Microsoft

Azure Features Overview

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Microsoft

IoT

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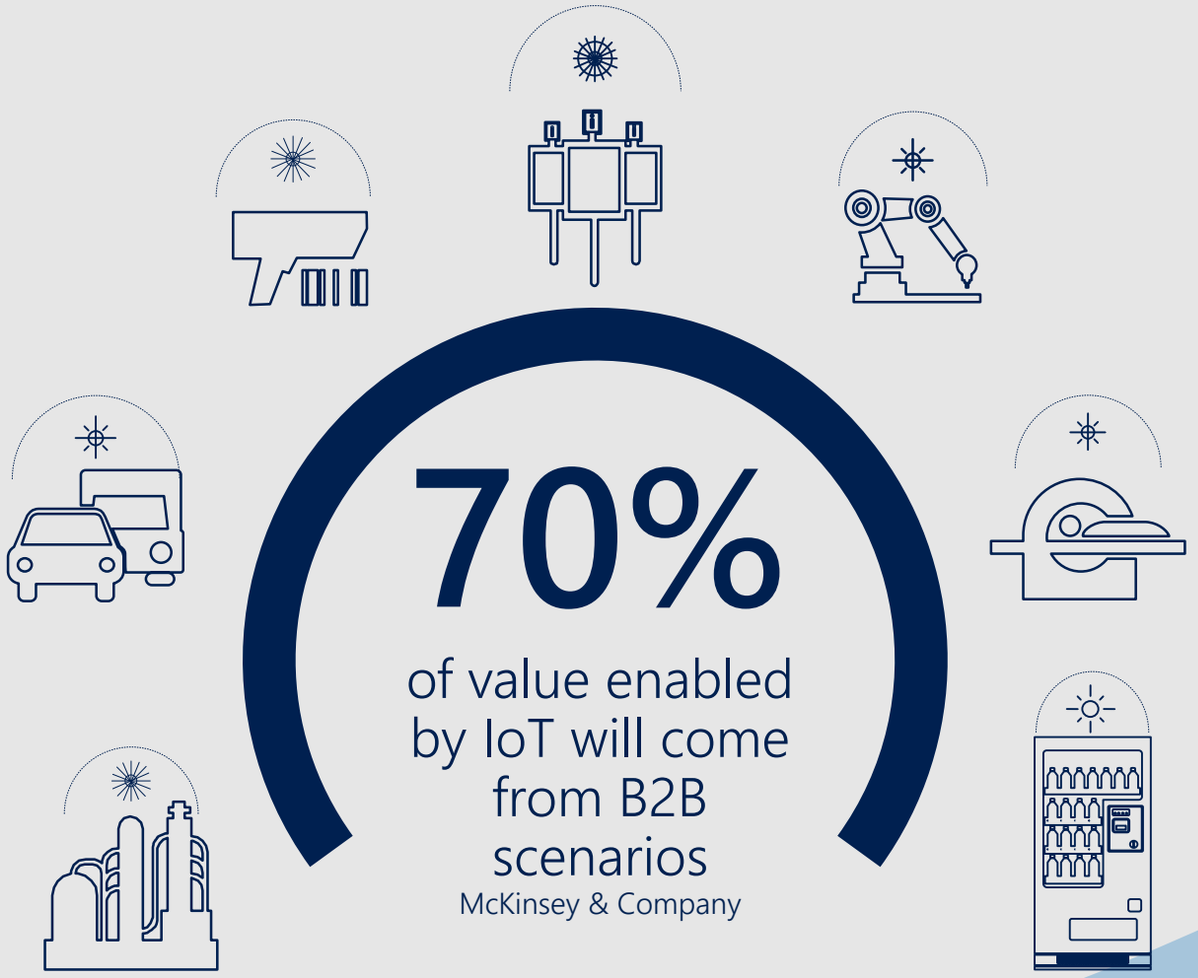
Internet of Things opportunity



21 billion

Connected “things” by 2020

—Gartner

$2 trillion

Market for IoT by 2020

—IDC

Defining Internet of Things

Build Things

Control Anything

Gain Insights

Take Action

30%
Year on year decline in silicon costs

20B+
Devices with different devices, silicon, OS, sensors

4ZB
of the data on earth will come from IoT by 2020

$10B
market for business process automation tools by 2020

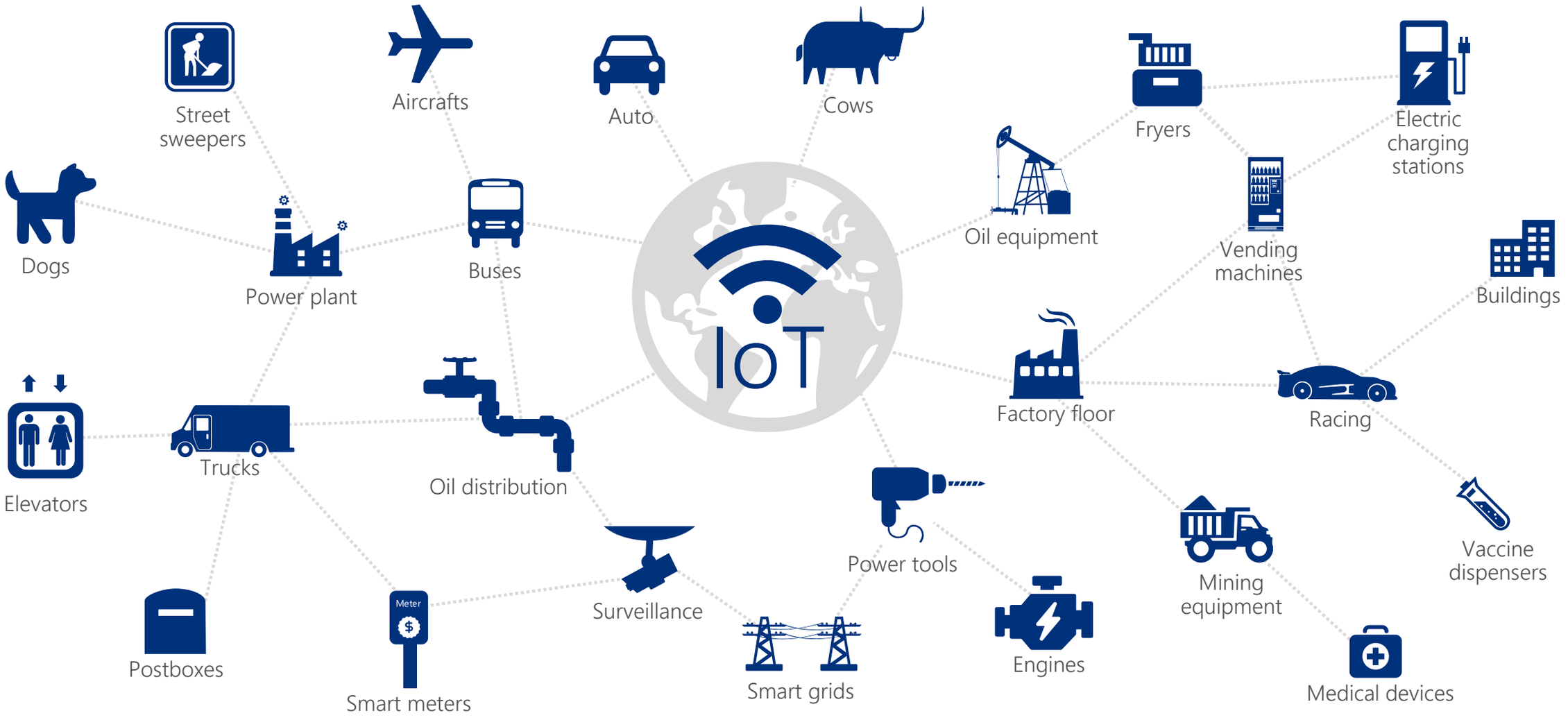
The Internet of Things (IoT) is key to achieving digital transformation

According to a recent IoT survey…

73%	Of the companies surveyed are currently active in IoT
60%	Of those working on IoT are aiming to grow revenue and profits
50%	Reduction in downtime with predictive maintenance

Source: *Redefining the Connected Conversation*, IoT Trends, Challenges & Experience Survey. James Brehm & Associates, 2016.

Innovation at work – real IoT use cases



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Azure Container Service

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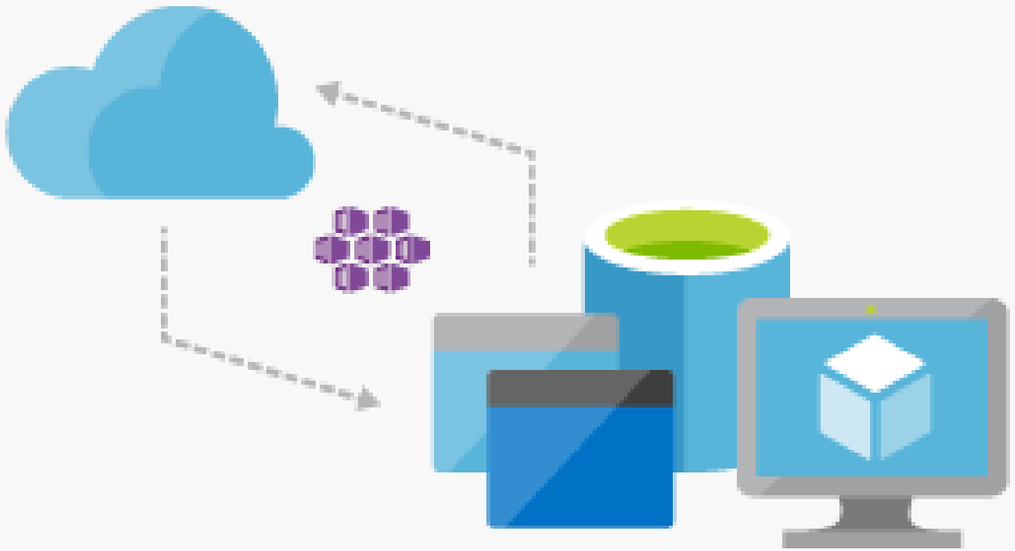
What is a Container?

- A **container** is a runtime instance of an image.
- An **image** is a lightweight, stand-alone, executable package that includes everything needed to run a piece of software.
- You can put your app(s) to run into the container with a consistent environment.



Practical Example of an Image and Container

Normally you need to install ASP.NET on your physical machine to develop a C# .NET API application…

Well, Docker has an **ASP.NET image** you can select for a sample API project containing:

- Windows Server Core as the base OS
- IIS 10 as a Web Server
- .NET Framework (multiple versions)
- .NET Extensibility for IIS

You build your app as usual, then add a **DockerFile** (*it's a single small file with a set of instructions in your project file directory, don't worry we'll go over that later*). You will select that Docker ASP.NET image in your **DockerFile.**

When you **build** and **run** a container (either a VM or physical machine) with your API project, the **DockerFile** will pull down the **ASP.NET image** with everything you need. Your code will now be setup with the image's environment. The container will be running in seconds with the correct version of all your libraries/OS.

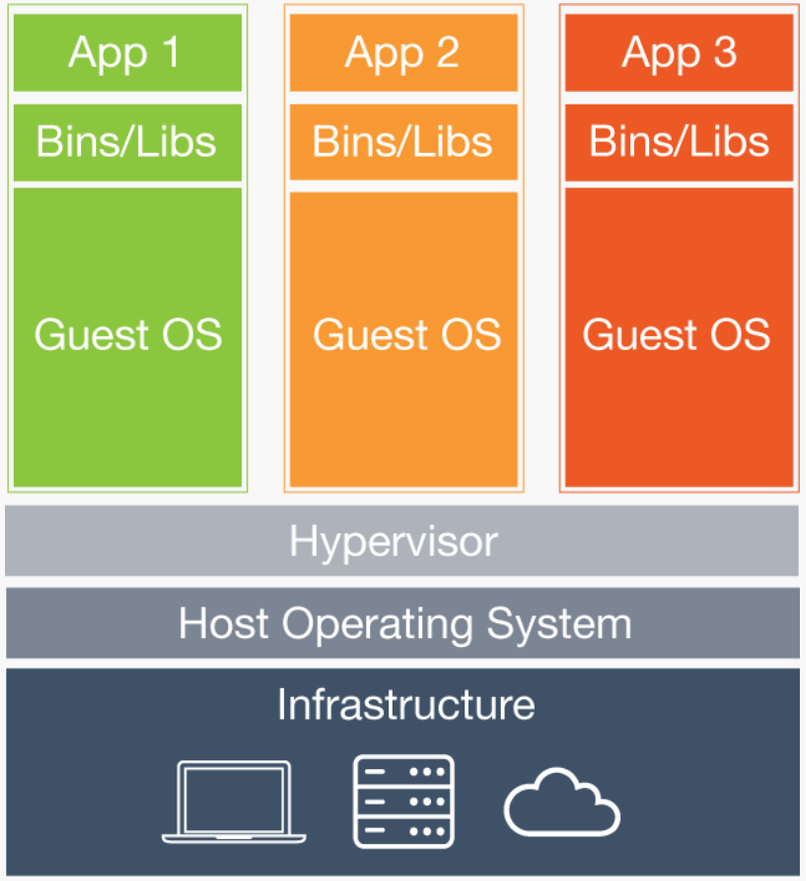
Now you have a **container** that is repeatable, easy to setup, and portable!

"If an image is a class, then a container is an instance of a class—a runtime object."

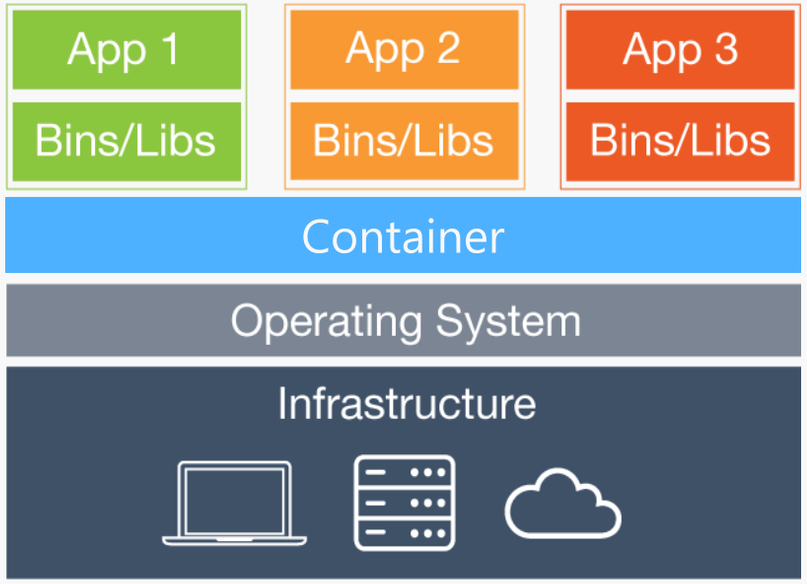
Containers are lightweight and portable encapsulations of an environment in which to run applications.

Containers are significantly more lightweight than a VM.

Virtual Machine



Container



Startup Performance

NodeJS with Windows Server Core

Windows Server Container
~1 second

Hyper-V Container
~3.3 seconds

A virtual machine takes ~**5 seconds to over a min**

*Includes initial boot provisioning phase (out-of-box setup etc…)

**Startup time after initial container start.

Testing performed on HP ProLiant SL250s Gen8, E5-2600, 2 Socket, 8 Core, 128GB RAM, HP SATA SSD - results may vary based on hardware and software configurations.

Microsoft

Azure Batch Service and Low Priority VMs

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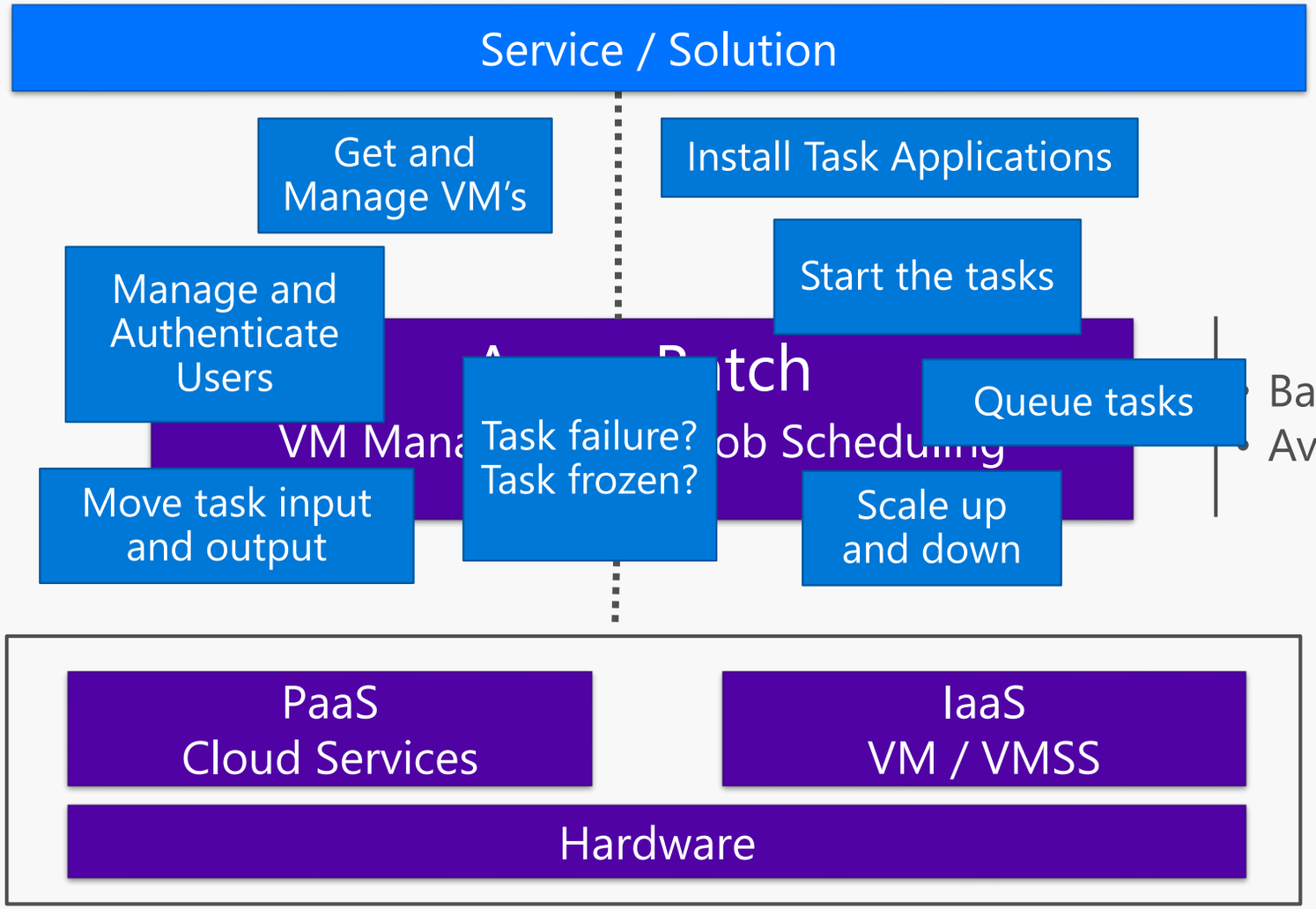
What is Azure Batch Service?

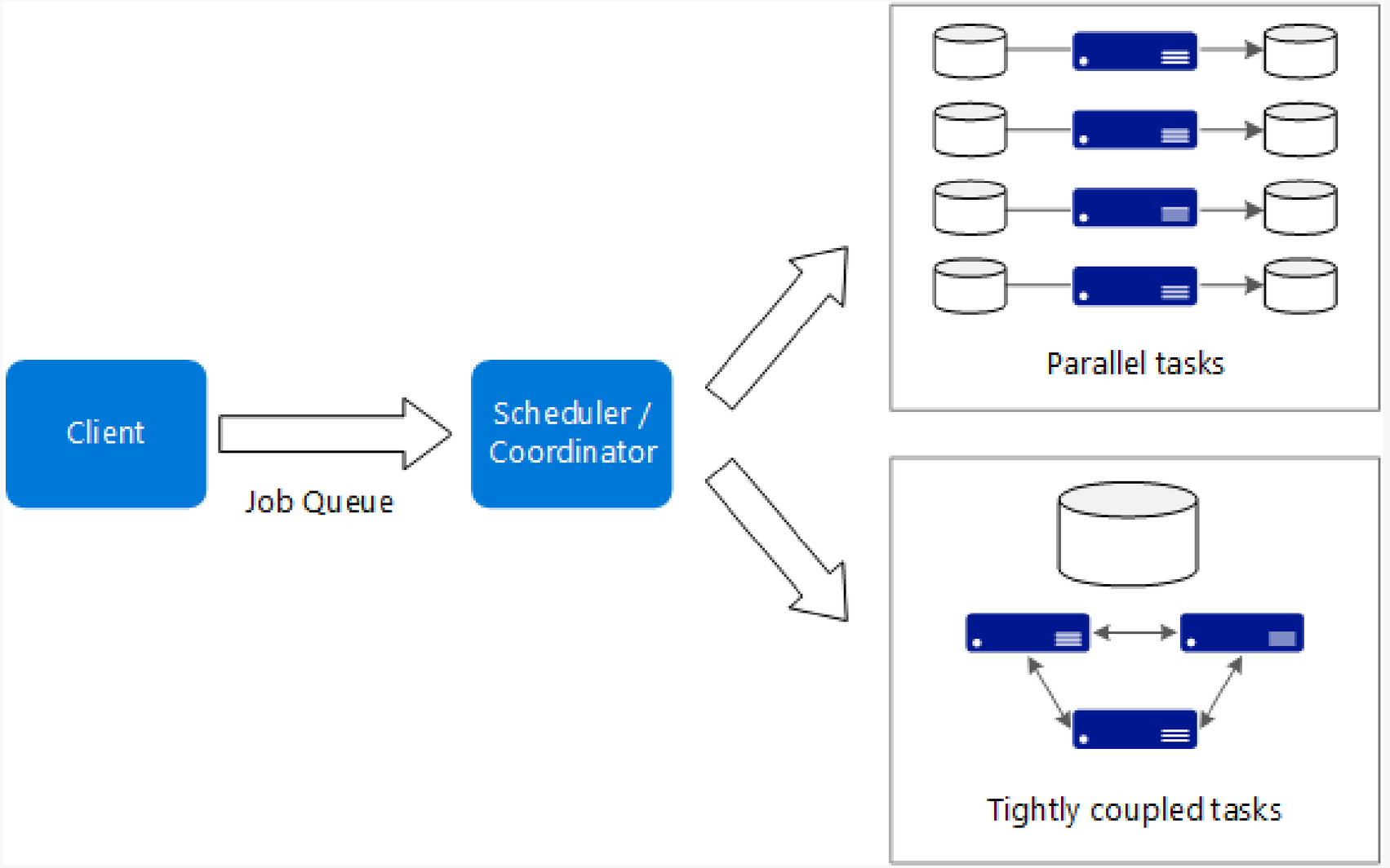
- A platform service for running large-scale parallel and high-performance computing (HPC) applications efficiently in the cloud.
- Azure Batch schedules compute-intensive work to run on a managed collection of virtual machines, and can automatically scale compute resources to meet the needs of your jobs.

Azure Batch and compute stack

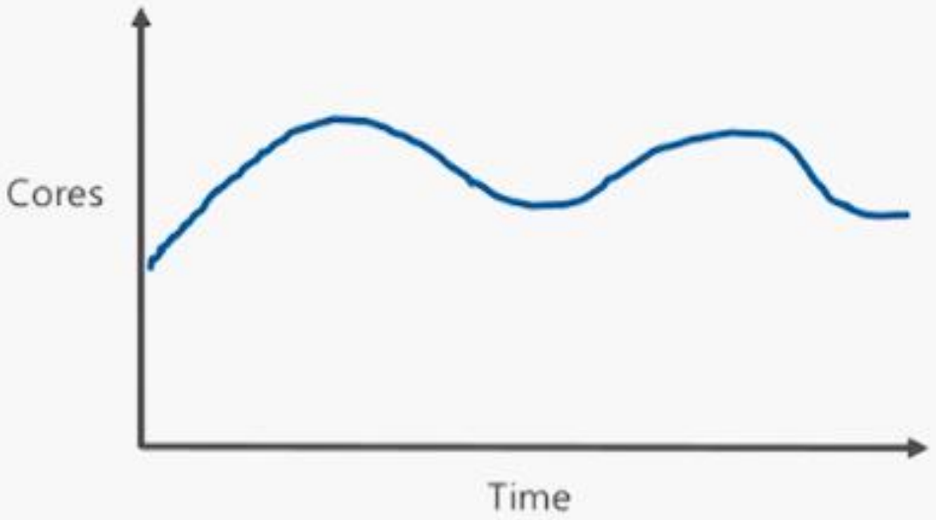


- Batch processing platform
- Avoid building infrastructure

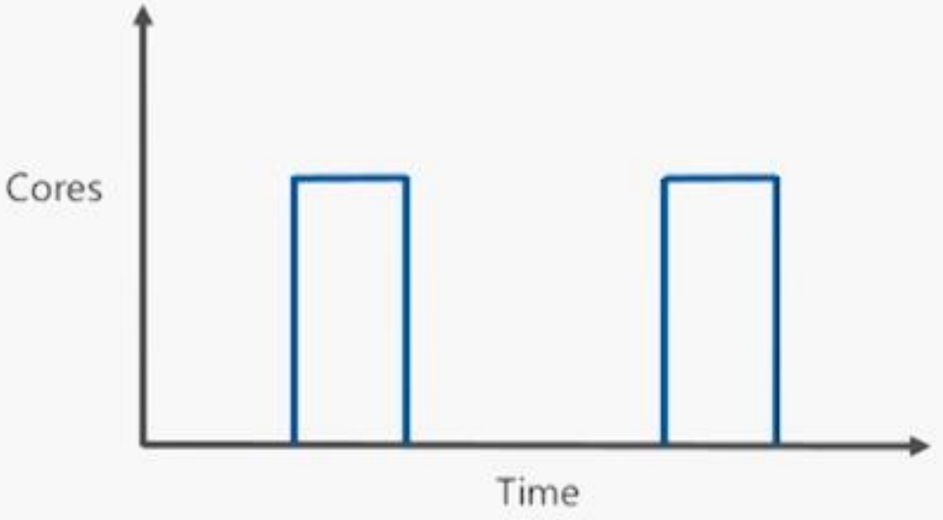
What is Azure Batch Service?



Common Usage Pattern



Load varies and number of VM's required for load varies over time



Load can be thousands of cores for a few hours a day, then zero cores for rest of day

Obtain required number of VM's when needed, pay-for-use, then give them back (and not pay) when there's no work

What is Batch being used for?

Media transcoding

Media Services - audio and video transcoding, etc.

TV Everywhere – video transcoding using ffmpeg

XBox video – video pre-processing

Rendering

HoloLens team renders test environments using Blender

Engineering companies rendering pipeline using 3DSMax and V-Ray on Linux VMs

Test execution

Azure Engineering CloudValidate service

Intune runs 20K tests in 20 mins following check-in's

Financial risk analysis testing

Risk analysis

Insurance and financial services

Deep Learning

Use CNTK, Caffe, TensorFlow, Torch, etc.

Data ingestion and processing

Azure StorSimple team ingest and pre-process to prepare for HDInsight jobs

Nightly data ingestion and processing of automotive data

ADF data copy activities

Pricing models

Energy pricing using python Monte Carlo quant models

R and Spark models for hotels

Engineering simulations

Engineering ISV customers can run apps at scale

Image processing

Analyze MRI scans for sign of dementia

Misc

Tracking drug company spending against doctor prescriptions

Aircraft route optimization and simulation

Low Priority VMs Current

- We are giving you access to spare capacity that can exist in each region, for a significantly reduced price.
- The amount of spare capacity is going to vary by region and VM size according to multiple factors, including day of week, time of day, and demand for different VM sizes.
- We effectively let you “borrow” and take advantage of this unused capacity for a great price.

Low-Priority VM's

Significantly lower priced compute

- Up to 80% discount compared to on-demand price - fixed price
- All Batch VM sizes and regions
- Uses surplus capacity; availability could vary; VMs could be preempted

Suitable workloads

- Distributed parallel jobs - many discrete tasks, interrupt tolerant, shorter task execution times, flexible job completion time
- e.g. Dev, test – regression, scale, load

Value

- Get work done for lower cost, faster, or do more for same price

Low-priority VMs offer large discounts of up to about 80% and are available using Azure Batch.

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Azure Functions

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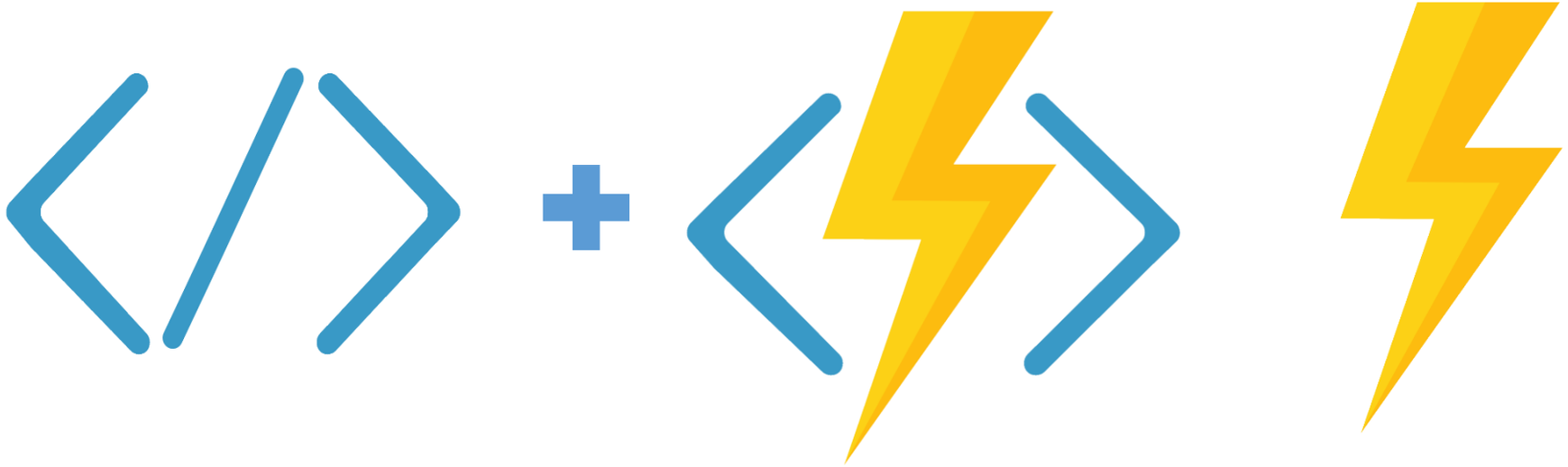
What is Azure Functions?

Code

Azure Functions

Events + data



Azure Functions features

- Choice of language – Write functions using C#, F#, Node.js, Python, PHP, batch, bash or any exe
- Pay-per-use pricing model – Pay for only the time spent executing the function
- Use your own code dependencies – Functions support NuGet and NPM, use your own libraries
- Integrated security – Protect HTTP-triggered functions with OAuth providers
- Integration with other Azure services and SaaS providers
- Continuous integration
- Open-source – Azure Functions runtime is open-source and available on GitHub

What can Azure Functions do?

- BlobTrigger - Process Azure Storage blobs when they are added to containers
- EventHubTrigger - Respond to events delivered to an Azure Event Hub
- Generic webhook - Process webhook HTTP requests from any service that supports webhooks
- GitHub webhook - Respond to events that occur in your GitHub repositories
- HTTPTrigger - Trigger the execution of your code by using an HTTP request
- QueueTrigger - Respond to messages as they arrive in an Azure Storage queue
- ServiceBusQueueTrigger - Connect your code to other Azure services or on-premises services by listening to message queues
- ServiceBusTopicTrigger - Connect your code to other Azure services or on-premises services by subscribing to topics
- TimerTrigger - Execute cleanup or other batch tasks on a predefined schedule

Azure Functions Integration

- Azure DocumentDB
- Azure Event Hubs
- Azure Mobile Apps (tables)
- Azure Notification Hubs
- Azure Service Bus (queues and topics)
- Azure Storage (blob, queues, and tables)
- GitHub (webhooks)
- On-premises (using Service Bus)

Choosing the right hosting plan

- Functions are designed to handle short tasks, and currently, a function can only run for a maximum of 5 minutes
- Consumption plan
  - Function apps are assigned to a compute processing instance
  - If you need more instances added or removed dynamically, Azure handles this
  - Functions run in parallel minimizing the total time needed
  - Cost is driven by memory size and total execution time across all functions
  - Use if your compute needs are intermittent or your job times tend to be short
- App Service Plan
  - Functions will run on dedicated VMs
  - Basic, Standard and Premium Tiers
  - Good option if you already have under-utilized VMs in an existing app plan
  - Good option if you expect your app functions to run continuously or almost continously

Microsoft

Azure Service Fabric

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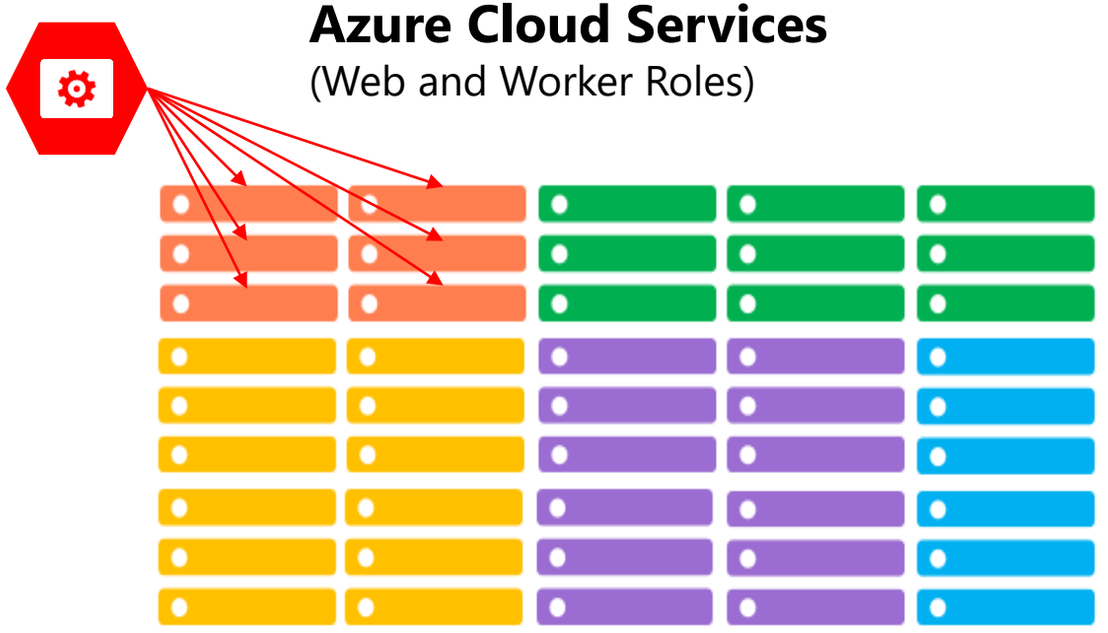
What is Azure Service Fabric?

"A distributed systems platform that makes it possible to build scalable, reliable, low-latency managed services and applications for the cloud."

Service Fabric Capabilities

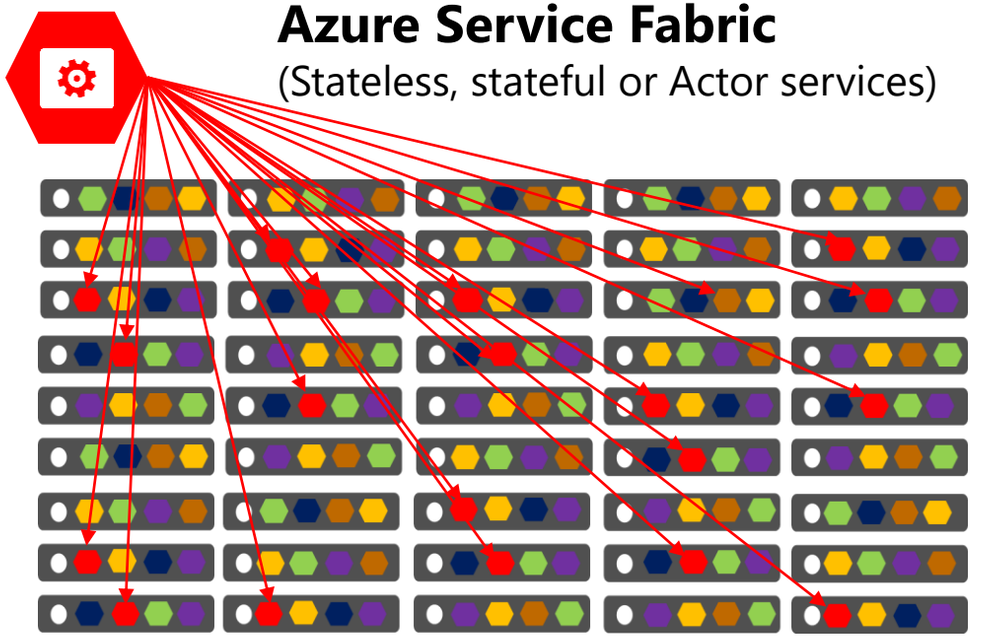
- Application deployment services:
  - Rolling update with rollback - Upgrade and patch microservices within applications independently
  - Strong versioning
  - Side-by-side support
- Leadership election
- Naming service for discovery of applications
- Partitioning support
- Azure Load balancing and placement constraints
- Consistent state replication framework
- Ability to scale-up or scale-down your Service Fabric cluster

Azure Cloud Services vs. Azure Service Fabric



Azure Cloud Services
(Web and Worker Roles)

- 1 service instance per VM with uneven workloads
- Lower compute density
- Slow in deployment and upgrades
- Slower in scaling and disaster recovery



Azure Service Fabric
(Stateless, stateful or Actor services)

- Many microservices per VM
- High microservices density
- Fast deployment and upgrades
- Fast scaling microservices

Service Fabric and microservices

- A microservice is whatever you want it to be:
  - ASP.NET application *(VMs have no support for applications that require IIS)*
  - node.js, Java VMs
  - Arbitrary .exe
- Stateless microservices
  - Stateless microservices (e.g. protocol gateways, web proxies, etc.) do not maintain any mutable state outside of any request and its response from the service.
  - Azure Cloud Services worker roles are an example of stateless service
- Stateful microservices
  - Reliability of state through replication and local persistence
  - Reduces the complexity and number of components in traditional three-tier architecture

Service Fabric and microservices (con't)

- A microservice is (*logic* + *state*) that is independently versioned, deployed, and scaled
- Have a unique name that can be resolved
  e.g. fabric:/myapplication/myservice
- Interacts with other microservices over well defined interfaces and protocols like REST
- Remains always logically consistent in the presence of failures
- Are hosted inside a process (code + config)
- Are typically developed by a small engineering team

Microsoft

Azure Media Services

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Azure Media Services

Azure Media Services is an extensible, multi-tenant platform that enables end-to-end video workflows in the Azure public cloud.

AZURE MEDIA INDEXER

TECHNICAL DETAILS

Audio or Video

MP4, WMV, MP3, M4A, AAC, WAV, WMA

Azure Media Indexer

Audio Decoding

Vocabulary Adaptation

Segmentation

Speech Recognition

Caption Alignment

Closed captions

(TTML/WebVTT/SAMI)

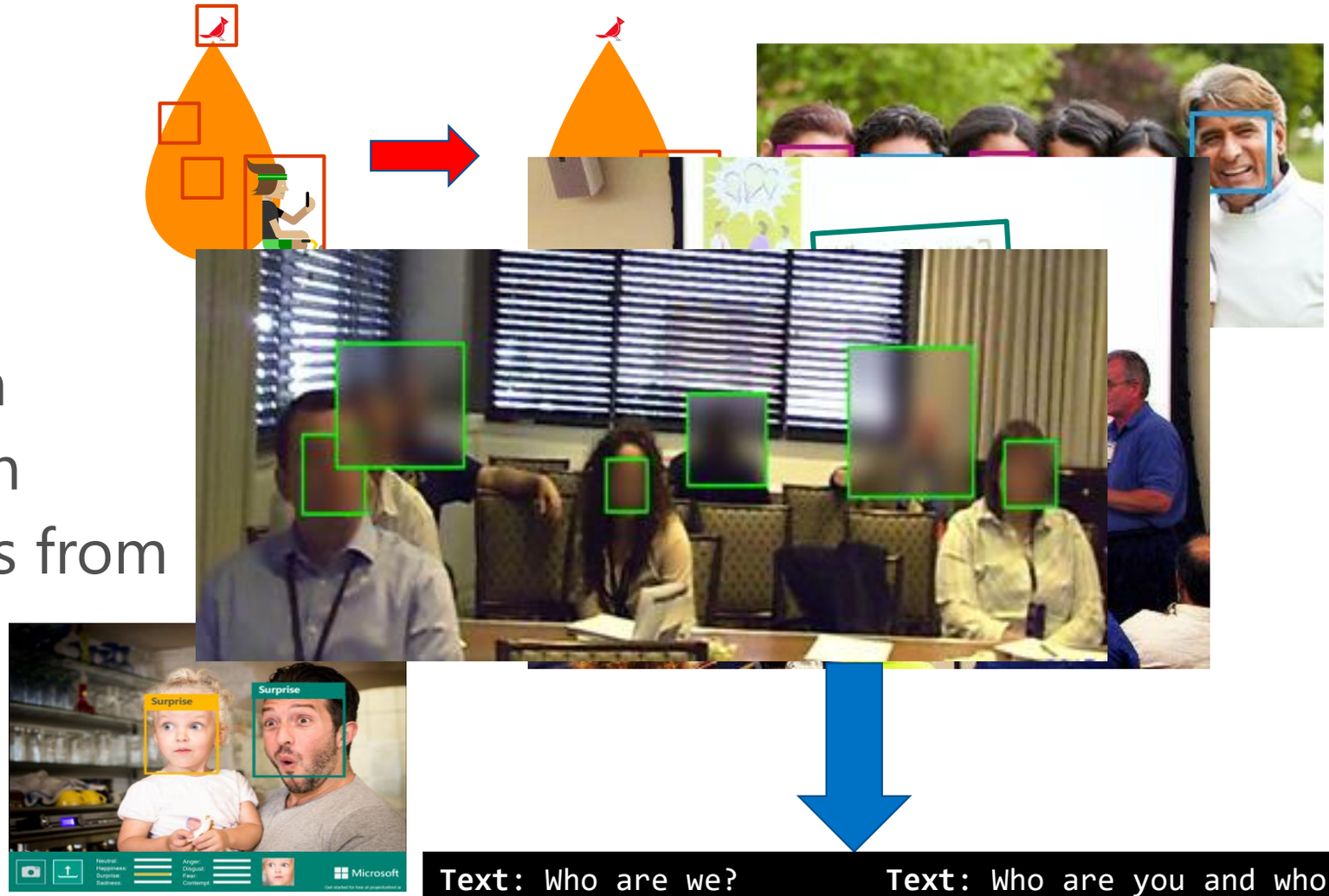
Audio Indexing Blob (AIB) for use with SQL Server and custom Ifilter add-on (link)

Flexible metadata files

(keywords, word info)

Features

- Motion Detection
- Face Detection
- Emotion Recognition
- Video Summarization
- Extract typeset words from video content
- Facial Redaction
- Video Tagging
- Action Recognition
- Content Moderation



Text: Who are we?
Location:
(200,100,250,50)
Time: 0:45:02

Text: Who are you and who is the person sitting next to you?
Location:
(100,250,350,90)
Time: 0:45:02

Microsoft

Machine Learning

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What Is It?

Formal definition: "A computer program is said to learn from experience E with respect to some class of tasks T and performance measure P, if its performance at tasks in T, as measured by P, improves with experience E" - Tom M. Mitchell

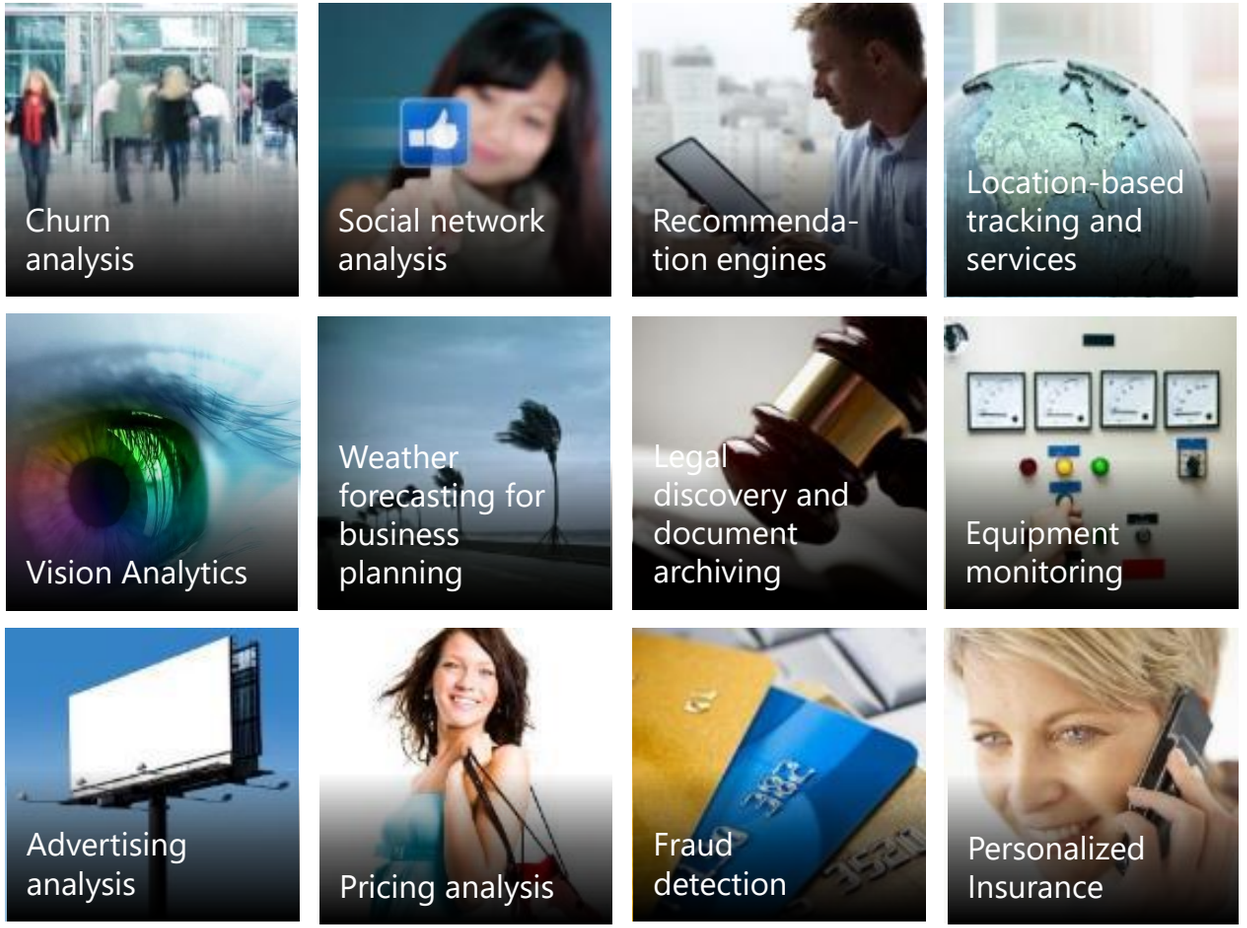
Another definition: "The goal of machine learning is to program computers to use example data or past experience to solve a given problem." – Introduction to Machine Learning, 2nd Edition, MIT Press

ML often involves two primary techniques:

- Supervised Learning: Finding the mapping between inputs and outputs using correct values to "train" a model
- Unsupervised Learning: Finding patterns in the input data

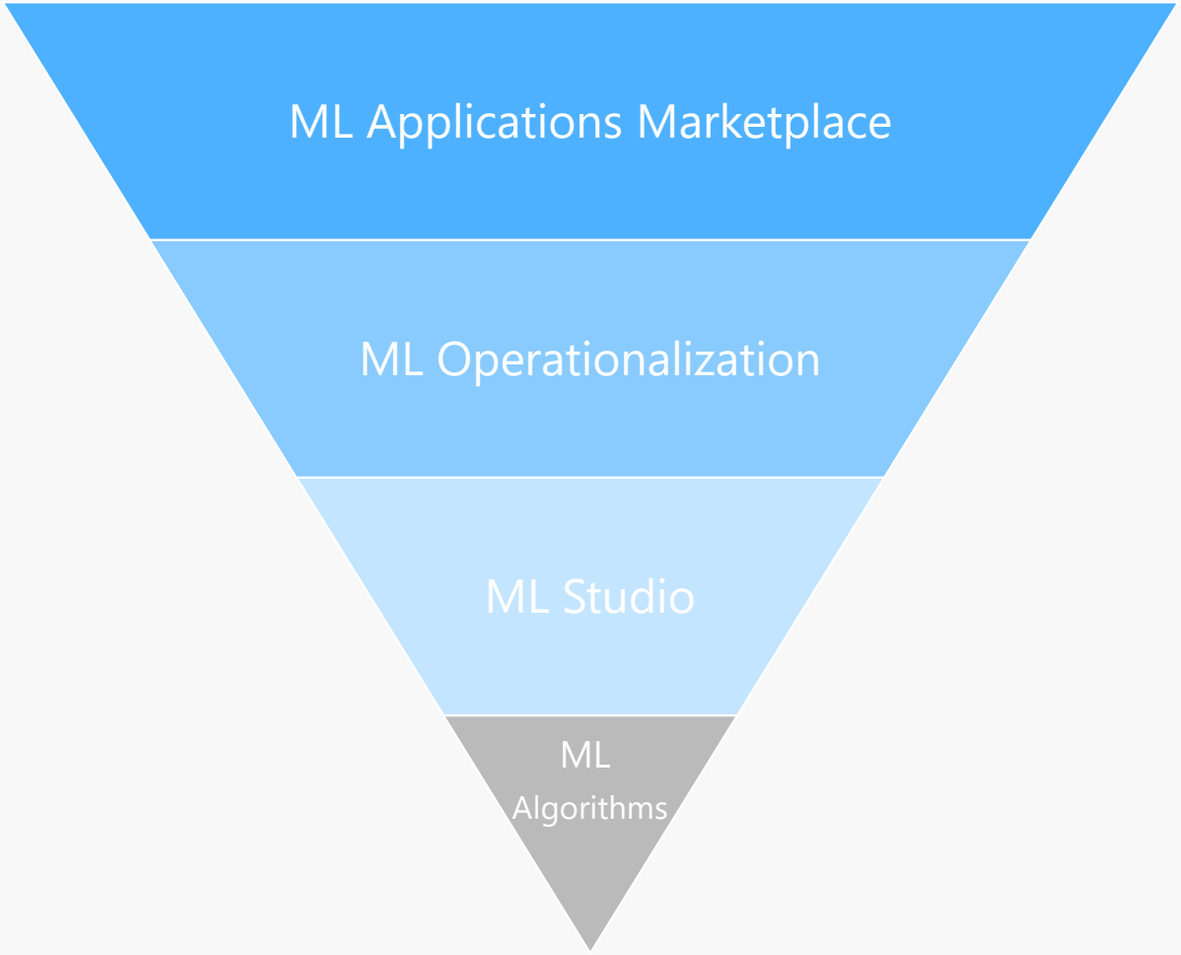
Machine Learning / Predictive Analytics

Machine learning & predictive analytics are core capabilities that are needed throughout your business



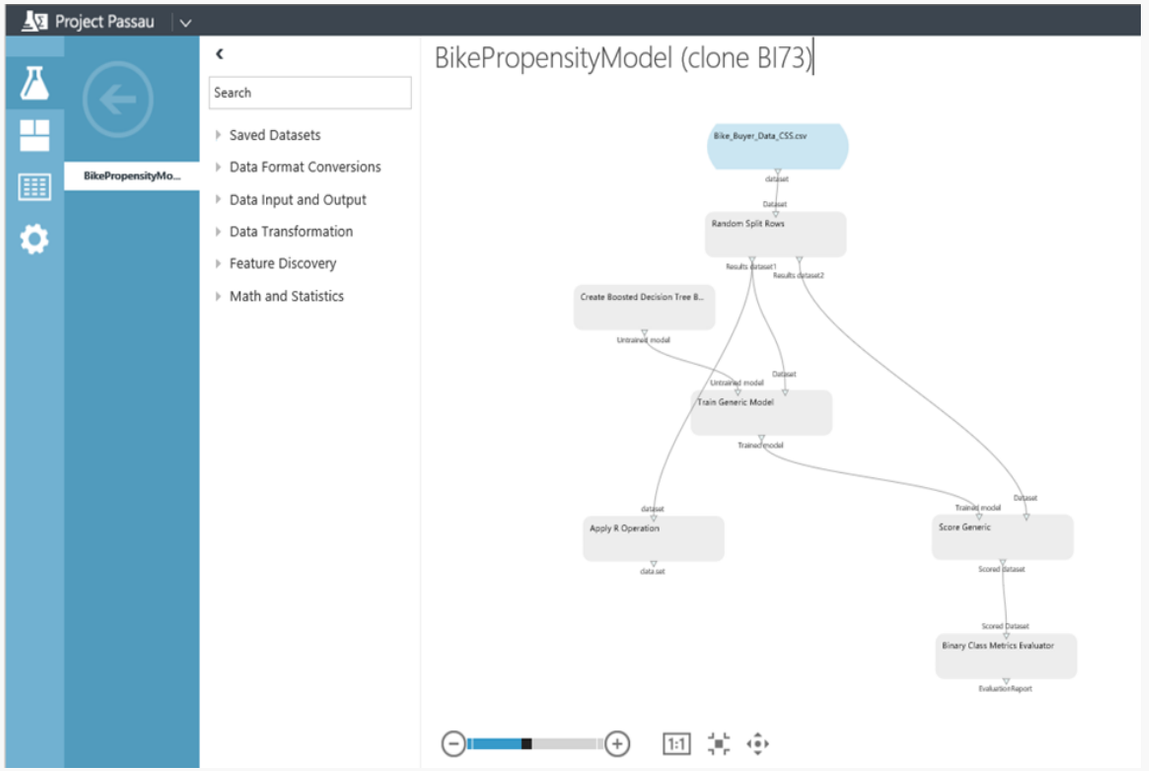
Azure ML Vision

Make machine learning (ML) accessible to every enterprise, data scientist, developer, information worker, consumer, and device anywhere in the world



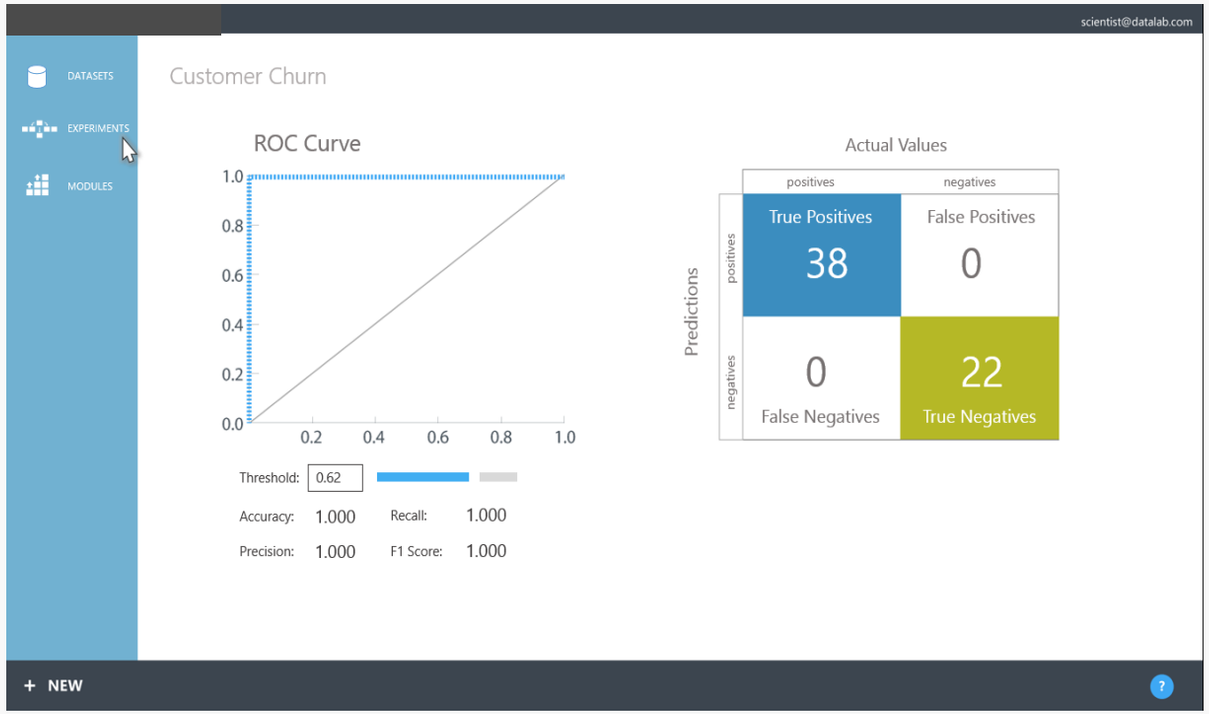
Azure ML Benefits

- Accessible through a web browser
- Collaborative work with Azure workspace
- Visualize data science workflow
- Best in class ML algorithms
- Extensible, support for R OSS

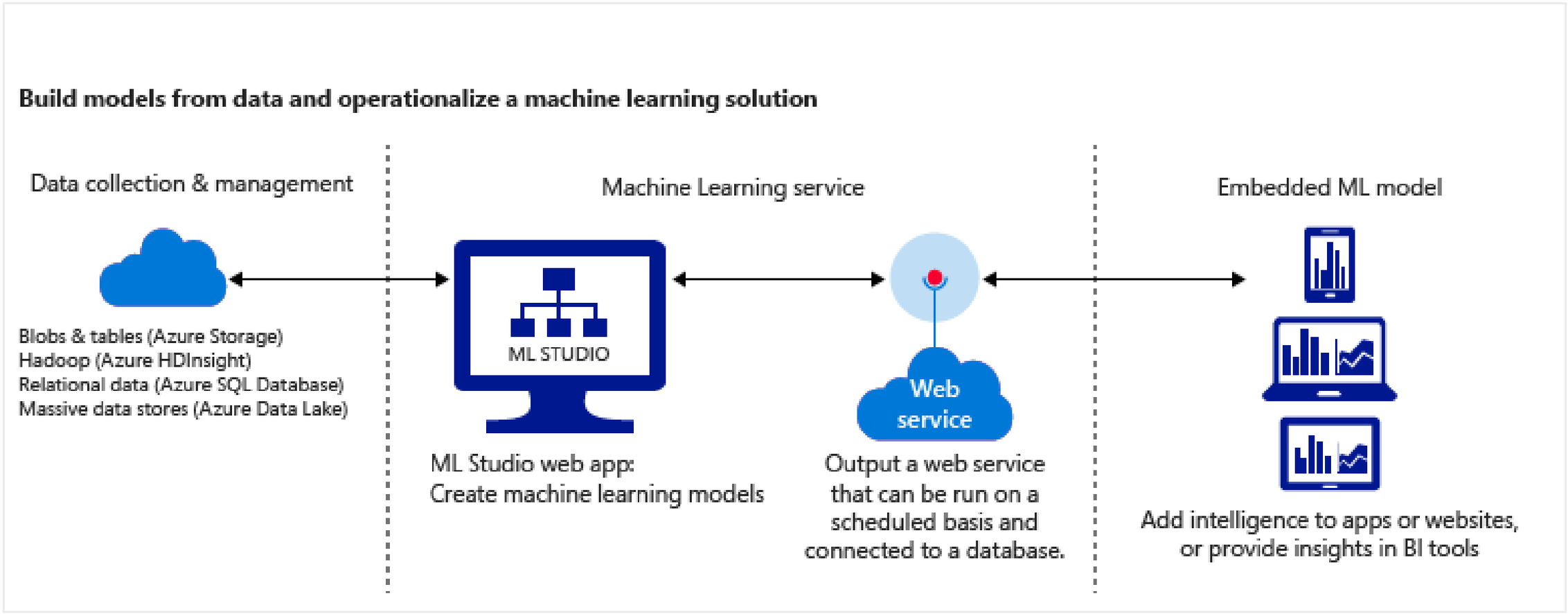


Azure ML Benefits

- Library of models, search discover and reuse
- Rapidly try features, ML algorithms and modeling strategies
- Quickly deploy model as Azure web service



Azure ML Workflow



Microsoft

Blockchain Etherium

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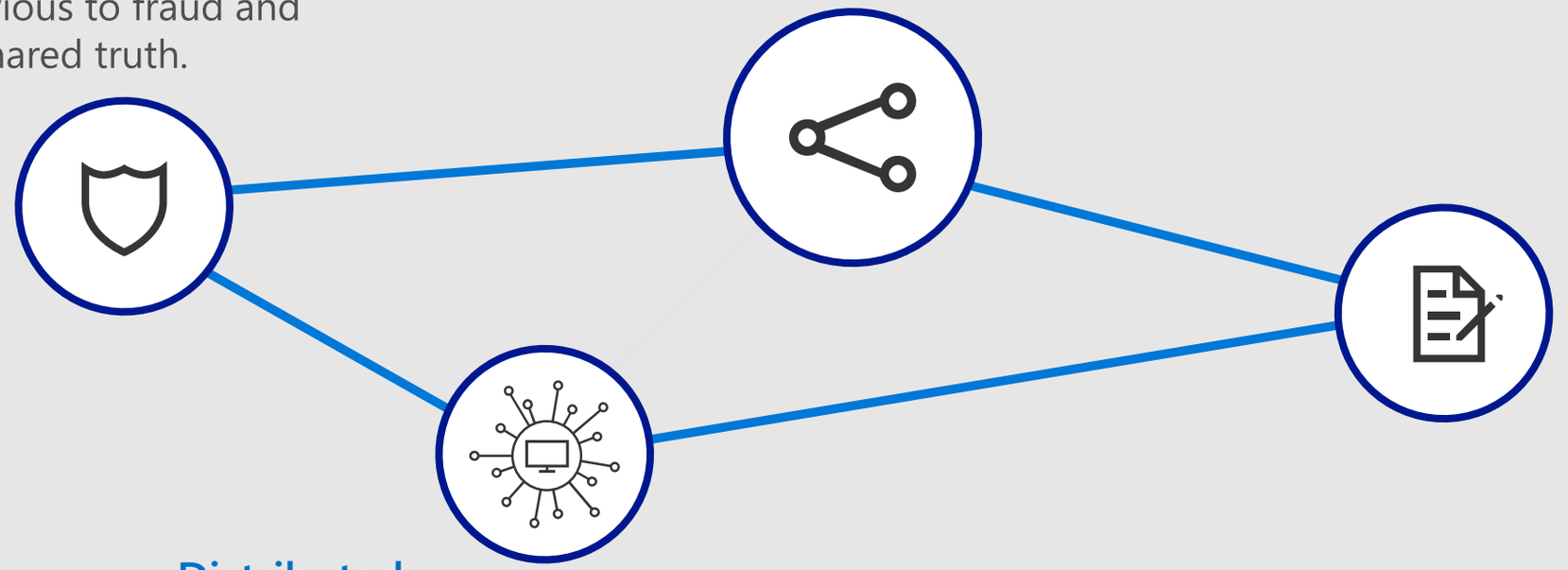
A Secure, Shared, Distributed Ledger

Shared
Blockchain value is directly linked to the number of organizations or companies that participate in them. There is huge value to even the fiercest of competitors to participate with each other in these shared database implementations.

Secure
Uses cryptography to create transactions that are impervious to fraud and establishes a shared truth.



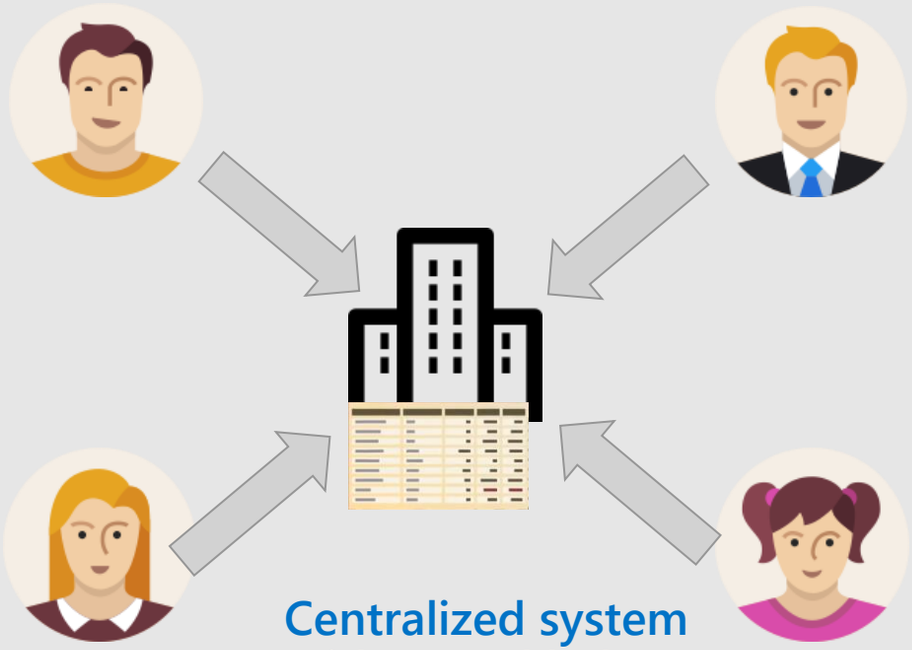
Ledger
The database is “write once” so it is an immutable record of every transaction that occurs.

Distributed
There are many replicas of the blockchain database. In fact, the more replicas there are the more authentic it becomes.

The Importance of Shared Data

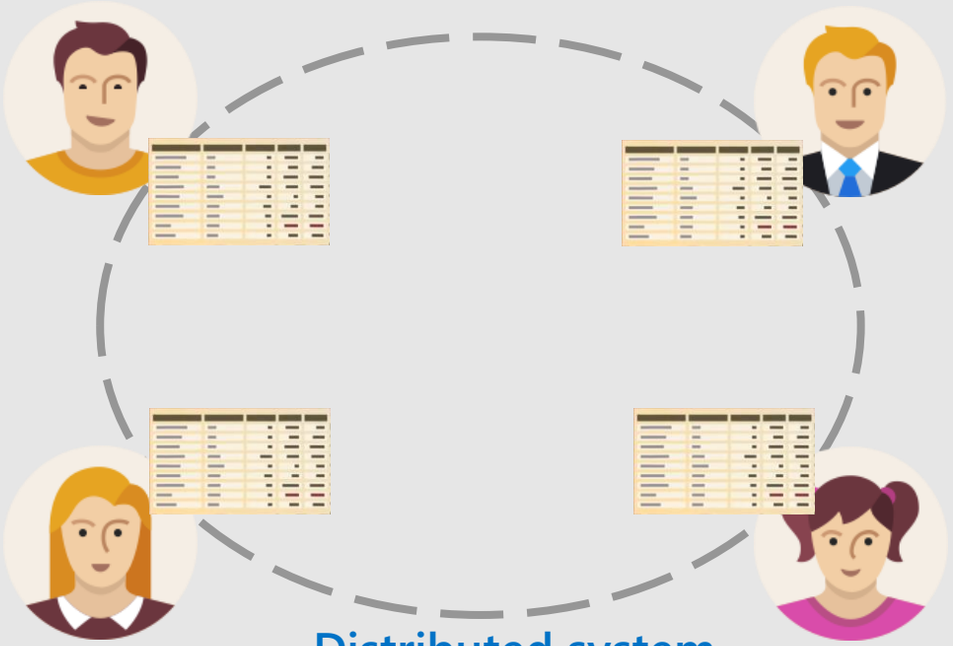
- Traditional ledgers are centralized and use 3rd parties and middlemen to approve and record transactions
- Blockchain safely distributes ledgers across the entire network and does not require any middleman
- The technology maintains multiple replicas like p2p torrent file sharing

Traditional System



Centralized system with stored ledger

Blockchain System



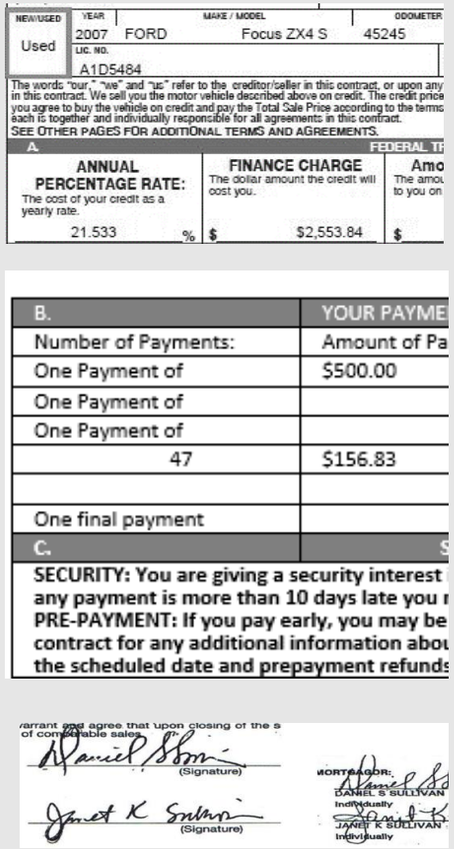
Distributed system with distributed ledger

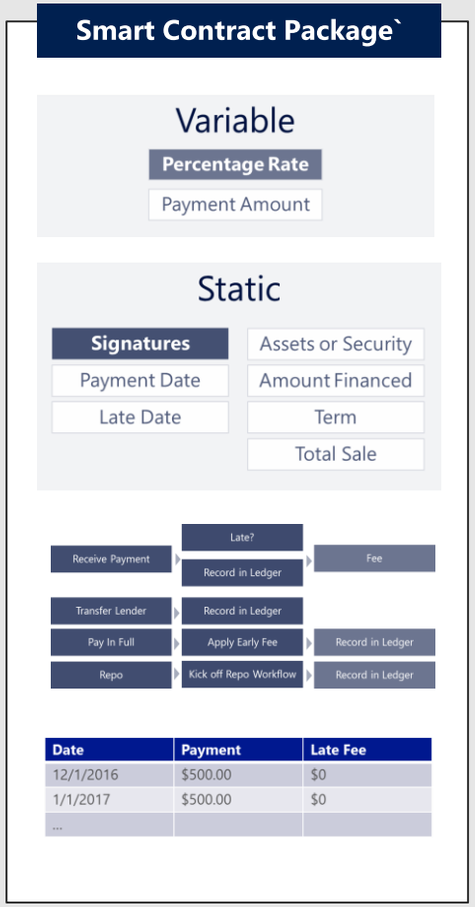
Smart Contracts

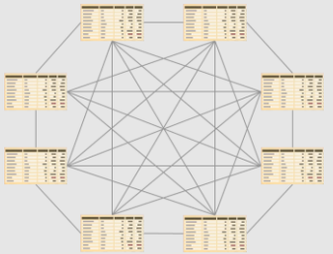
Smart Contracts are objects available on some blockchains (Ethereum)

They allow agreements between parties to be reduced to code, variables and properties, that can be published to a blockchain

Promising for multi-party contracts, and processes

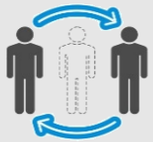






Incremental and Transformational Opportunities

Efficiency



Eliminate intermediaries
Share information directly with business partners

Reduce Fraud
Highly secure and transparent

Increase Speed
Simplified transactions with faster settlement

Transformation

Grow Revenue
Stronger customer connections grow revenue.

Build New Relationships
Reach and serve new customers, and create new partnerships

Enter New Markets
New revenue opportunities through more efficient processes and reduced costs.

Popular scenarios

Financial
Trading
Deal origination
POs for new securities
Equities
Fixed income
Derivatives trading
Total Return Swaps (TRS)
2nd generation derivatives
The race to a zero middle office
Collateral management
Settlements
Payments
Transferring of value
Know your client (KYC)
Anti money laundering
Crowd Funding
Peer-to-peer lending
Compliance reporting
Trade reporting & risk visualizations
Betting & prediction markets

Insurance
Claim filings
MBS/Property payments
Claims processing & admin
Fraud detection/prediction
Telematics & ratings
Digital authentication
Asset management
Automated underwriting
Self-administered insurance

Media
Digital rights mgmt
Game monetization
Art authentication
Purchase & usage monitoring
Ticket purchases
Fan tracking
Ad click fraud reduction
Resell of authentic assets
Real time auction & ad placements

Computer Science
Micronization of work (pay for algorithms, tweets, ad clicks, etc.)
Expanse of marketplace
Disbursement of work
Direct to developer payments
API platform plays
Notarization & certification
P2P storage & compute sharing
DNS

Medical
Records sharing
Prescription sharing
Compliance
Personalized medicine
DNA sequencing

Asset Titles
Diamonds
Designer brands
Car leasing & sales
Home Mortgages & payments
Land title ownership
Digital asset records

Government
Voting
Vehicle registration
WIC, Vet, SS, benefits, distribution
Licensing & identification
Copyrights

Identity
Personal
Objects
Families of objects
Digital assets
Multifactor Auth
Refugee tracking
Education & badging
Purchase & review tracking
Employer & Employee reviews

IoT
Device to Device payments
Device directories
Operations (e.g. water flow)
Grid monitoring
Smart home & office management
Cross-company maintenance markets

Payments
Micropayments (apps, 402)
B2B international remittance
Tax filing & collection
Rethinking wallets & banks

Consumer
Digital rewards
Uber, AirBNB, Apple Pay
P2P selling, craigslist
Cross company, brand, loyalty tracking

Supply Chain
Dynamic ag commodities pricing
Real time auction for supply delivery
Pharmaceutical tracking & purity
Agricultural food authentication
Shipping & logistics management

Microsoft

Azure Data Lake

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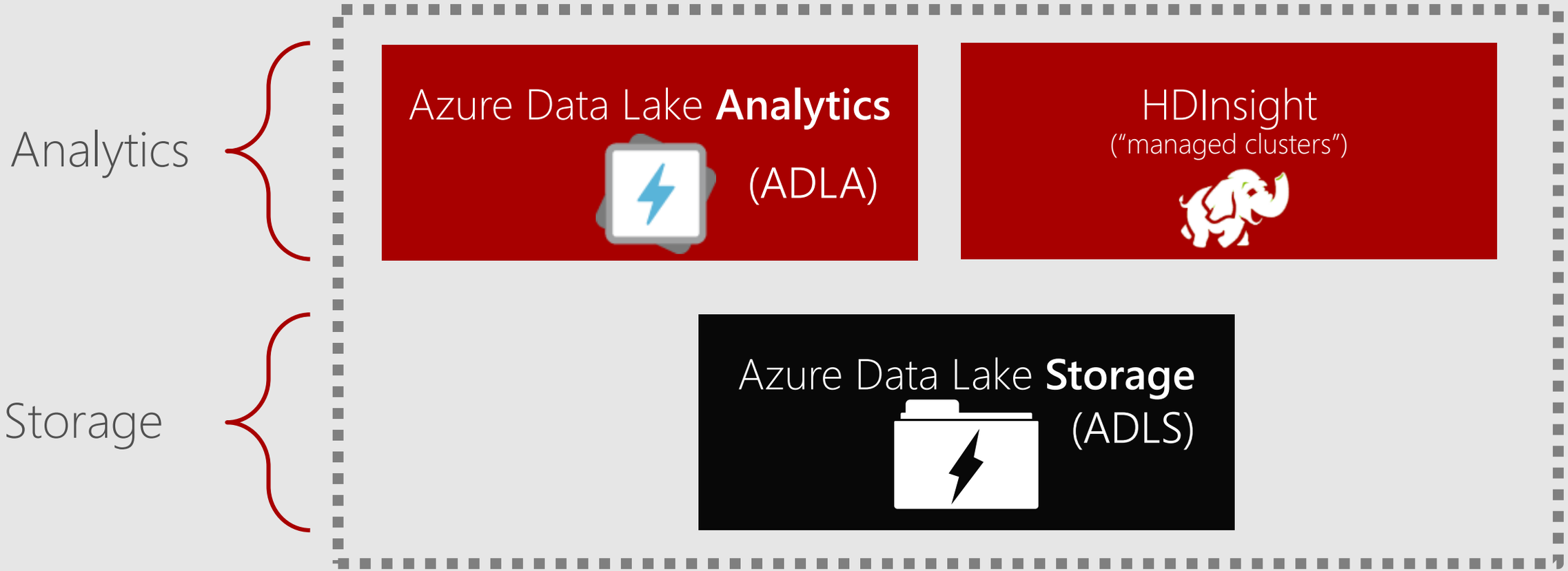
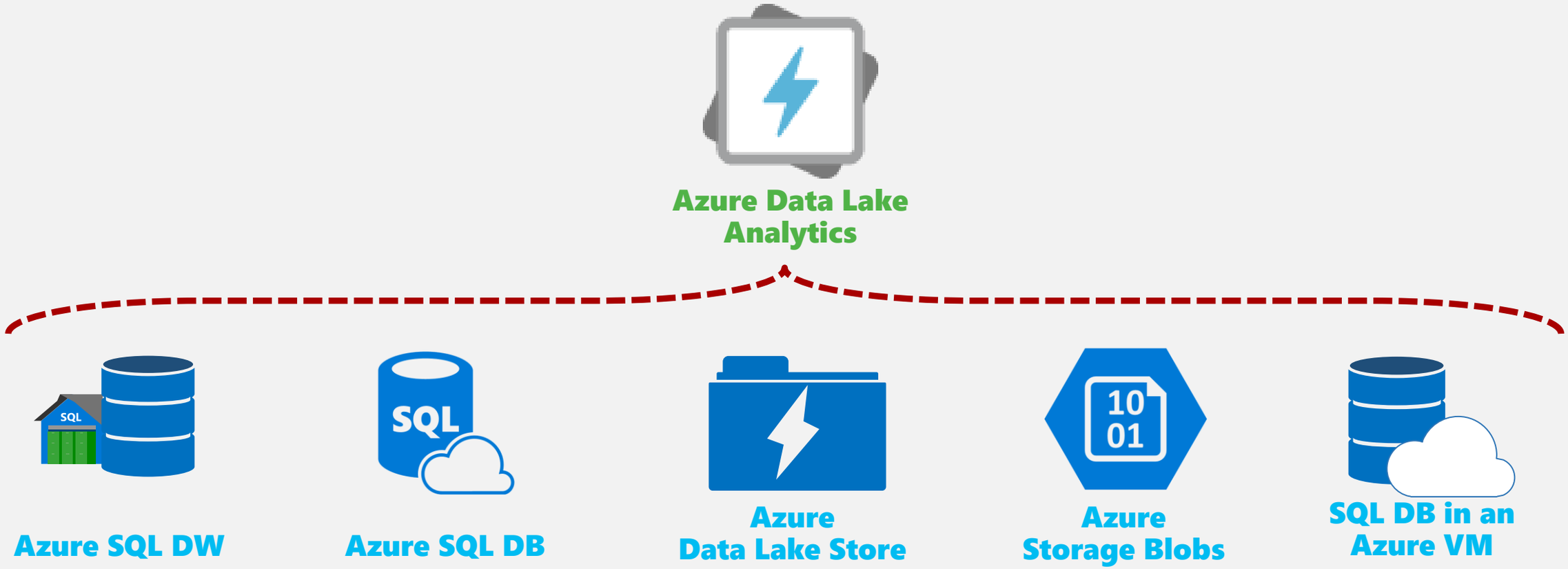
Azure Data Lake



The Intelligent Data Lake

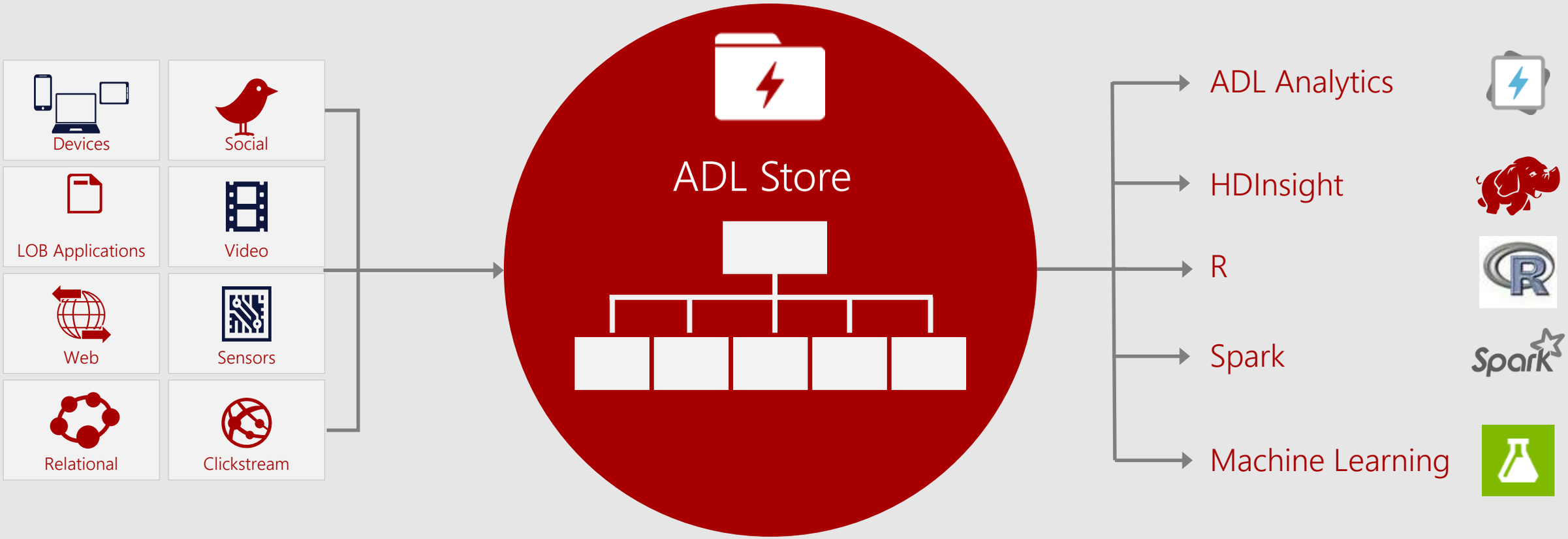
- Azure Data Lake Store - A No Limits Data Lake that powers Big Data Analytics
  - Petabyte sized files and trillions of objects
  - Scalability for massively parallel analytics Azure HDInsight
- Azure Data Lake Analytics - A On-Demand Analytics Job Service to power intelligent action
  - Start in seconds, scale instantly, pay per job
  - Develop massively parallel analytic programs with simplicity
  - Run Big Cognition at Petabyte Scale

ADLA: Work across all cloud data



ADLS: work with multiple analytic frameworks

A highly scalable, distributed, parallel file system in the cloud specifically designed to work with multiple analytic frameworks



Microsoft

Azure Storage

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Azure Storage

- Enables *large-scale storage* scenario
- Massively scalable
  - Elastic – scale as needed
  - High volume - store *hundreds of terabytes*
  - Durable
  - Highly-available
  - Low cost
- Pay only for what you use
- Exposed via RESTful Web services

Azure Storage Account

- It all starts with a storage account…
- Controls access to Azure Storage Services
- Supports four different storage models…
  - Tables (** not relational database tables **)
  - Blobs
  - Queues
  - Files
- Create up to 100 storage accounts per subscription
- Combined total storage of up to 500 TB per account

Azure Table Service

- Azure service that stores large amounts of denormalized, structured data in the cloud
- NoSQL, key-value store with schema-less design
- Highly available
- Cost-effective – (much) less expensive than relational database storage
- Considerations…
  - Supports massive data amounts (terabytes)
  - But, not complex joins, foreign keys or stored procedures
  - Fast querying on clustered indexes (partition and row keys)
  - Exposes Linq and OData querying capabilities

Azure Blob Storage

- Azure Blob storage is a service for storing large amounts of *unstructured object data*, such as text or binary data, that can be accessed via HTTP or HTTPS
- Common use cases for Blob storage…
  - Serving images or documents
  - Storing files for distributed access
  - Streaming video and audio
  - Storing data for backup and restore, disaster recovery, and archiving
  - Storing data for analysis by an on-premises or Azure-hosted service
  - Social data such as photos, videos, music, and blogs
  - Big data, such as logs and other large datasets

Azure Blob Storage

- Blob storage accounts expose the Access Tier attribute which can be specified during account creation and modified later as needed.
- There are two types of access tiers that can be specified based on your data access pattern:
  - A Hot access tier which indicates that the objects in the storage account will be more frequently accessed. You get a lower cost per-transaction.
    - Data that is in active use or expected to be accessed (read from and written to) frequently.
    - Data that is staged for processing and eventual migration to the cool storage tier.
  - A Cool access tier which indicates that the objects in the storage account will be less frequently accessed. This allows you to store data at a lower data storage cost.
    - Backup, archival and disaster recovery datasets.
    - Older media content not viewed frequently anymore but is expected to be available immediately when accessed.
    - Large data sets that need to be stored cost effectively while more data is being gathered for future processing. (*e.g.*, long-term storage of scientific data, raw telemetry data from a manufacturing facility)
    - Original (raw) data that must be preserved, even after it has been processed into final usable form. (*e.g.*, Raw media files after transcoding into other formats)
    - Compliance and archival data that needs to be stored for a long time and is hardly ever accessed. (*e.g.*, Security camera footage, old X-Rays/MRIs for healthcare organizations, audio recordings and transcripts of customer calls for financial services)

Queue Storage

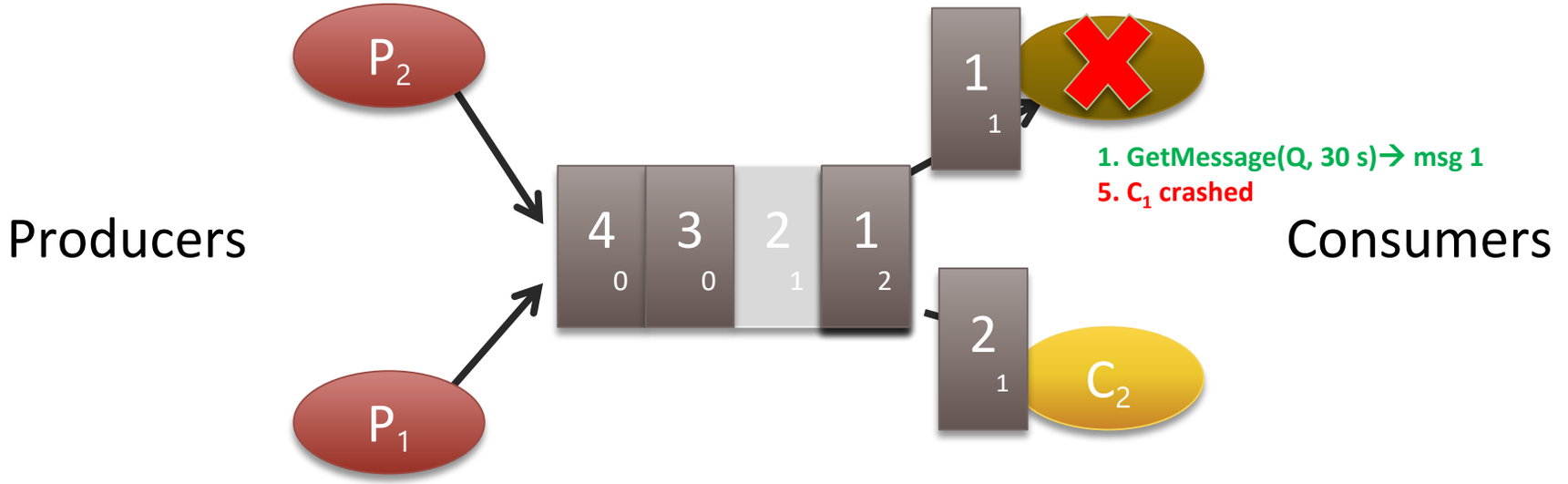
- Simple asynchronous dispatch queue
  - **Limit to queue length ~ subject to storage limit**
  - **64 KB per message**
  - List queues—list queues in account
- SAS Security
- HTTP/REST queue operations
  - CreateQueue
  - DeleteQueue
  - Get/Set Metadata
  - Clear Messages
- HTTP/REST message operations
  - PutMessage—adds a message to the queue
  - GetMessages—reads one or more messages and hides them
  - PeekMessages—reads one or more messages without hiding them
  - DeleteMessage—permanently deletes messages from queue

Add Message to Queue (C#)

```
Random rnd = new Random();
var storageAccount = CloudStorageAccount.FromConfigurationSetting("DataConnectionString");

// initialize queue storage
CloudQueueClient queueStorage = storageAccount.CreateCloudQueueClient();
queue = queueStorage.GetQueueReference("trmessages");
queue.CreateIfNotExist();

while (true)
{
    int target = rnd.Next(0, 3);
    int data = rnd.Next(target * 10, (target + 1) * 10);

    TR12Message.TR12Message msg = new TR12Message.TR12Message(target, data);

    queue.AddMessage(new CloudQueueMessage(msg.ToString()));

    Thread.Sleep(50);
}
```

Queue Storage Reliability

- Guarantee delivery/processing of messages (two-step consumption)
  - Worker de-queues message and it is marked as Invisible for a specified Invisibility Time
  - Worker deletes message when finished processing
  - If worker role crashes, message becomes visible for another worker to process
  - Remember to handle poison messages, remove messages if de-queue count is above the threshold
  - No guarantee that a message won't be picked up by multiple receivers



Azure Files - Scenarios

- Files – A PaaS solution to a network share in cloud
- Share data across VMs and applications
  - Multiple writers, multiple readers using standard file system semantics.
- Share settings throughout services
  - VMs can read settings and files from a common, shared location. These can be updated externally via REST.
- Dev/Test/Debug
  - Very useful to have a shared location for installing applications, setting up VMs, running tools, and keeping notes while developing, testing, and debugging cloud services.

Other good uses:

- Migrating on-premises applications that rely on file shares to run on Azure virtual machines or cloud services, without expensive rewrites
- Storing shared application settings, for example in configuration files
- Storing diagnostic data such as logs, metrics, and crash dumps in a shared location
- Storing tools and utilities needed for developing or administering Azure virtual machines or cloud services

Durability Options

- Data redundancy and replication, options include…
  - Locally Redundant Storage (LRS)
    - Stores 3 replicas of the data within a single zone (facility) in a single region
    - Single facility, but different fault and upgrade domains
    - Protects against disk, node and rack failures, but not from the failure of a single data center.
  - Zone Redundant Storage (ZRS)
    - Stores 3 replicas across multiple zones (facilities) within a single region or across regions
    - ZRS ensures that your data is durable within a single region.
    - *ZRS is currently available only for block blobs, and is only supported for versions 2014-02-14 and later. Once you have created your storage account and selected ZRS, you cannot convert it to use to any other type of replication, or vice versa.*
  - Geo Redundant Storage (GRS)
    - Stores 6 replicas of the data across two regions (3 replicas in each region)
    - Protects against regional natural disasters
    - Updates across regions performed asynchronously
    - *For maximum durability, we recommend that you use geo-redundant storage
  - Read-Access Geo Redundant Storage (GRS)
    - Similar to Geo-Redundant, but enable read-only access to secondaires
    - Default option for your storage account when you create it

Microsoft

Azure Service Bus

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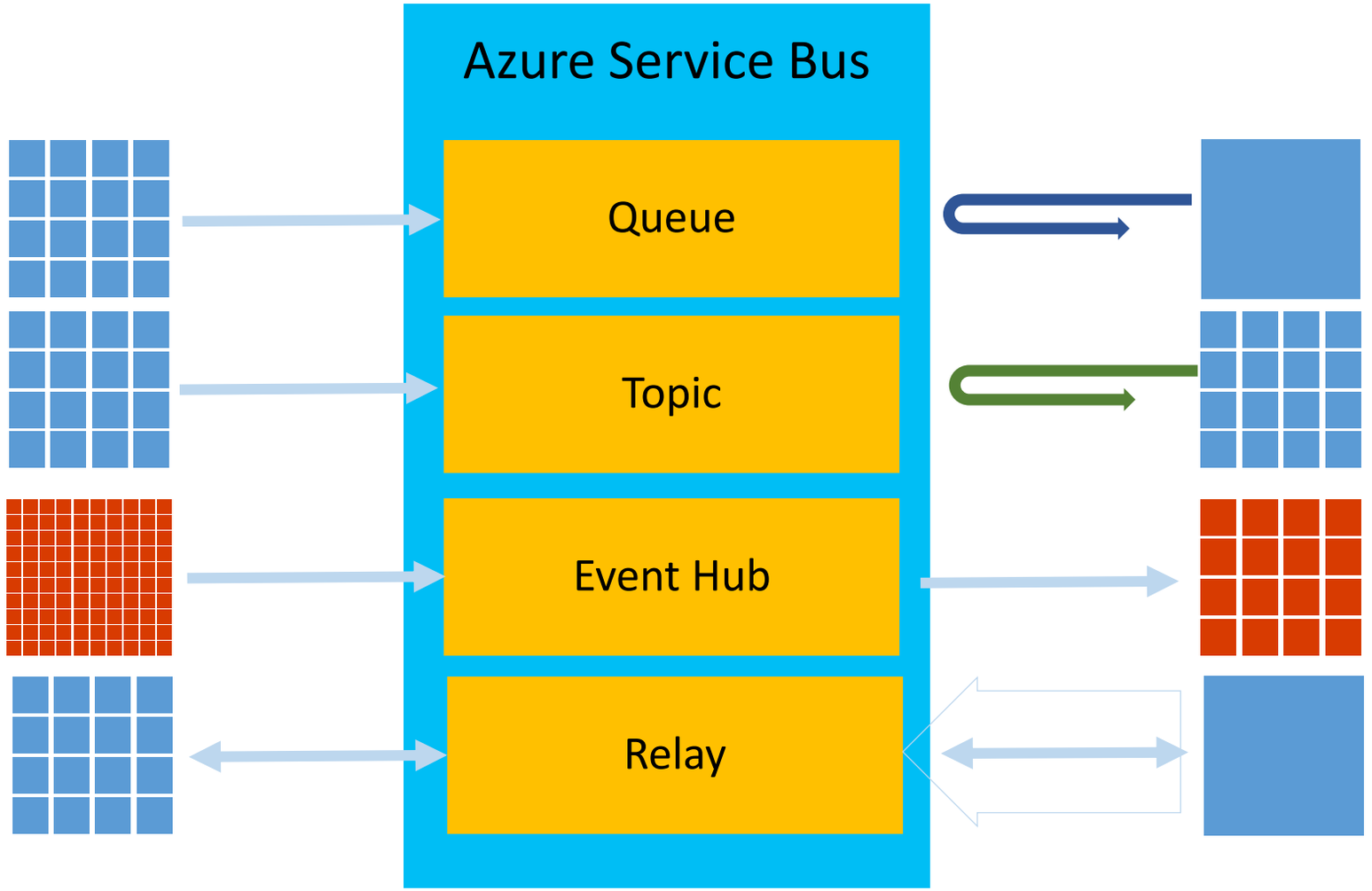
Why use the Azure Service Bus?



Transactional Cloud AMQP/HTTP Broker
High-Scale, High-Reliability Messaging
Sessions, Scheduled Delivery, etc.

Transactional Message Distribution
Up to 2000 subscriptions per Topic
Up to 2K/100K filter rules per subscription

Cloud-scale telemetry ingestion from
websites, apps, and devices

NAT and Firewall Traversal Service
Request/Response Services
Unbuffered with TCP Throttling

Use Microsoft Azure Storage Queues When

- Your application needs to store over **5 GB** worth of messages in a queue, where the messages have a lifetime shorter than seven days
- Your application requires flexible leasing to process its messages. This allows messages to have a very short lease time, so that if a worker crashes, the message can be processed again quickly
- Your application wants to track progress for processing a message inside the message
- You require server-side logs of all of the transactions executed against your queue

Use Service Bus Queues When

- You require full integration with the WCF communication stack in the .NET Framework
- Your solution needs to be able to support automatic duplicate detection
- You need to be able to process related messages as a single logical group
- Your solution requires transactional behavior and atomicity when sending or receiving multiple messages from a queue
- The Time to Live (TTL) characteristic of the application-specific workload can exceed the seven-day period
- Your application handles messages that can exceed 64 KB, but will not likely approach the **256 KB** limit
- Your solution requires the queue to provide a guaranteed First In, First Out (FIFO) ordered delivery

Use Service Bus Queues When (continued)

- Your solution must be able to receive messages without having to poll the queue
- You deal with a requirement to provide a role-based access model to the queues, and different rights/permissions for senders and receivers
- Your queue size will not grow larger than 5 GB
- You can envision an eventual migration from queue-based point-to-point communication to a message exchange pattern (pub/sub)
- Your messaging solution needs to support the At-Most-Once delivery guarantee without the need for you to build the additional infrastructure components
- You would like to publish and consume message batches

Microsoft

Event Hubs

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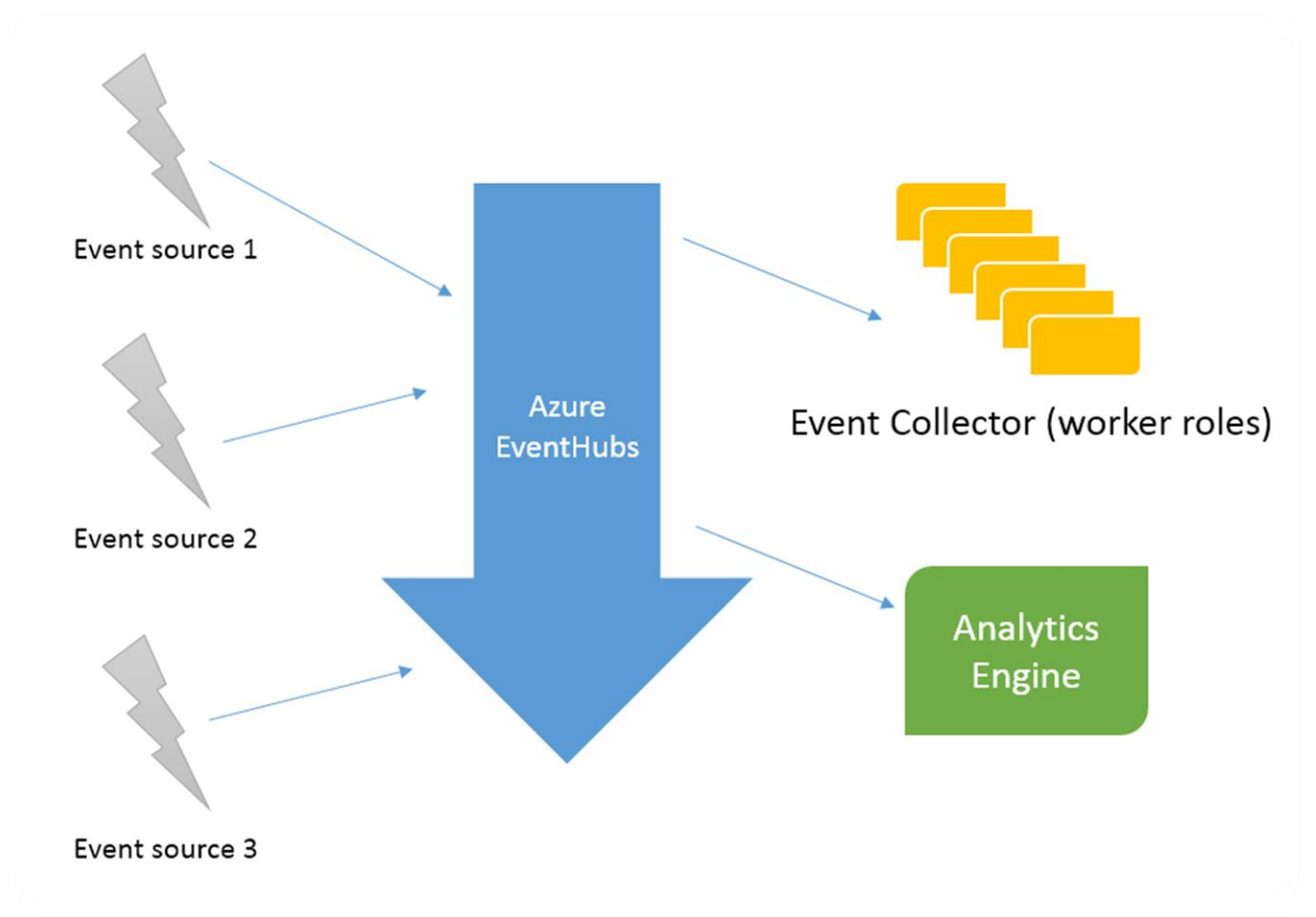
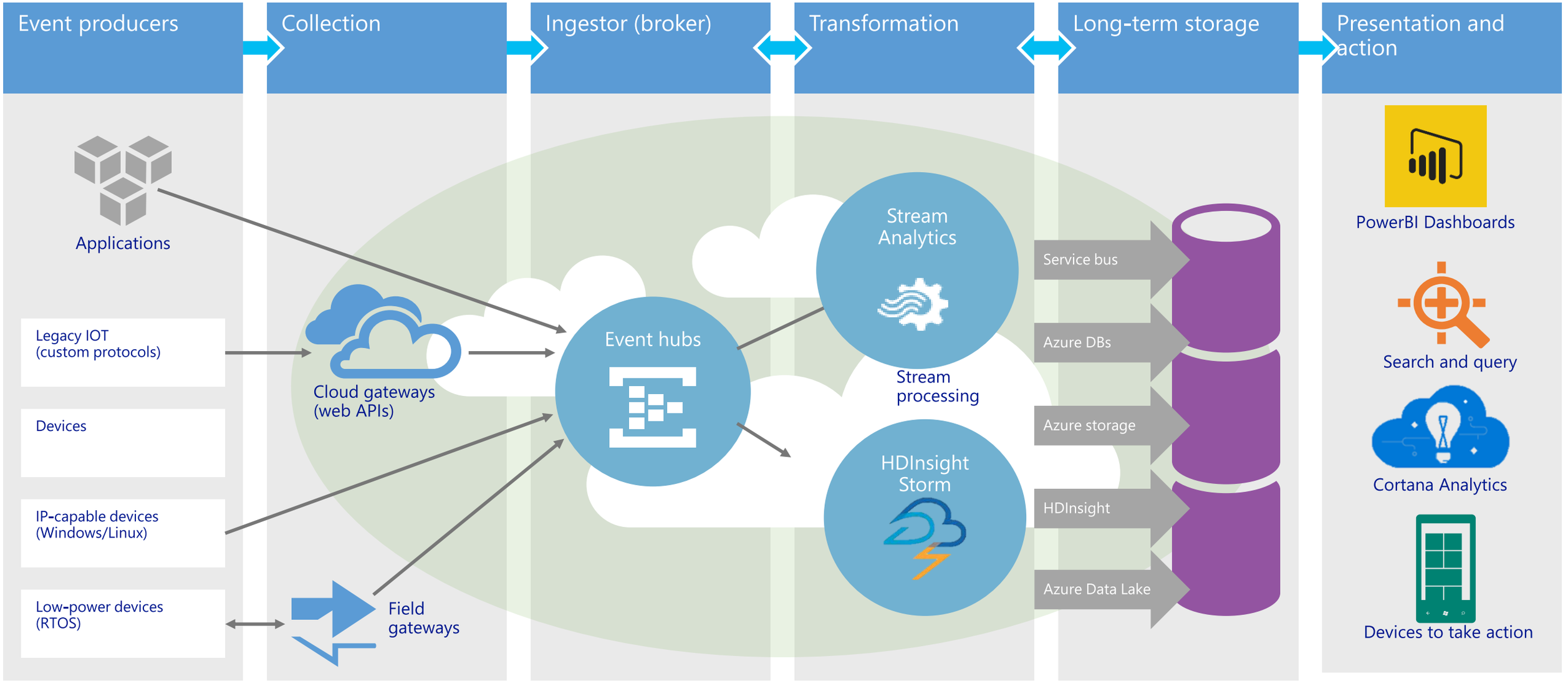
Event Hubs - Overview



Azure Architecture for Processing Events



Queues and Topics != Event Hubs

Queues & Topics

- Unit of Work = Message
- Lightweight Infrastructure w/ Heavyweight messaging
- Specific, significant actions
- Like shipping a package
  - Fine grained rich options at message level

Event Hubs

- Unit of Work = Stream
- Heavyweight Infrastructure w/ Lightweight messaging
- Click / App / Telemetry stream
- Like shipping a pallet
  - Coarse options at stream level

Microsoft

CosmosDB

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Azure Cosmos DB Evolution

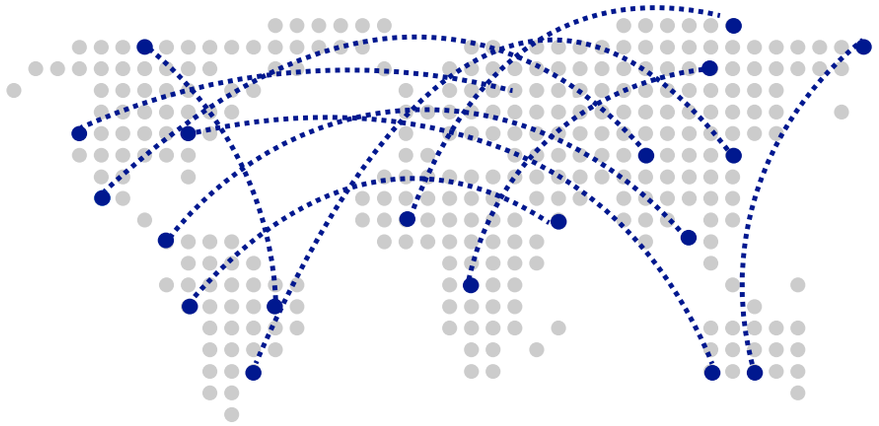
- Originally started to address the problems faced by large scale apps inside Microsoft
- Built from the ground up for the cloud
- Used extensively inside Microsoft
- One of the fastest growing services on Azure

2010 — Project Florence

2014 — DocumentDB

2015

2017 — Cosmos DB



Turnkey Global Distribution

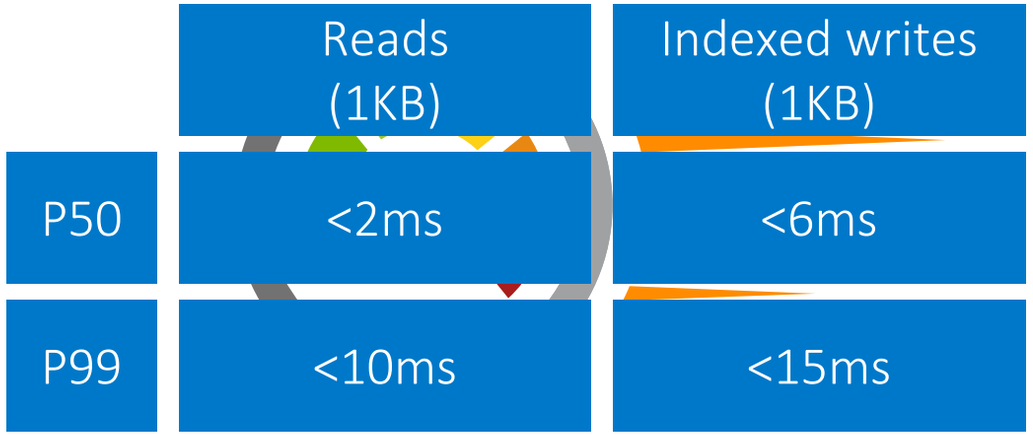
Worldwide presence as a Foundational Azure service

Automatic multi-region replication

Multi-homing APIs

Manual and automatic failovers

Designed for High Availability



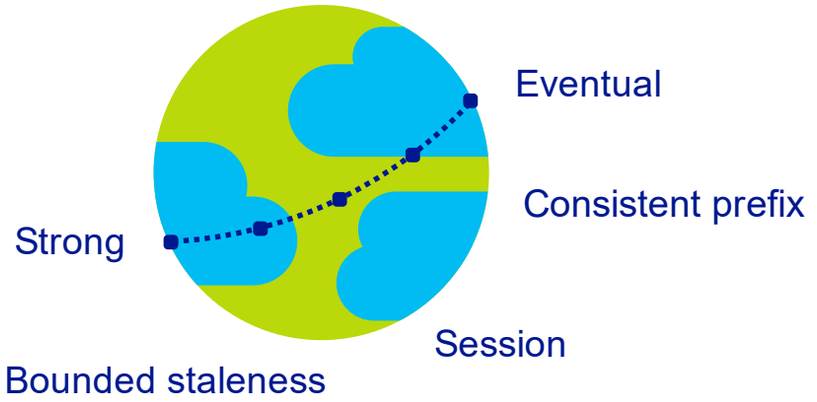
Guaranteed low latency at P99 (99th percentile)

Requests are served from local region

Single-digit millisecond latency worldwide

Write optimized, latch-free database engine designed for SSD

Synchronous automatic indexing at sustained ingestion rates



Multiple, well-defined consistency choices

Global distribution forces us to navigate the CAP theorem

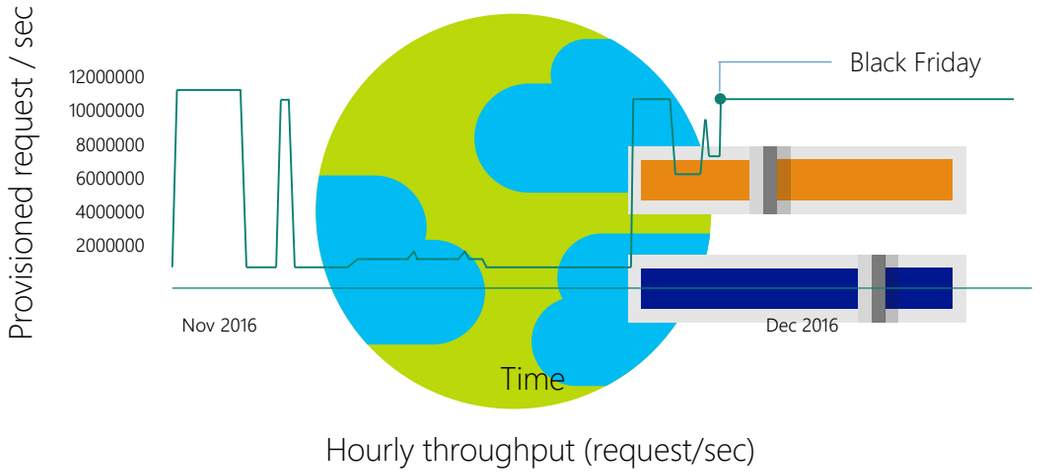
Writing correct distributed applications is hard

Five well-defined consistency levels

Intuitive and practical with clear PACELC tradeoffs

Programmatically change at anytime

Can be overridden on a per-request basis



Hourly throughput (request/sec)

Elastically scalable storage and throughput

Single machine is never a bottle neck

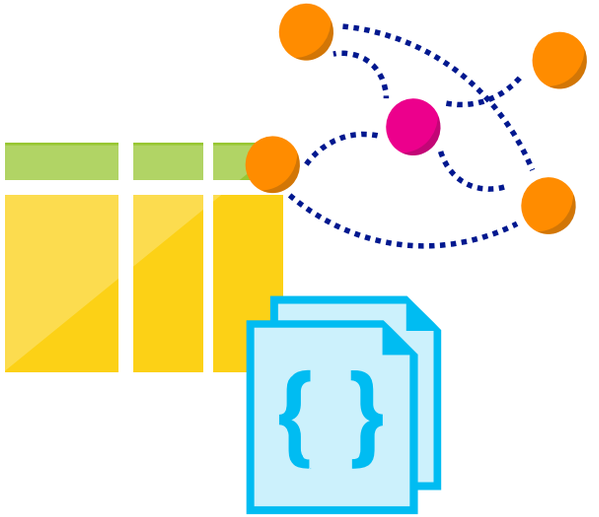
Transparent server-side partition management

Elastically scale storage (GB to PB) and throughput (100 to 100M req/sec) across many machines and multiple regions

Automatic expiration via policy based TTL

Pay by the hour, change throughput at any time for only what you need

Support for both request per second and requests per minute to handle spikes cost-effectively



Multi-model, multi-API

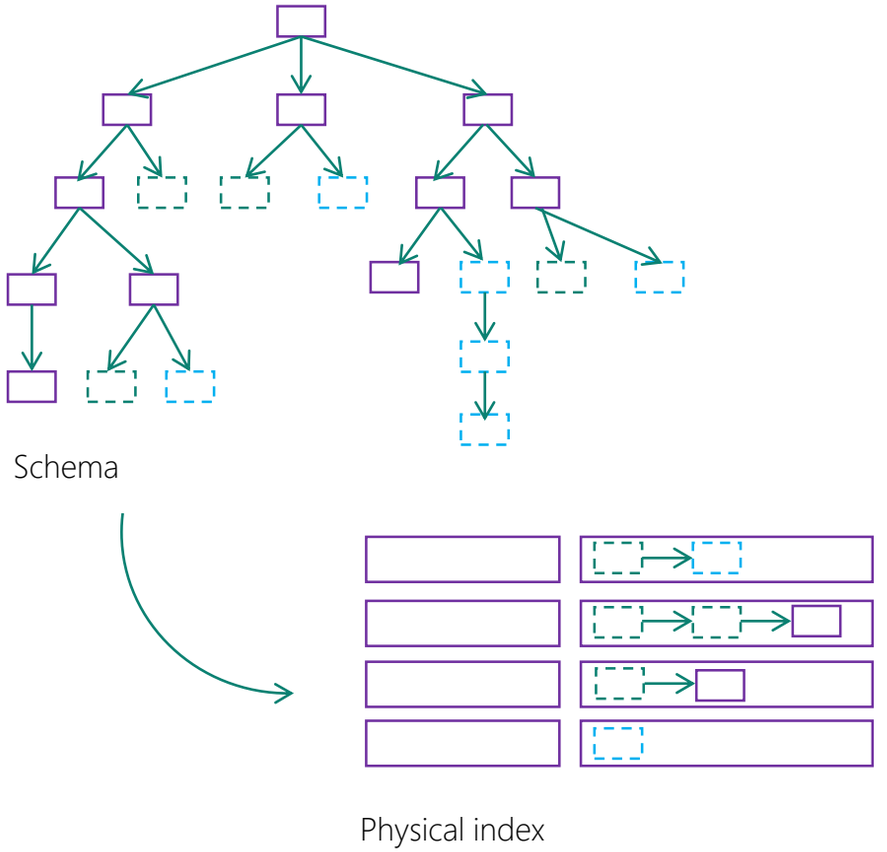
Database engine operates on Atom-Record-Sequence type system

All data models can be efficiently translated to ARS

Multi-model: Key-value, Document, and Graph

Multi-API: SQL (DocumentDB), MongoDB, Table, and Gremlin

More data-models and APIs to be added



Schema-agnostic, automatic indexing

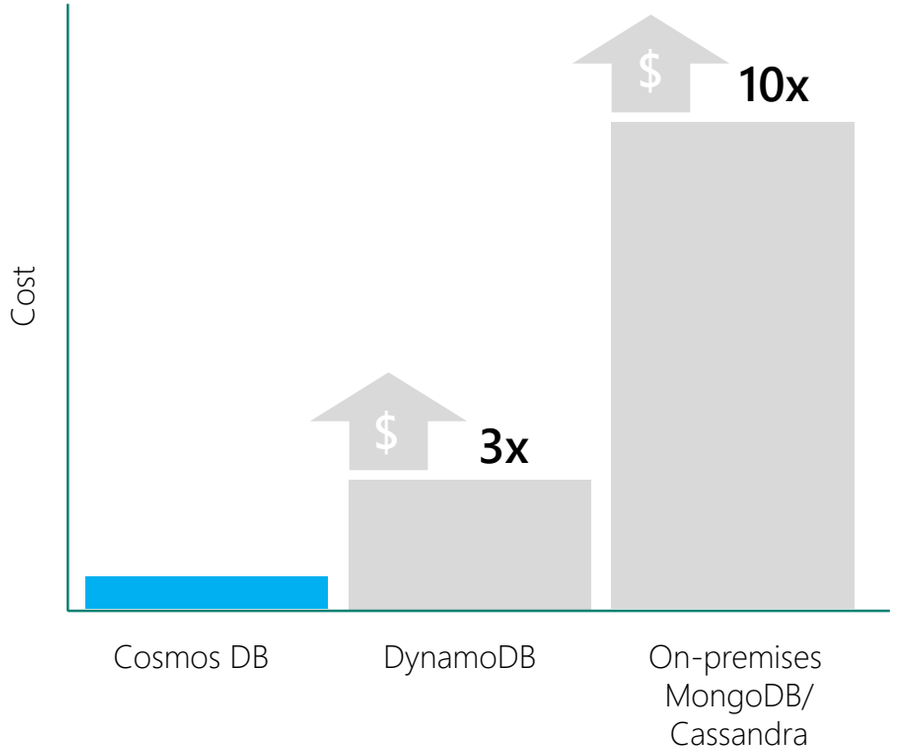
At global scale, schema/index management is painful

Automatic and synchronous indexing

Hash, range, and geospatial

Works across every data model

Highly write-optimized database engine



Lowest Total Cost of Ownership (TCO)

Deeply exploit cloud core properties and economies of scale

Significantly cheaper than DynamoDB, Cassandra, Cloud Spanner and MongoDB

Designed from the ground up as a multi-tenant service with end-to-end resource governance to provide performance isolation.

Fully managed as a service - no dev/ops expenses needed

Microsoft

Application Insights

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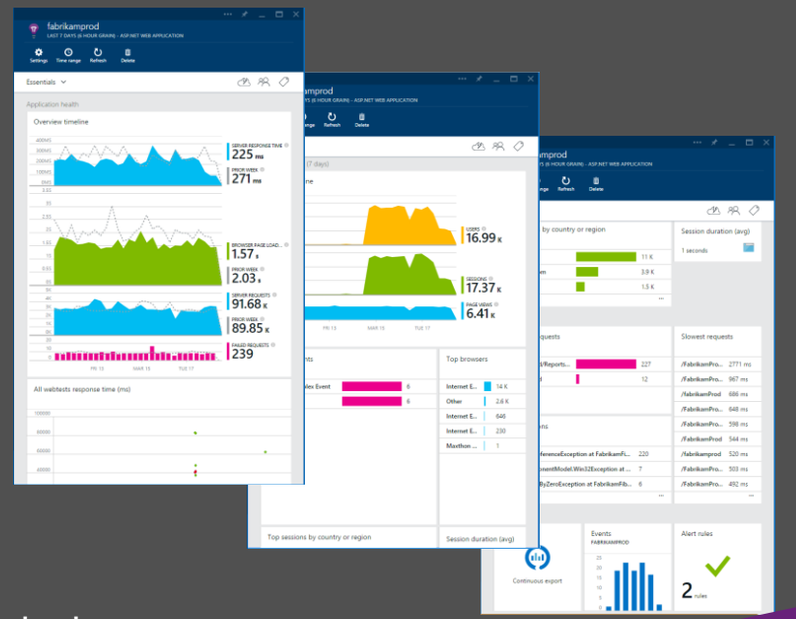
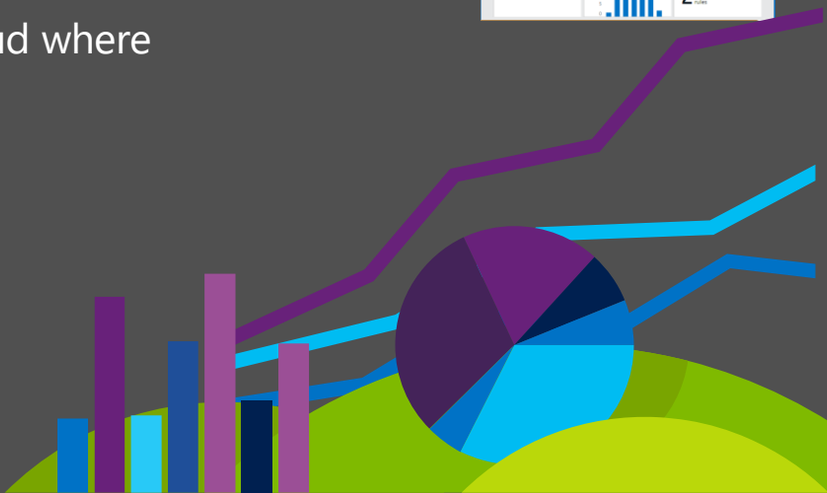
What is Application Insights?

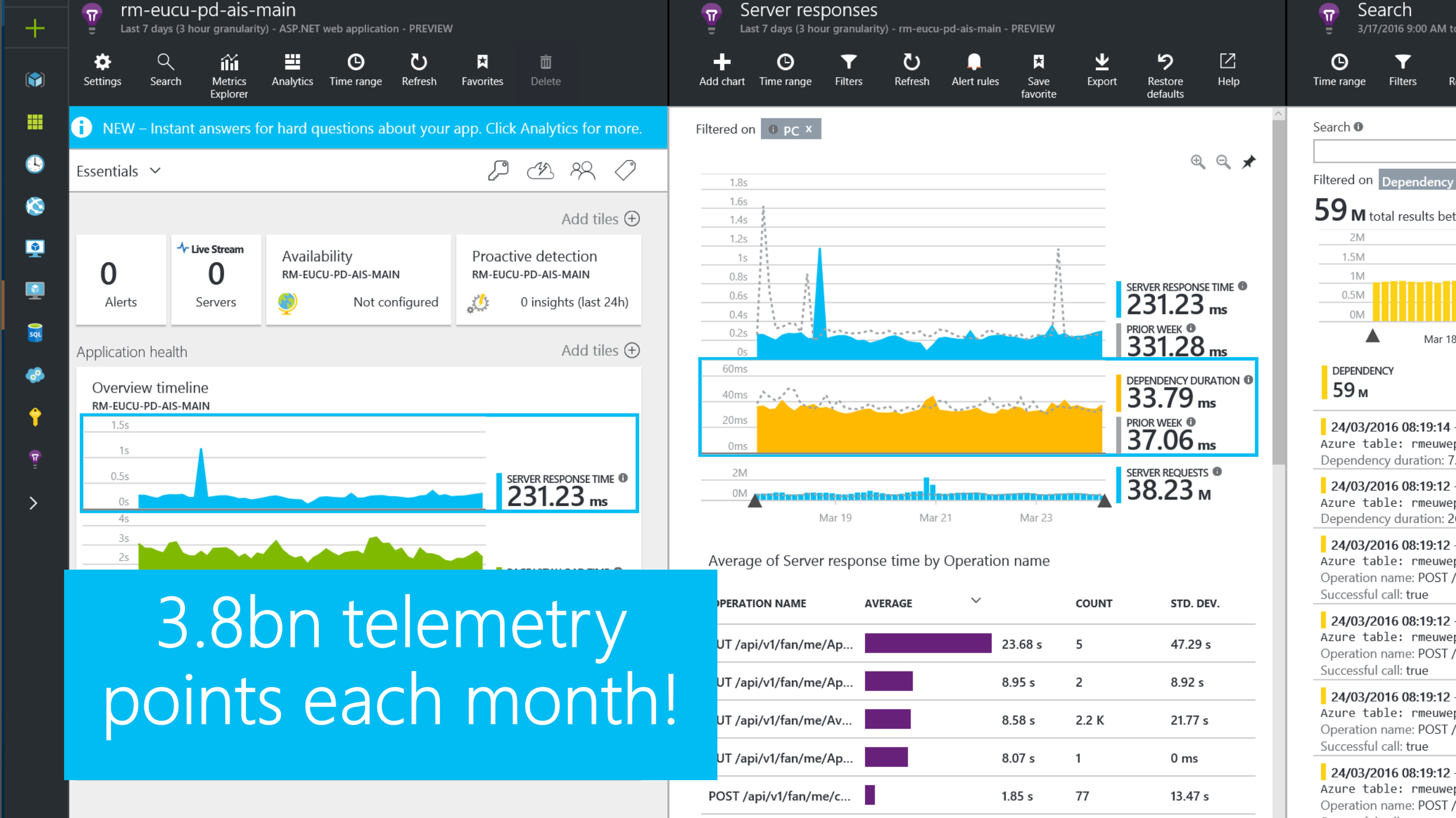
1 Telemetry is collected at each tier: server backend, middleware, web service & browser

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

3 Identify, understand and resolve issues with powerful out-of-the-box and custom telemetry







3.8bn telemetry points each month!

New capabilities

Intelligent APM: Proactively Detect, Triage and Diagnose

Analytics: Instant Answers with Ad-hoc Queries

DevOps: Integration and Extensibility

Intelligent APM: Detect, Triage & Diagnose

Detect

Proactive alerts, dashboards and live-stream metrics

Triage

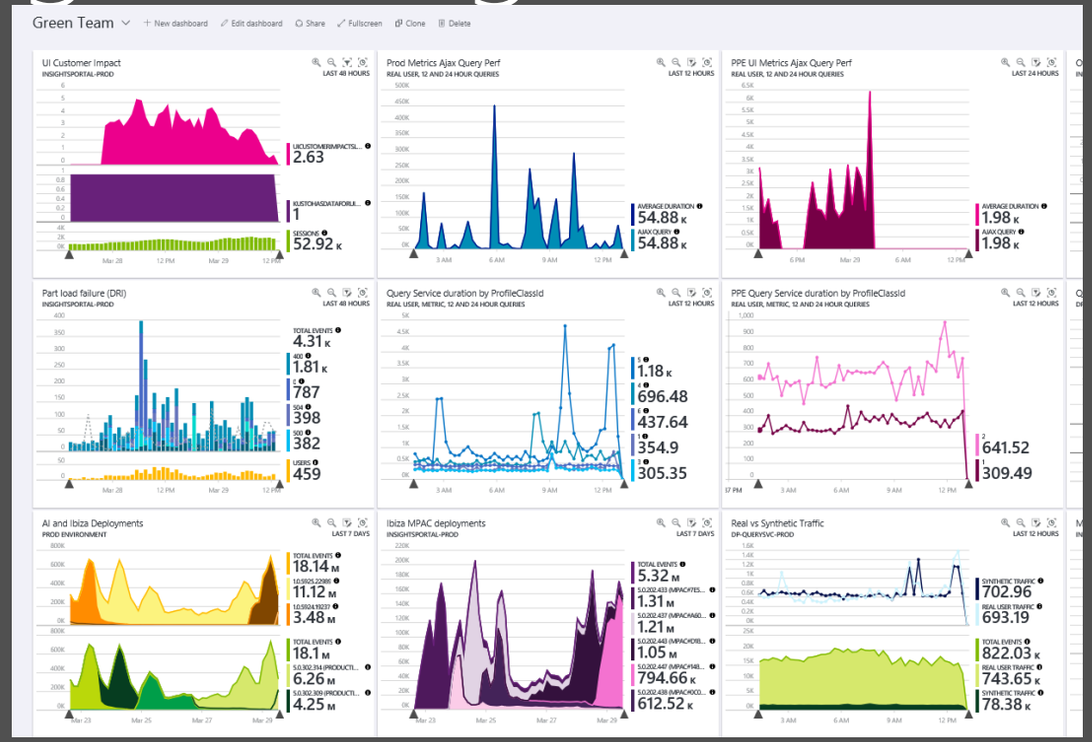
Application map and real user impact

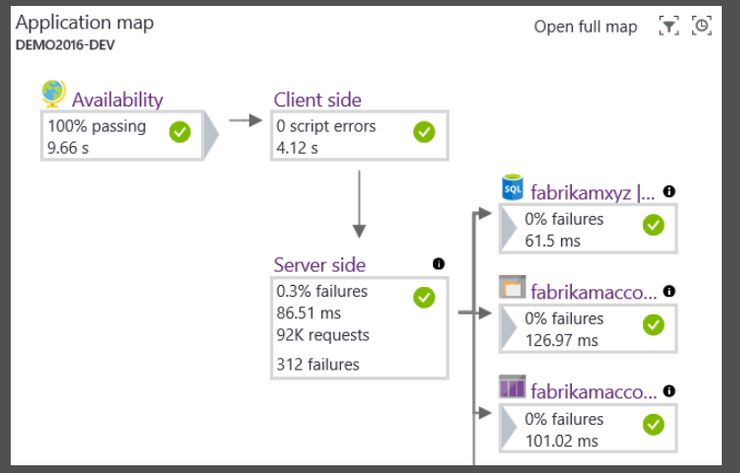
Diagnose

Exceptions, performance issues, dependency failures and Azure role lifecycle issues

Operationalize

Alerts based on metrics/traces/events/APM data





Customer story

"Application Insights provided us with the missing part of the equation for being able to combine, sort, query and filter data as needed.

Allowing our team to use their own ingenuity and experience to find data with a powerful query language has allowed us to find insights and solve problems we didn't even know we had.

A lot of interesting answers come from the questions starting with '*I wonder if*' …"

CMS Platform that powers rich interactive websites and intranets

Flexibility and extensibility

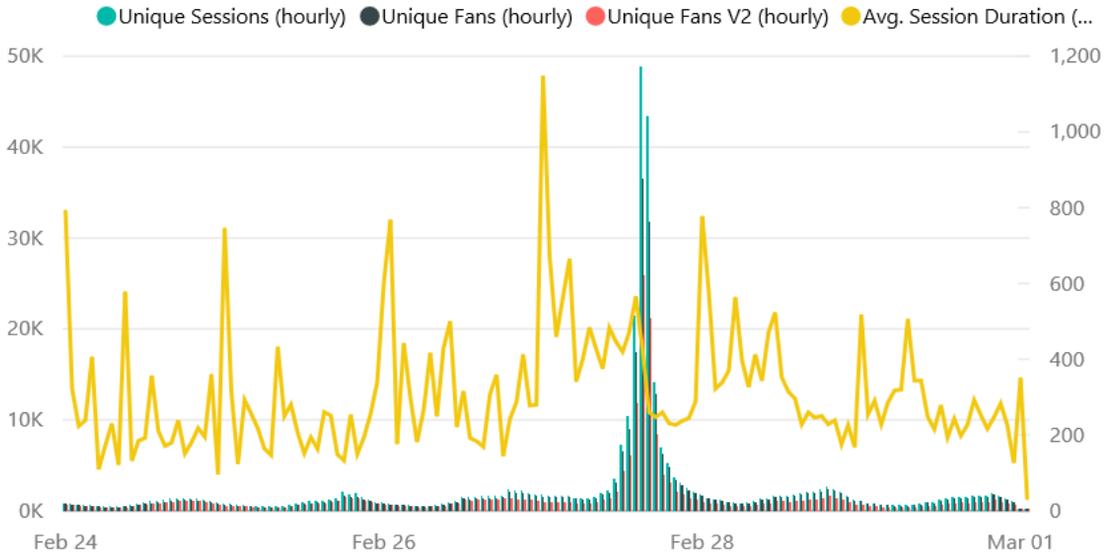
- Open Source SDKs to power insights for any web app
- Continuously export data to Azure Blob Storage or SQL
- Get immediate alerts via emails & web-hooks integration
- Visualize data with Power BI Content Pack

Realmadric

Unique Sessions and Fans by Hour

Start Date 24/02/20... | Last Date 01/03/2016

Unique Session, Fans, and Avg. Sessions Duration by Hours

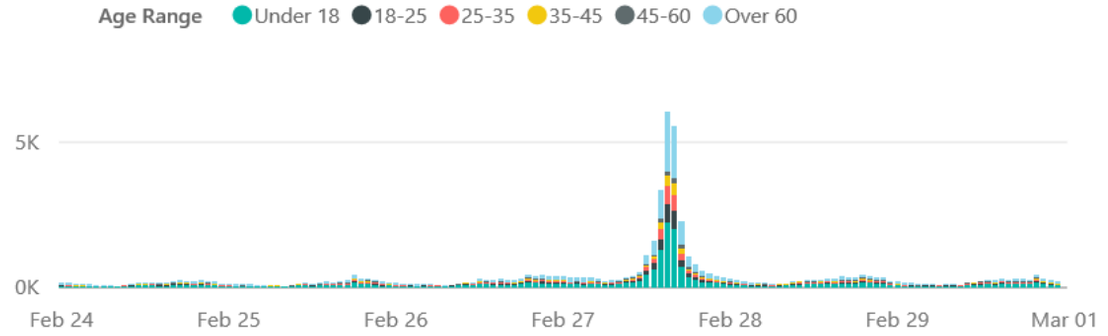


Unique Fans (hourly) by Country

Day
- 24/02/2016
- 25/02/2016
- 26/02/2016
- 27/02/2016
- 28/02/2016
- 29/02/2016
- 01/03/2016

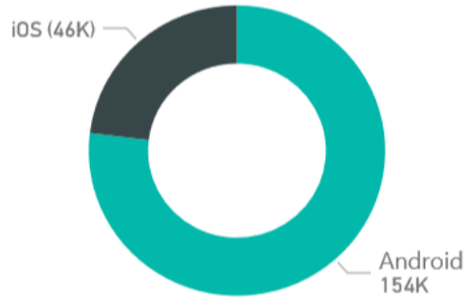
Gender
- Female
- Male
- Unknown

Unique Fans by Date and Age Range



341
Avg. Session Duration (hourly)

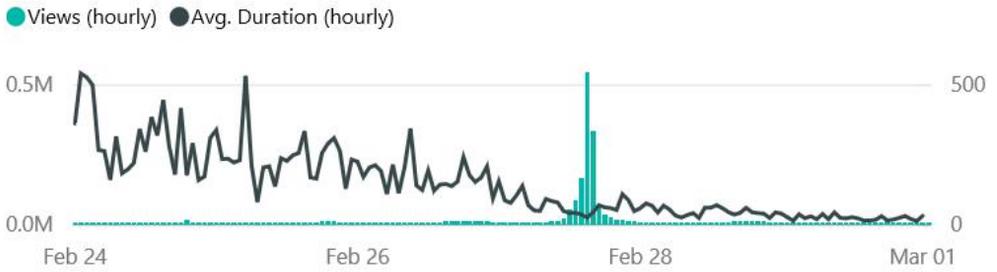
1.19
Sessions by Fan Ratio (hourly)



Profile Level
- (Blank)
- None
- Bronze
- Silver
- Gold
- Platinum
- Diamond

Realmadric

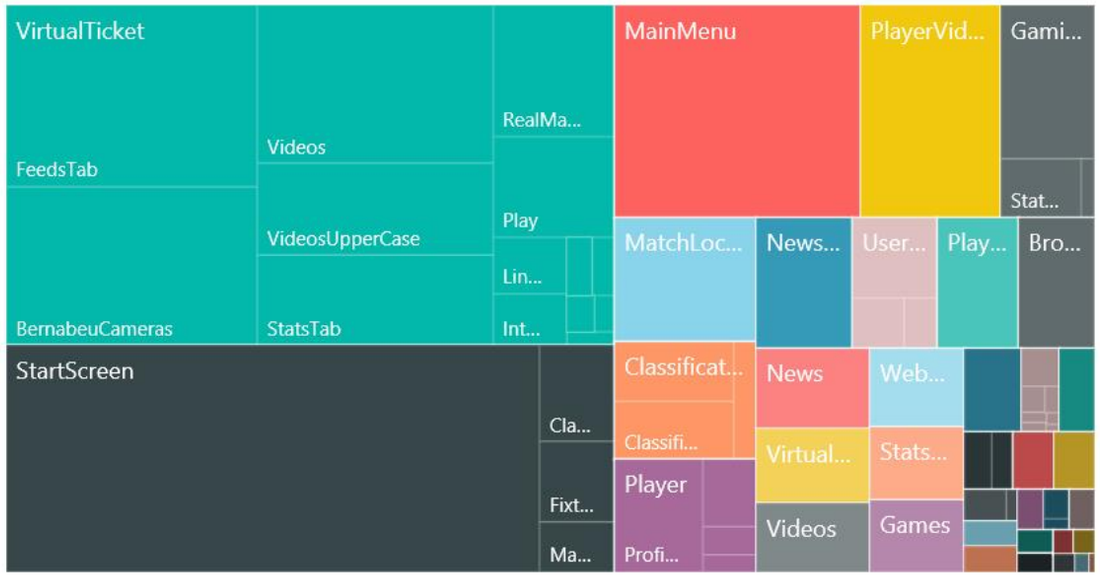
Navigation by Hour



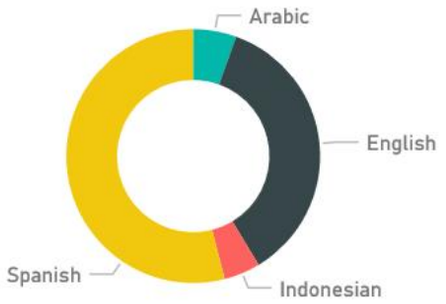
Day
- 24/02/2016
- 25/02/2016
- 26/02/2016
- 27/02/2016
- 28/02/2016
- 29/02/2016
- 01/03/2016

Profile Level
- (Blank)
- None
- Bronze
- Silver
- Gold
- Platinum
- Diamond

Age Range
- Unknown
- Under 18
- 18-25
- 25-35
- 35-45
- 45-60
- Over 60



View
- ApplicationSettings
- Badges
- Browser
- BuyCoins
- Checkin
- Checkins
- Classification
- ClassificationPH
- Coins
- CompetitionStats
- ExtendedSplashScreen
- Games
- GamificationPage
- GamificationStatus
- Inbox
- InboxDetail
- MainMenu
- MatchFinderList
- MatchLocation
- News
- NewsList
- NotificationActivity



Microsoft

Power BI

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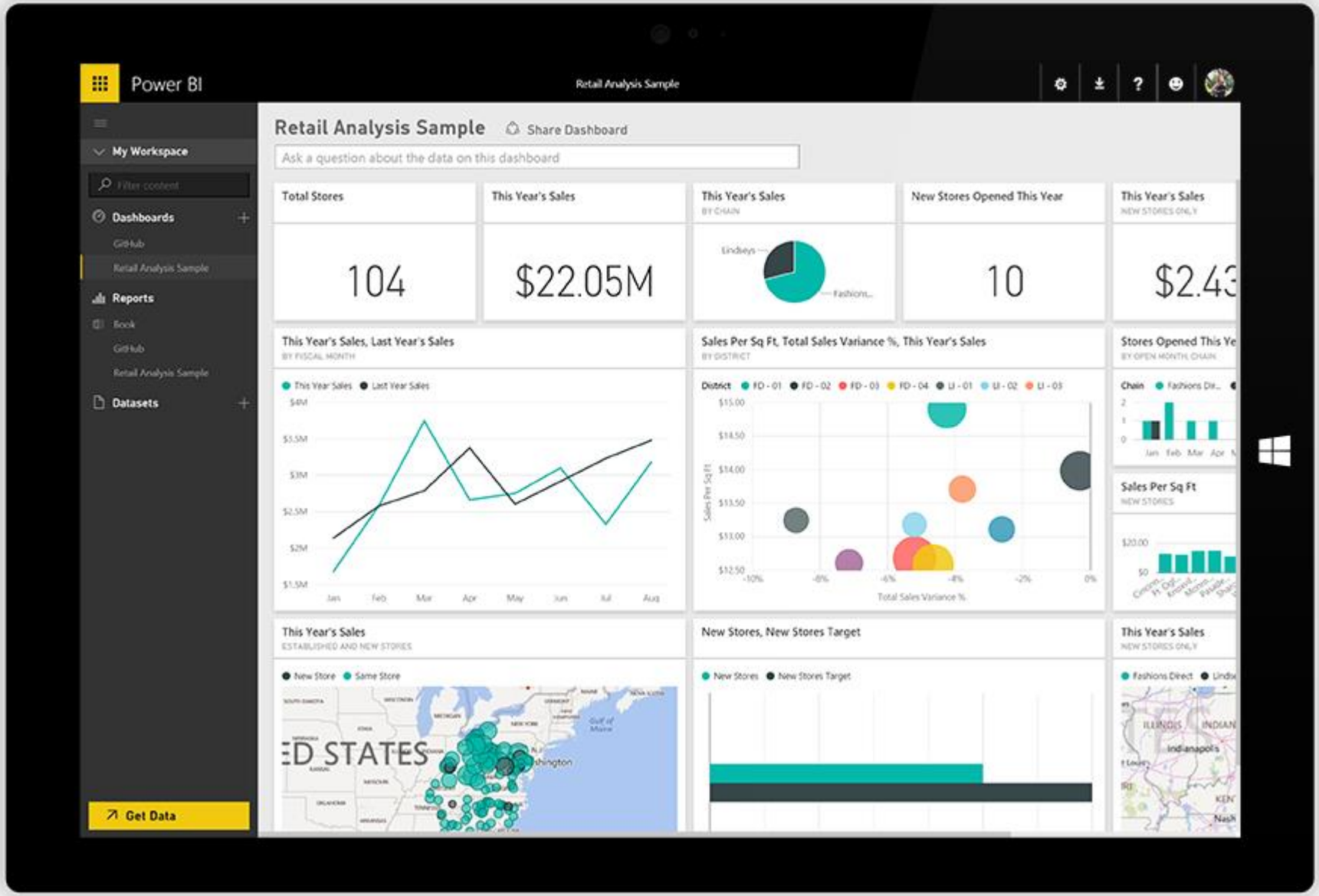
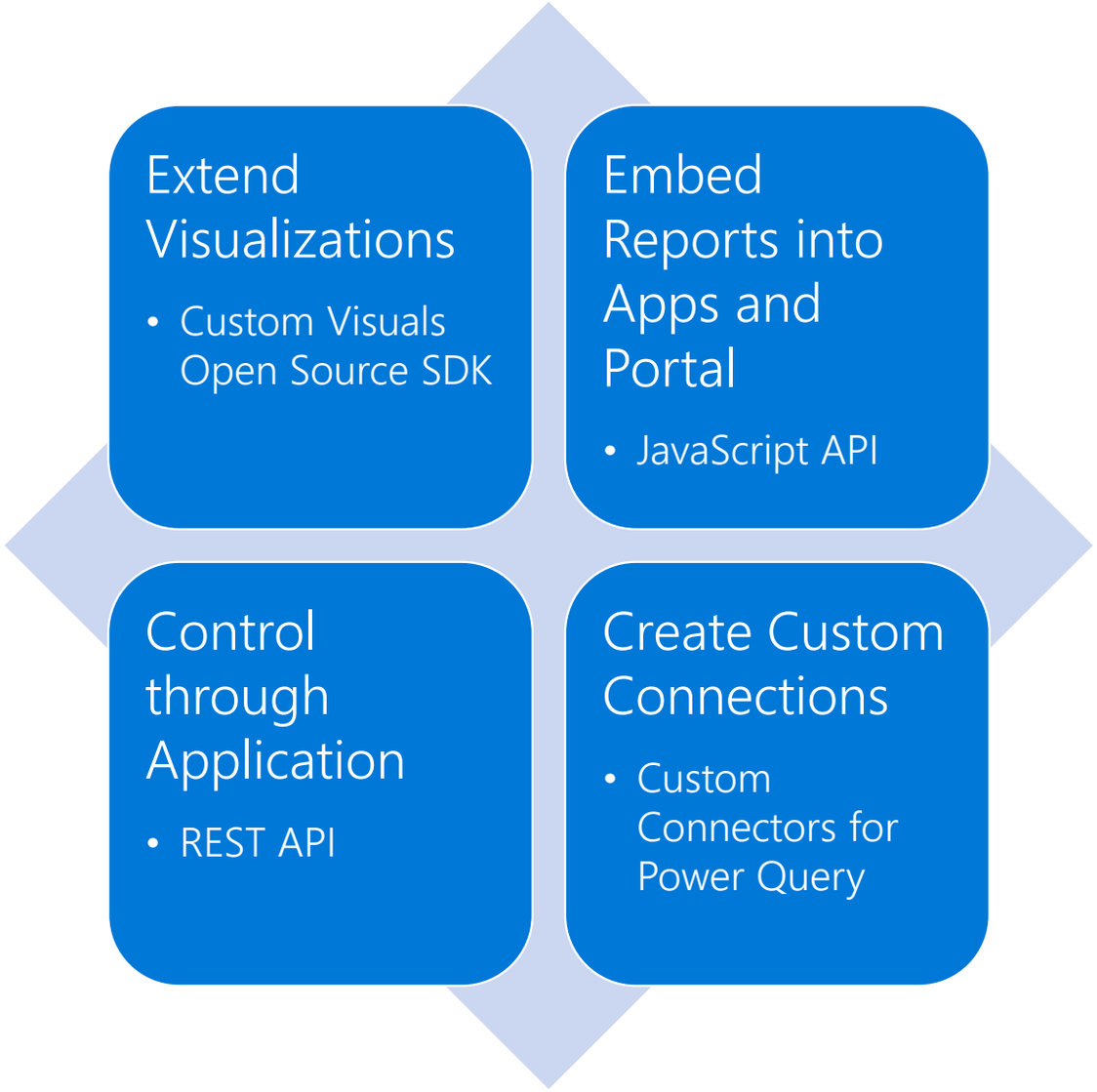
Introduction to Power BI



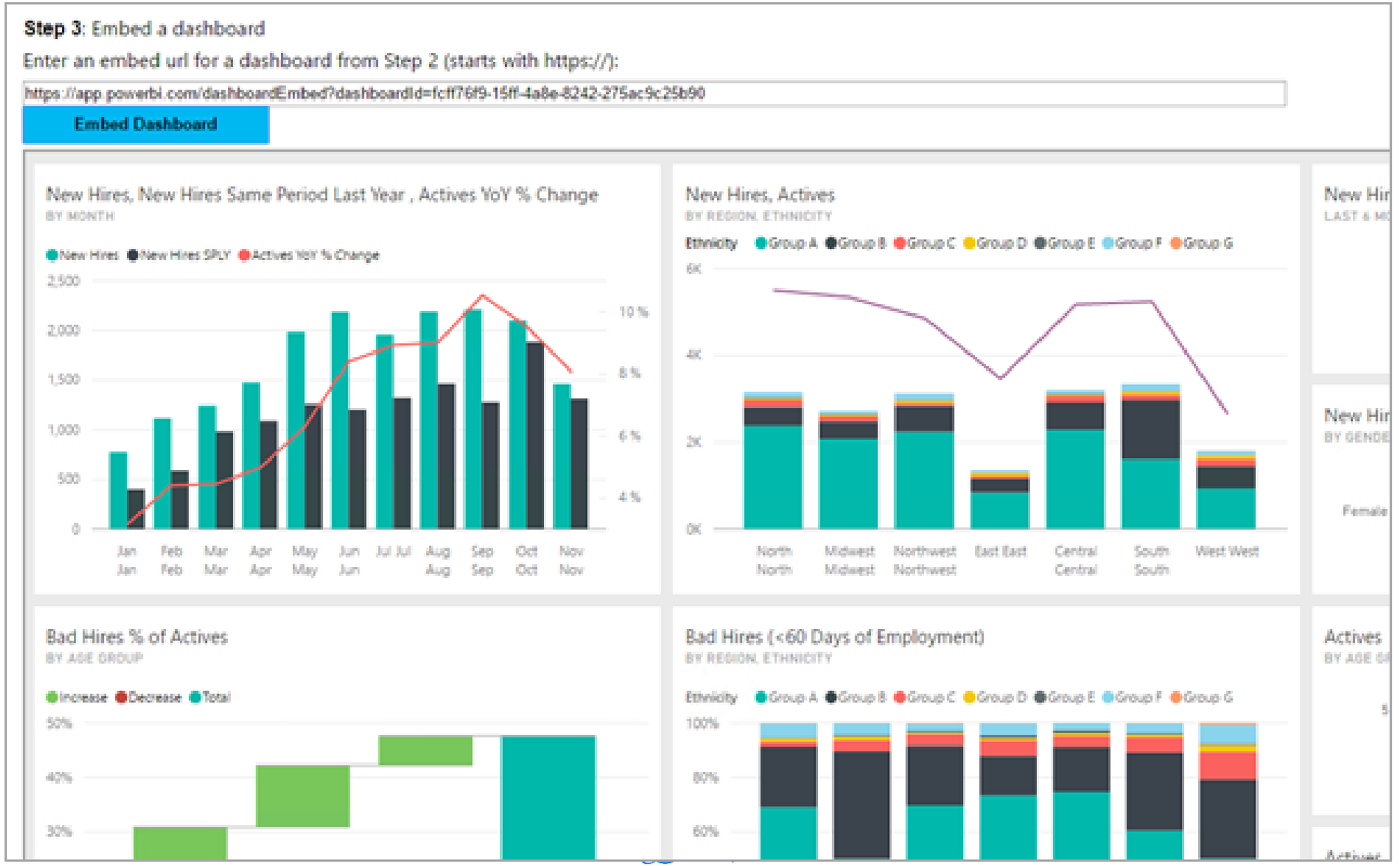
Opportunities for Developers



What you can do with Power BI REST API?

- Integrate Power BI Content (Dashboard, Tile, Report) into an Application
- Push Data from an Application into Power BI Dataset
- Control Gateways, Data Sources, Refresh, Data Sets…

Embedding Power BI into App



Product Sales - Power BI Desktop

File Home

Cut Copy Paste | Clipboard

Get Data Recent Sources Edit Queries | External Data

Refresh

Text Box Image | Insert

New Page | Report

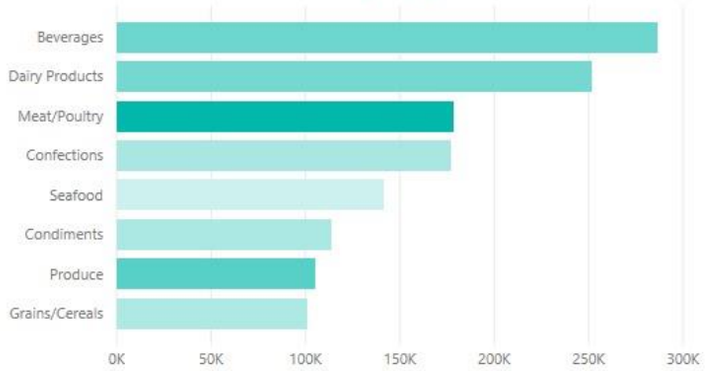
Manage Relationships | Relationships

New Measure New Column | Calculations

Publish | Share

Sales Analysis

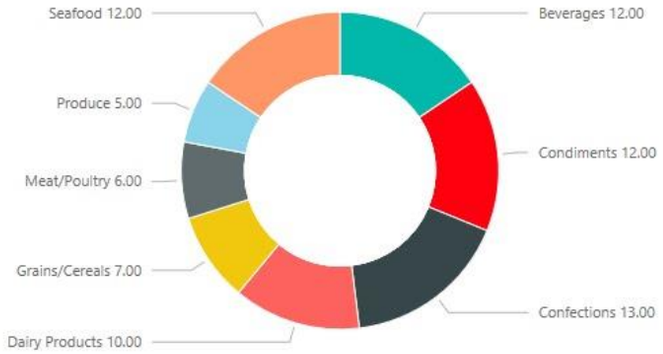
Total Sales by Category



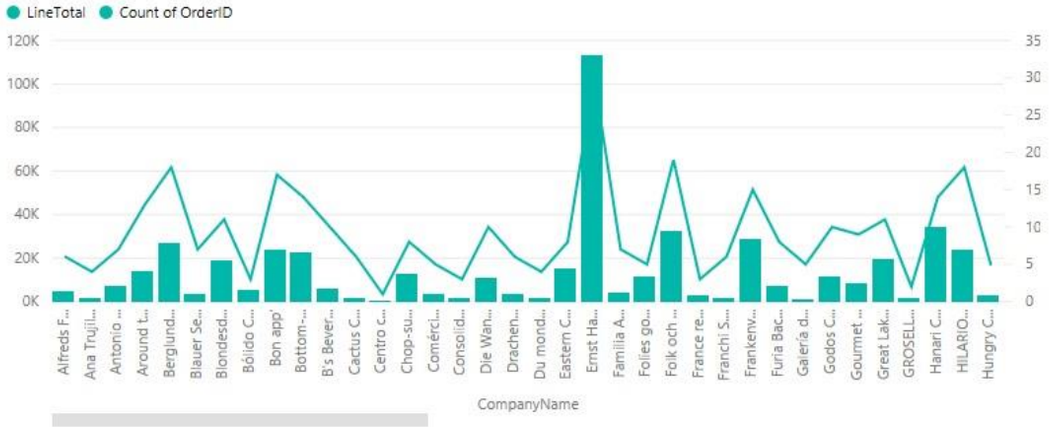
LineTotal by CategoryName

Number of Orders by Country

Count of Products by Category



LineTotal and Count of OrderID by CompanyName



Page 1

Visualizations

Filters

Page Level Filters

Drag data fields here

Fields

Categories
Customers
Order_Details
Orders
Products

PAGE 1 OF 1


15%
16%
$1.13M
$1.08M
15.00 %
16.00 %
$1.13M
$1.08M

Microsoft

Thank you!