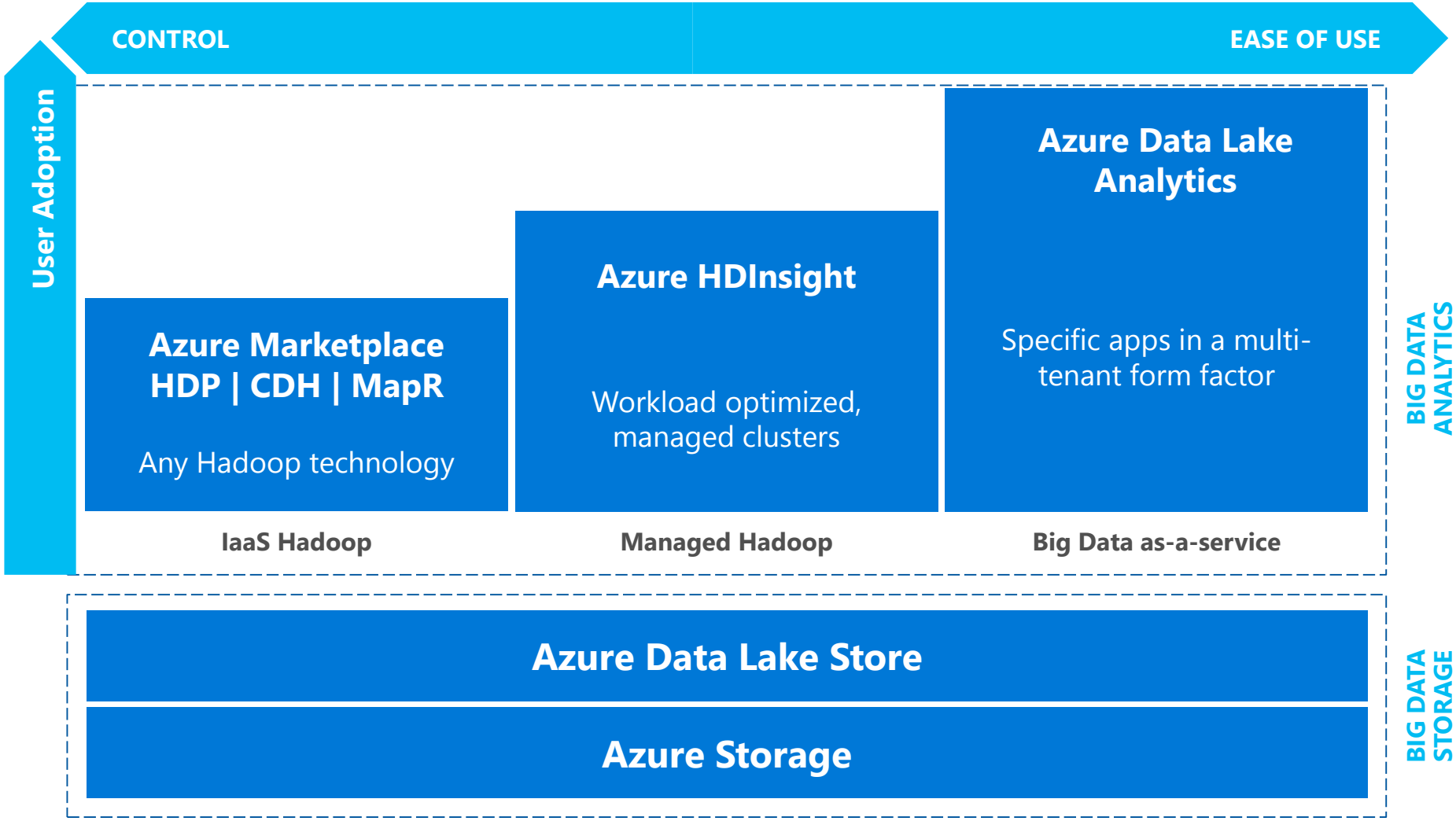
Enterprise-grade security

Built on YARN, designed for the cloud

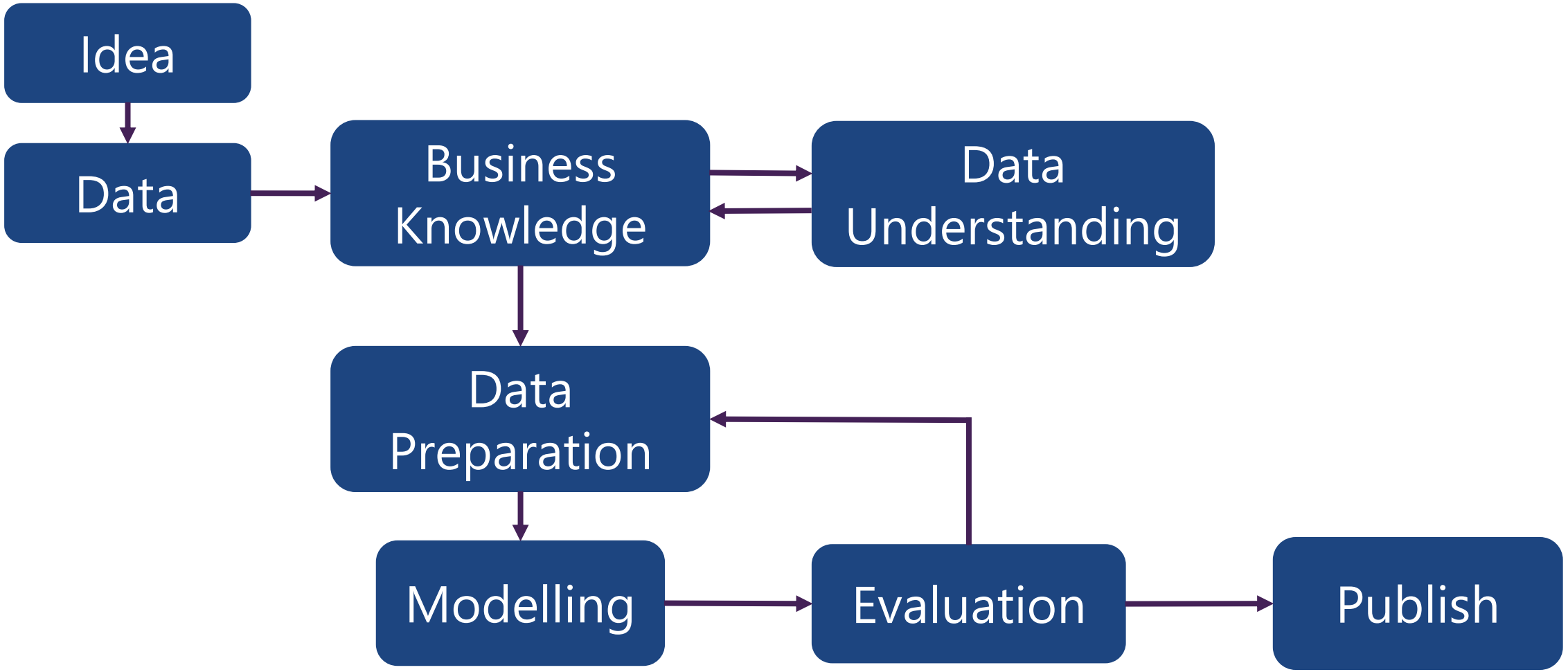
Debug and Optimize your Big Data programs with ease

- Deep integration with Visual Studio, Visual Studio Code, Eclipse, & IntelliJ
- Easy for novices to write simple queries
- Integrated with U-SQL, Hive, Storm, and Spark
- Actively offers recommendations to improve performance and reduce cost
- Playback visually displays job run

Bringing Big Data to everybody



Machine Learning Process Model



Azure Machine Learning Studio

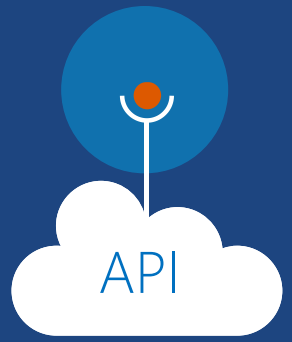
Data

Blobs and Tables

Hadoop (HDInsight)

Relational DB (Azure SQL DB)

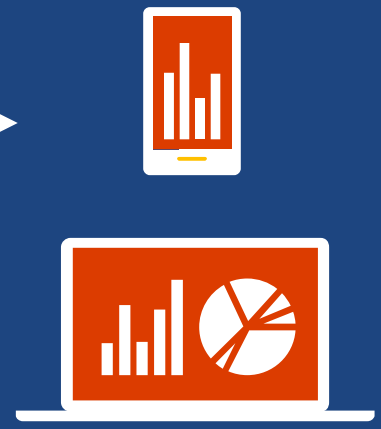
Integrated development environment for Machine Learning



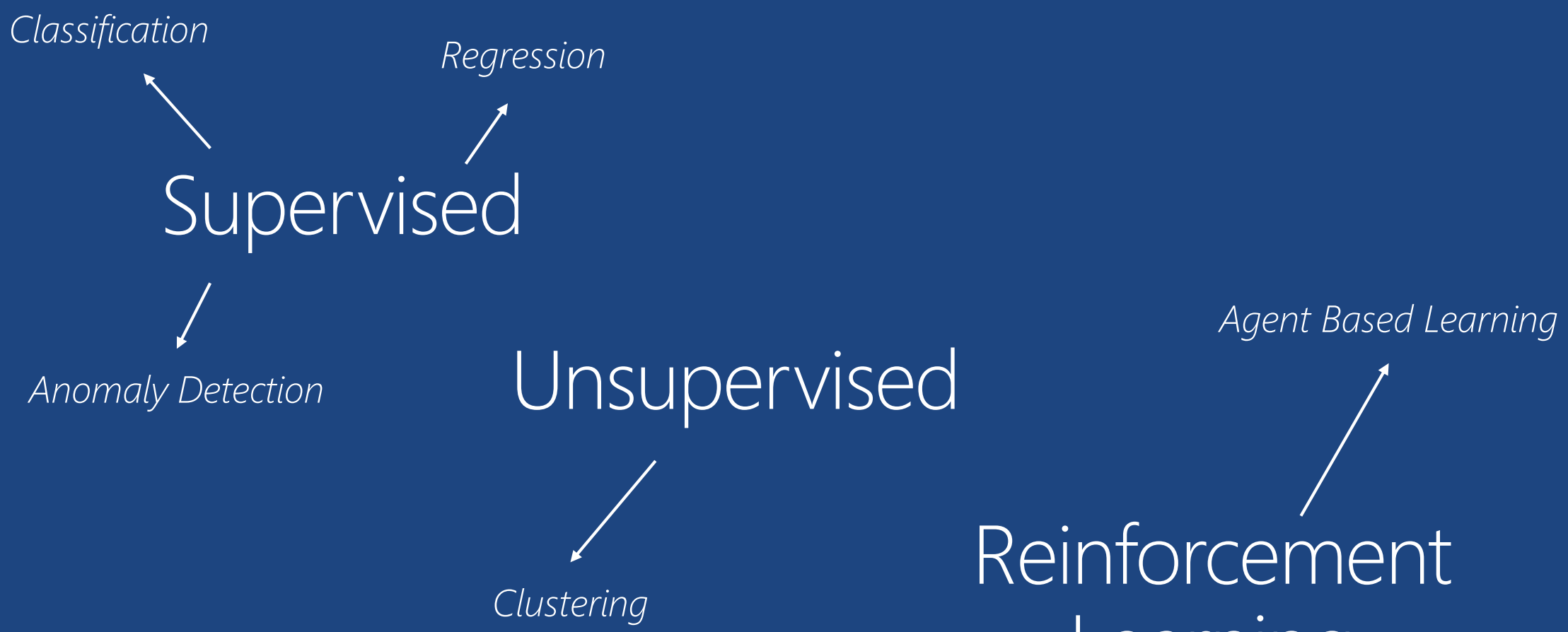
Model is now a web service that is callable

Monetize the API through our marketplace

Clients

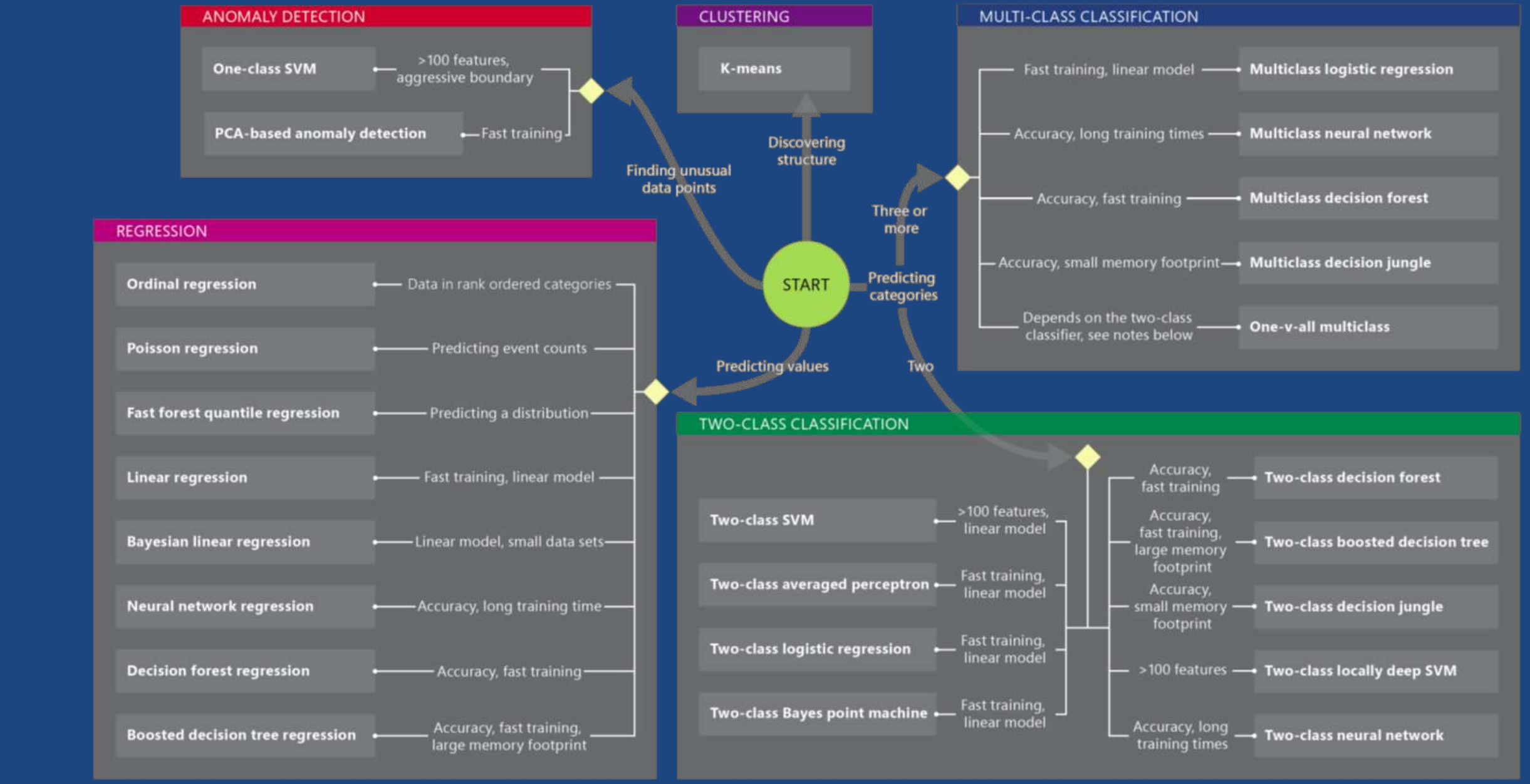


Flavors of Machine Learning



https://azure.microsoft.com/en-us/documentation/articles/machine-learning-algorithm-choice

Machine Learning Algorithm Cheat Sheet



Machine Learning in ML Studio

Anomaly Detection
- One-class Support Vector Machine
- Principal Component Analysis-based Anomaly Detection
- Time Series Anomaly Detection*

Classification

Two-class Classification
- Averaged Perceptron
- Bayes Point Machine
- Boosted Decision Tree
- Decision Forest
- Decision Jungle
- Logistic Regression
- Neural Network
- Support Vector Machine

Multi-class Classification
- Decision Forest
- Decision Jungle
- Logistic Regression
- Neural Network
- One-vs-all

Clustering
- K-means Clustering

Recommendation
- Matchbox Recommender

Regression
- Bayesian Linear Regression
- Boosted Decision Tree
- Decision Forest
- Fast Forest Quantile Regression
- Linear Regression
- Neural Network Regression
- Ordinal Regression
- Poisson Regression

Statistical Functions
- Descriptive Statistics
- Hypothesis Testing T-Test
- Linear Correlation
- Probability Function Evaluation

Text Analytics
- Feature Hashing
- Named Entity Recognition
- Vowpal Wabbit

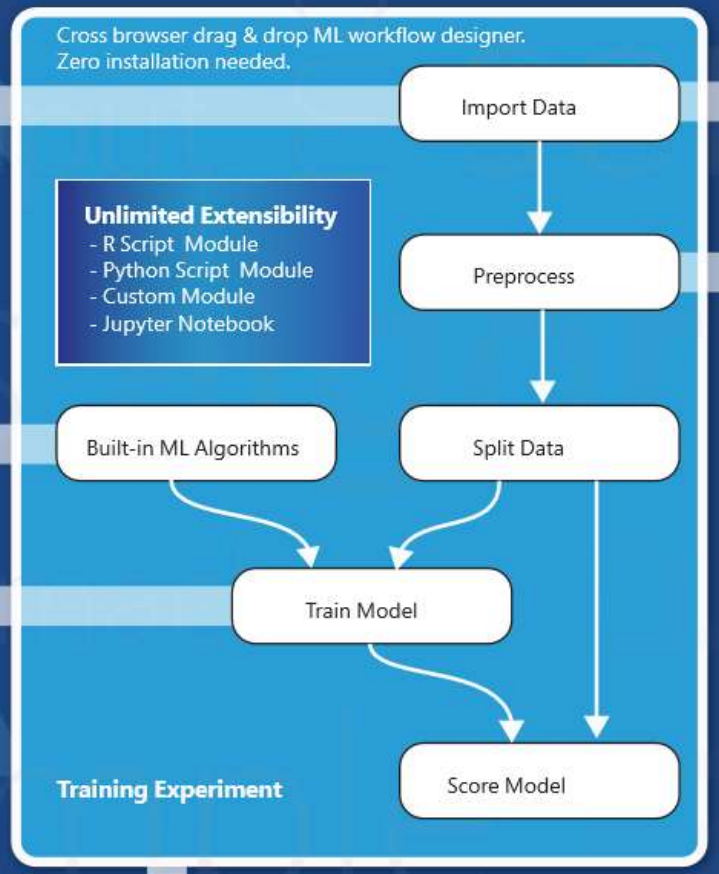
Computer Vision
- OpenCV Library

https://studio.azureml.net

Guest Access Workspace: Free trial access without logging in.
Free Workspace: Free persisted access, no Azure subscription needed.
Standard Workspace: Full access with SLA under an Azure subscription.

Data/Model Visualization
- Scatterplots
- Bar Charts
- Box plots
- Histogram
- R and Python Plotting Libraries
- REPL with Jupyter Notebook
- ROC, Precision/Recall, Lift
- Confusion Matrix
- Decision Tree*

Training
- Cross Validation
- Retraining
- Parameter Sweep



Unlimited Extensibility
- R Script Module
- Python Script Module
- Custom Module
- Jupyter Notebook

Data Source
- Azure Blob Storage
- Azure SQL DB
- Azure SQL DW*
- Azure Table
- Desktop Direct Upload
- Hadoop Hive Query
- Manual Data Entry
- OData Feed
- On-prem SQL Server*
- Web URL (HTTP)

Data Format
- ARFF
- CSV
- SVMLight
- TSV
- Excel
- ZIP

Data Preparation
- Clean Missing Data
- Clip Outliers
- Edit Metadata
- Feature Selection
- Filter
- Learning with Counts
- Normalize Data
- Partition and Sample
- Principal Component Analysis
- Quantize Data
- SQLite Transformation
- Synthetic Minority Oversampling Technique

Enterprise Grade Cloud Service
- SLA: 99.95% Guaranteed Up-time
- Azure AD Authentication
- Compute at Large Scale
- Multi-geo Availability
- Regulatory Compliance*

One-click Operationalization

Predictive Experiment

Make Prediction with Elastic APIs
- Request-Response Service (RRS)
- Batch Execution Service (BES)
- Retraining API

Community
- Gallery (http://gallery.azureml.net)
- Samples & Templates
- Workspace Sharing and Collaboration
- Live Chat & MSDN Forum Support

* Feature Coming Soon