WELCOME to Today's Session

Sit tight. We will start shortly.

Mute your phone.

Register your Attendance via link in chat window.

Prepare to participate via chat and annotations.

AZ-301 TSI Exam Preparation

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Today’s Session

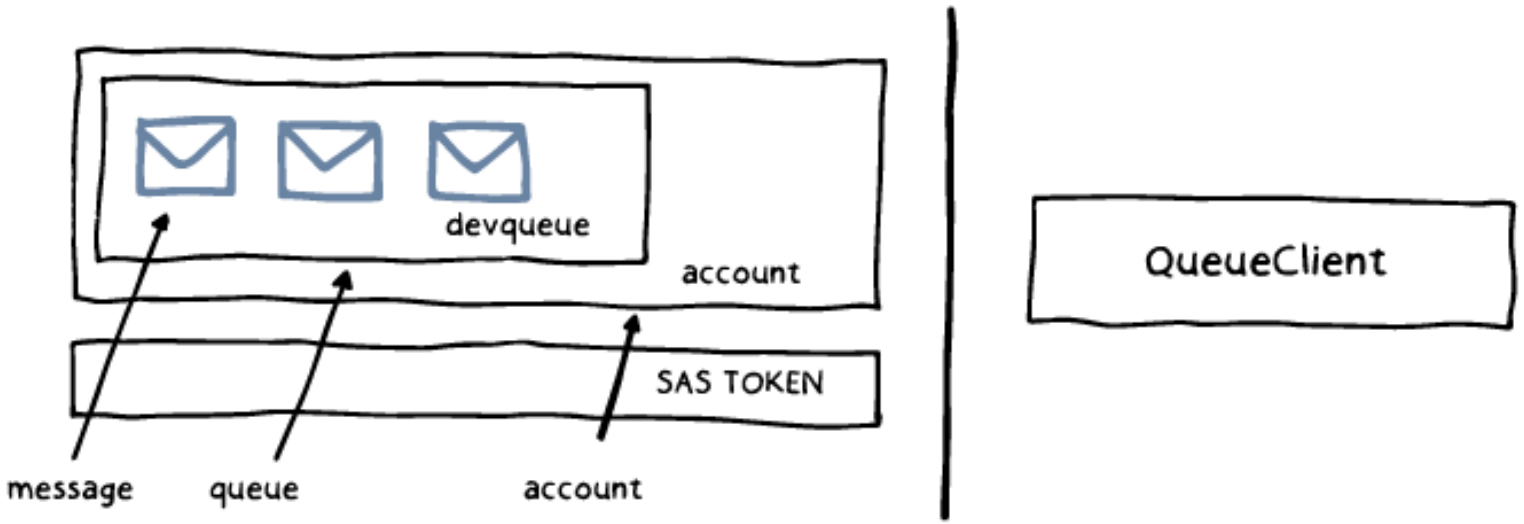
There will be a 15-minute break 75-90 minutes into the session

At the end of each section I’ll review the questions/comments in chat before proceeding, and leave time for additional Q&A

If you have found resources that have helped you understand a topic, share them with others via chat

Messaging Services

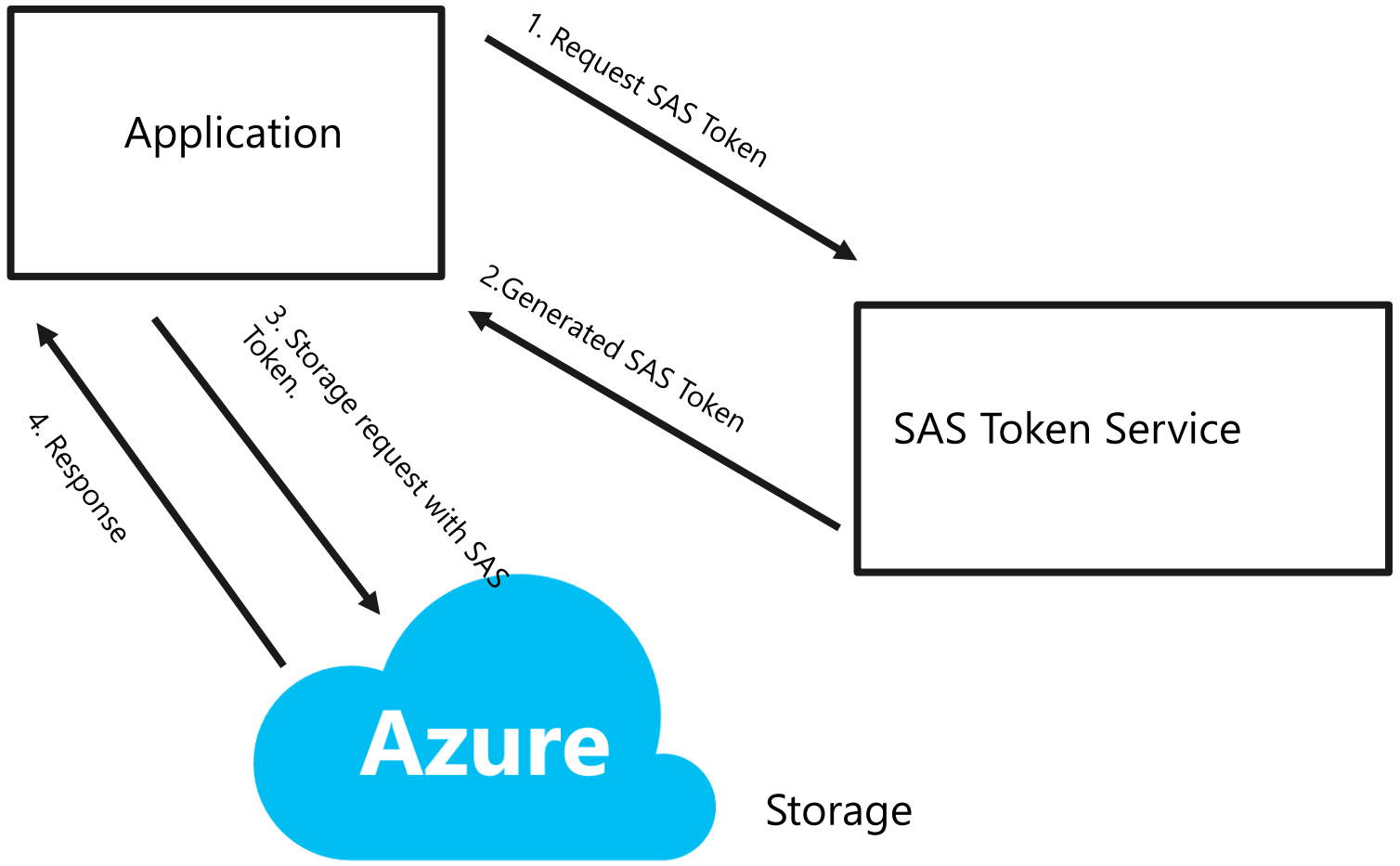
Storage Queues



Queue Message Handling

- Create/Delete Queue
- Measure Queue Length
- Insert Message into Queue
- Retrieve the Next Message
- Extend Message Lease
- Peek at the Next Message
- Update a Message
- Delete a Message

Storage Access Control

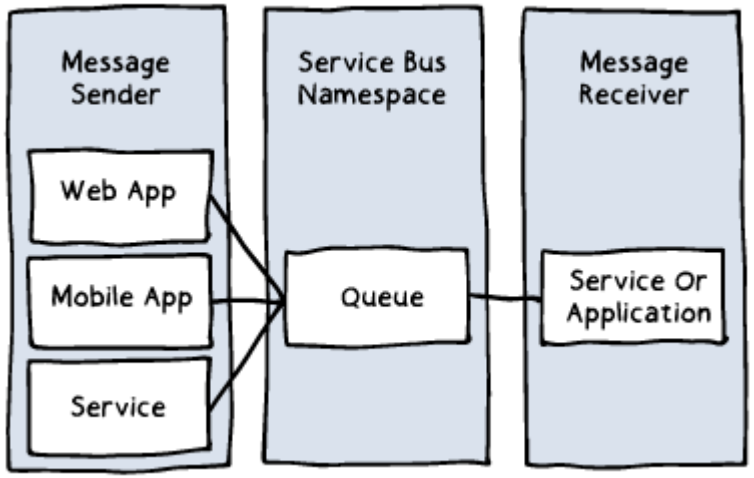


Service Bus

- Service Bus is a managed messaging infrastructure:
  - Massive in scale and completely managed
  - Allows you to scale out your applications and consumers knowing that the messaging platform will scale out with your application
- Allows decoupled components to communicate asynchronously and synchronously

Service Bus Queues

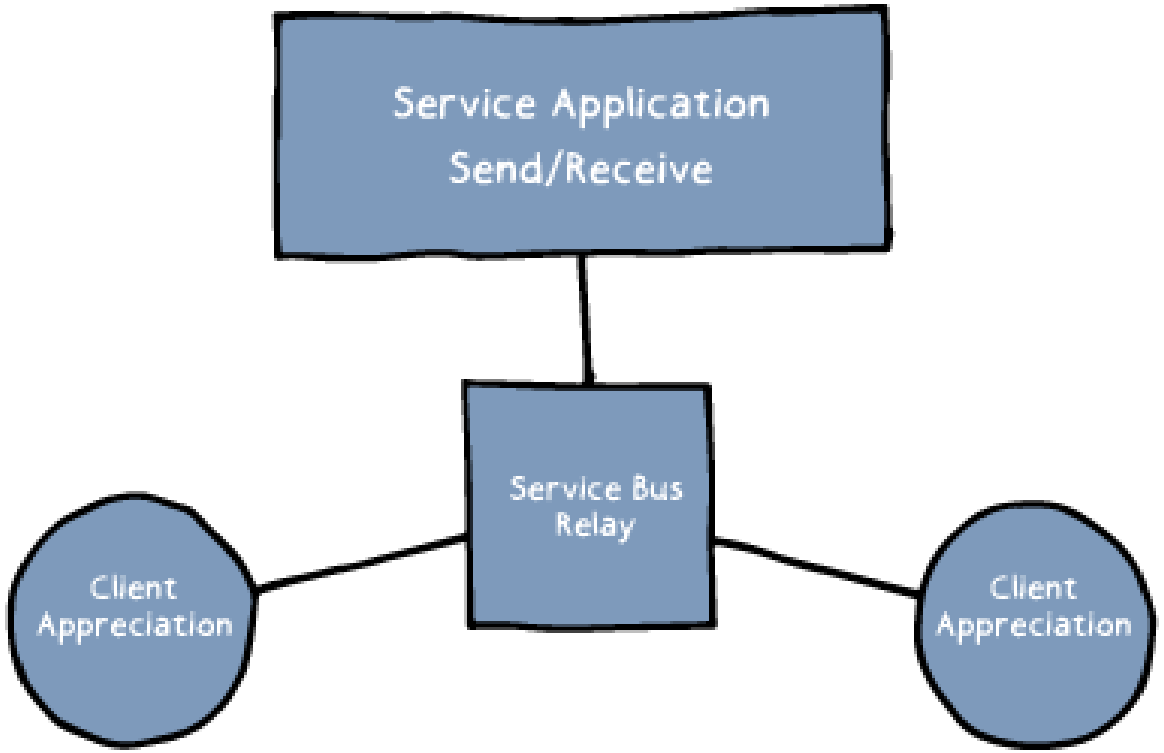
- Service Bus queues offer a brokered messaging communication model:
  - Distributed applications can share messages in a First In First Out (FIFO) pattern
  - Individual messages are only received by one message consumer



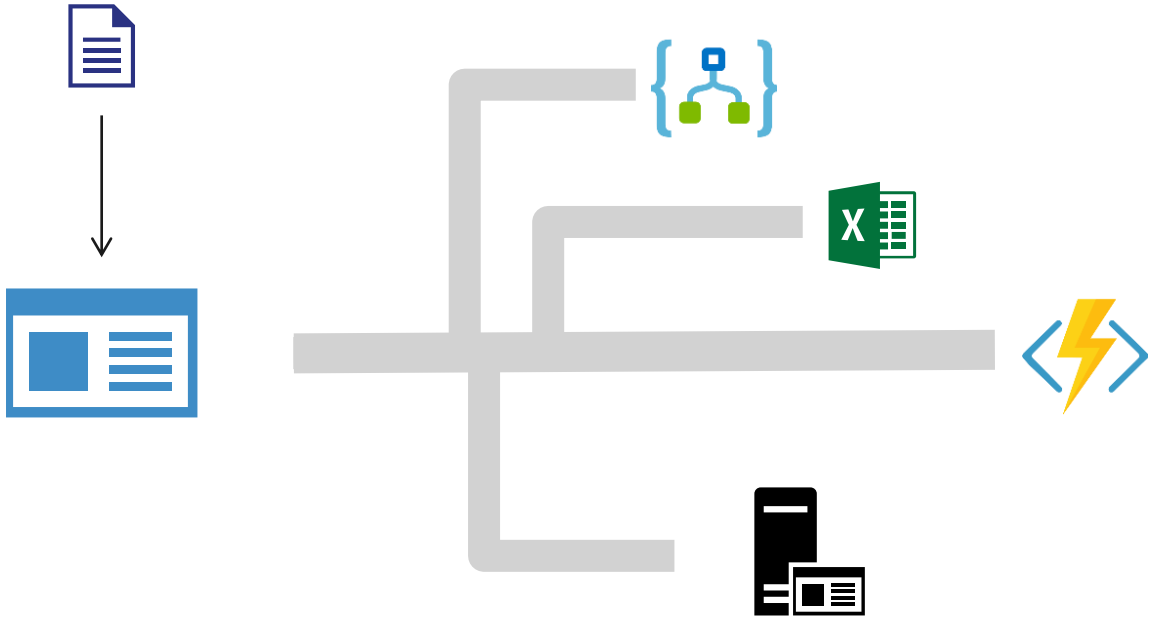
Service Bus Relay

- Relays provide a mechanism to connect distributed client applications or cloud services to a projected on-premises endpoint:
  - It allows for unidirectional or bi-directional communication
  - It relays messages directly to an endpoint without any brokering of the message
- Applications establish an outbound connection to the relay and the relay manages the transport of the messages

Service Bus Relay



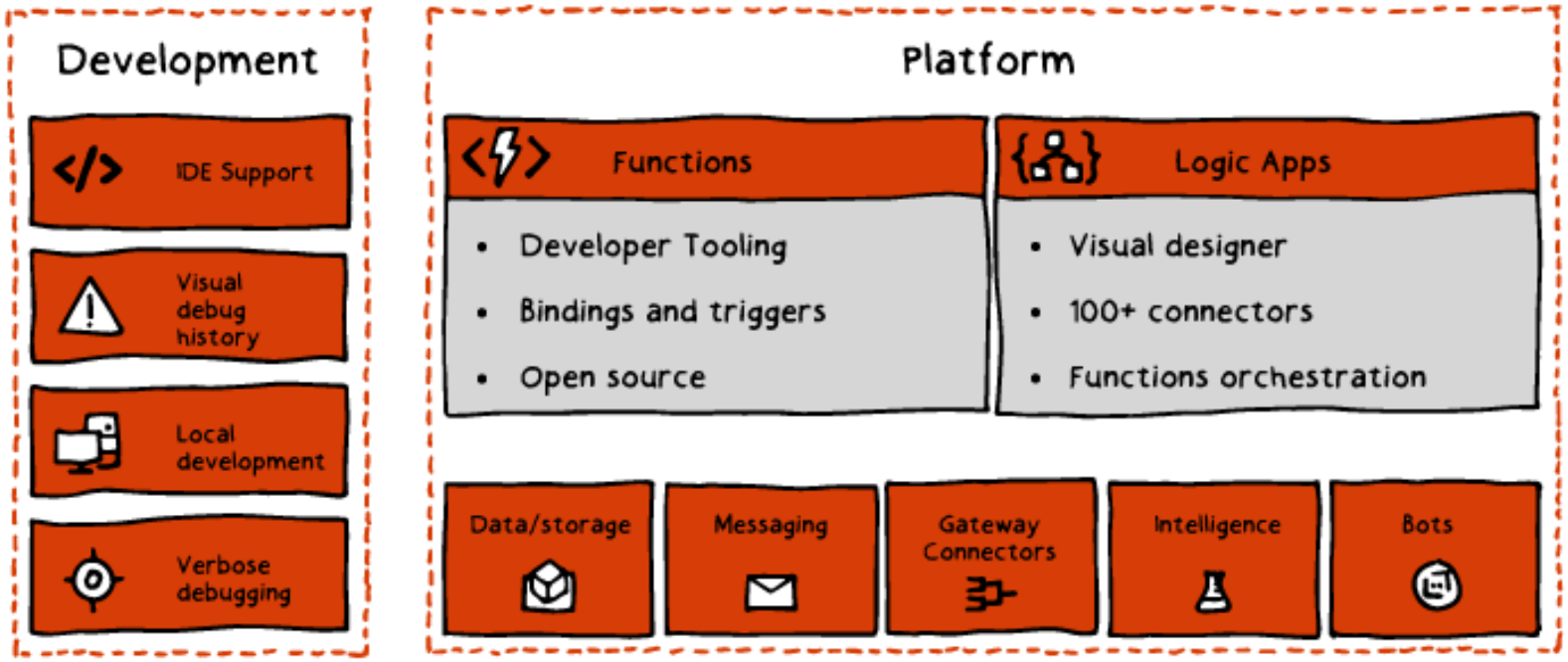
Event Grid



Event Grid and ARM Integration

- Automate Operations:
  - Event Grid can publish ARM events including:
    - Resource creation
    - Resource modification/deletion
    - Deployment of multiple resources to a resource group
    - Creation or deletion of a resource group
  - Azure services can respond to an Event Grid resource-based event by performing automation actions:
    - A Logic App can modify a newly created database
    - Azure Automation can manage a new VM
    - Metadata about a resource deployment can be stored in Azure Storage using an Azure Function

Serverless Integration



Logic Apps

- Cloud APIs and platform:
  - Supports over 125 built-in connectors
  - Scales to meet your needs
  - Enables rapid development
  - Extends with custom APIs and Functions
- API connections:
  - Authenticate once and reuse

Logic App Connectors

SaaS

- appFigures
- Asana
- Azure API Management
- Azure App Services
- Azure Automation
- Azure Cognitive Face API
- Azure Cognitive LUIS
- Azure Cognitive Text Analytics
- Azure Cognitive Vision
- Azure Data Lake Store
- Azure Document DB
- Azure Event Hub
- Azure Functions
- Azure Machine Learning
- Azure Resource Manager
- Azure Service Bus
- Azure SQL
- Azure Storage Blob
- Azure Storage Queues
- Basecamp
- Bing Search
- BitBucket
- Bitly
- Blogger
- Box
- Buffer
- Campfire
- Chatter
- Common Data Service
- Disqus
- DocuSign
- Dropbox
- Dynamics AX Online
- Dynamics CRM Online
- Dynamics CRM Service Bus
- Dynamics Financials
- Dynamics Operations
- Easy Redmine
- Eventbrite
- Facebook
- FreshBooks
- Freshdesk
- GitHub
- Gmail
- Google Calendar
- Google Contacts
- Google Drive
- Google Sheets
- Google Tasks
- GoTo Meeting
- GoTo Training
- GoTo Webinar
- Harvest
- HelloSign
- Infusionsoft
- JIRA
- Insightly
- Instagram
- Instapaper
- MailChimp
- Mandrill
- Medium
- Microsoft Project Online
- Microsoft Translator
- MSN Weather
- Muhimbi PDF
- Office 365
- Office 365 Users
- Office 365 Video
- OneDrive
- OneDrive for Business
- OneNote
- Outlook.com
- Outlook Tasks
- PagerDuty
- Pinterest
- Pipedrive
- Pivotal Tracker
- Power BI
- Project Online
- Redmine
- Salesforce
- Salesforce Chatter
- SendGrid
- SharePoint Online
- Slack
- SmartSheet
- SparkPost
- Stripe
- Survey Monkey
- Todoist
- Toodledo
- Trello
- Twilio
- Twitter
- Typeform
- UserVoice
- VS Team Services
- Webmerge
- Wordpress
- Wunderlist
- Yammer
- YouTube
- Zendesk

Protocols/Native

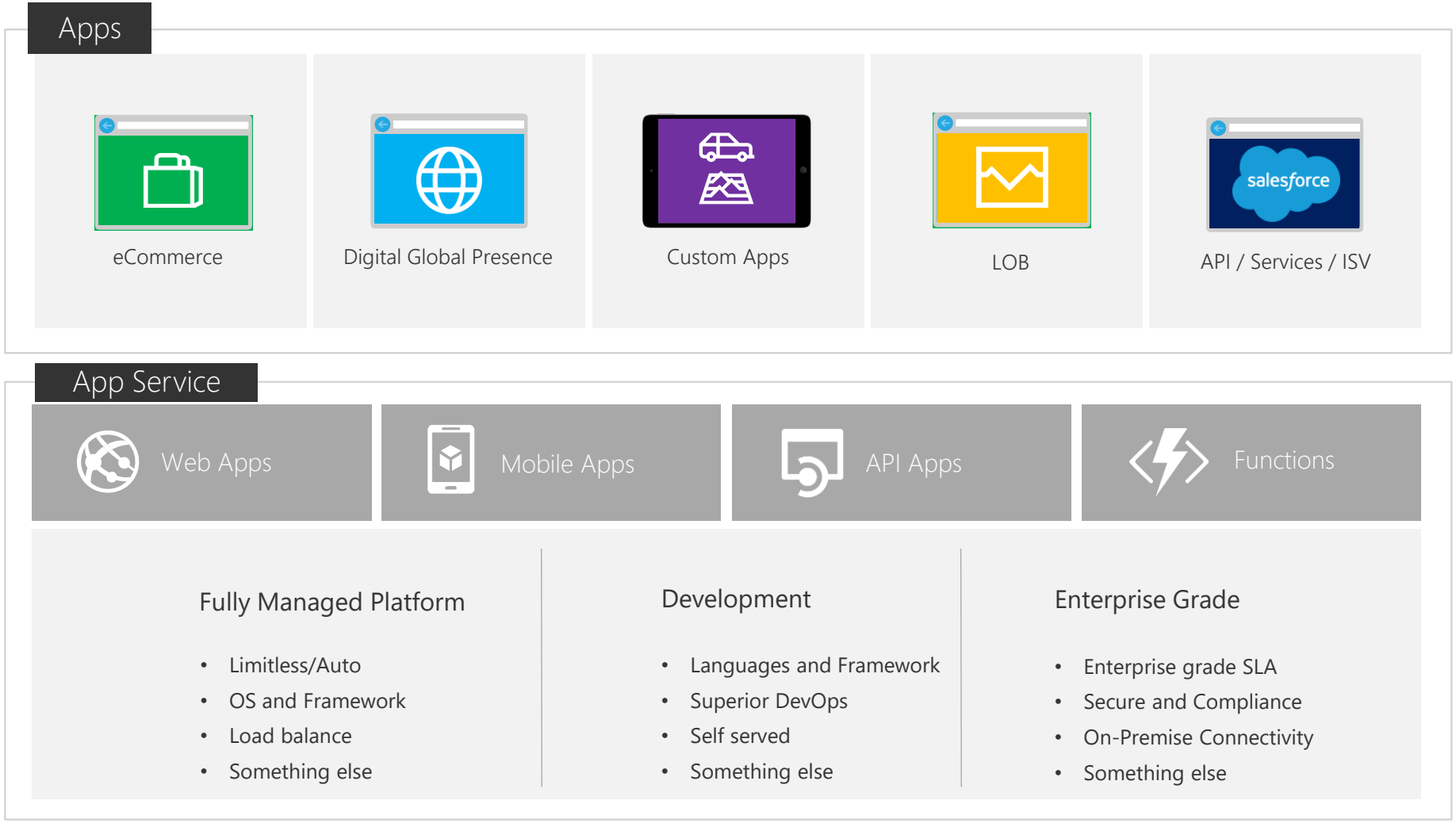
- HTTP, HTTPS
- HTTP Webhook
- FTP, SFTP
- SMTP
- RSS
- Compose, Query, Parse JSON
- Wait
- Terminate
- Workflow

- XML Validation
- Transform XML (+Mapper)
- Flat File Encode
- Flat File Decode
- X12
- EDIFACT
- AS2
- Integration Account Artifact Lookup

Hybrid

- BizTalk Server
- File System
- IBM DB2
- Informix
- Oracle DB
- SharePoint Server
- SQL Server
- SAP
- Websphere MQ

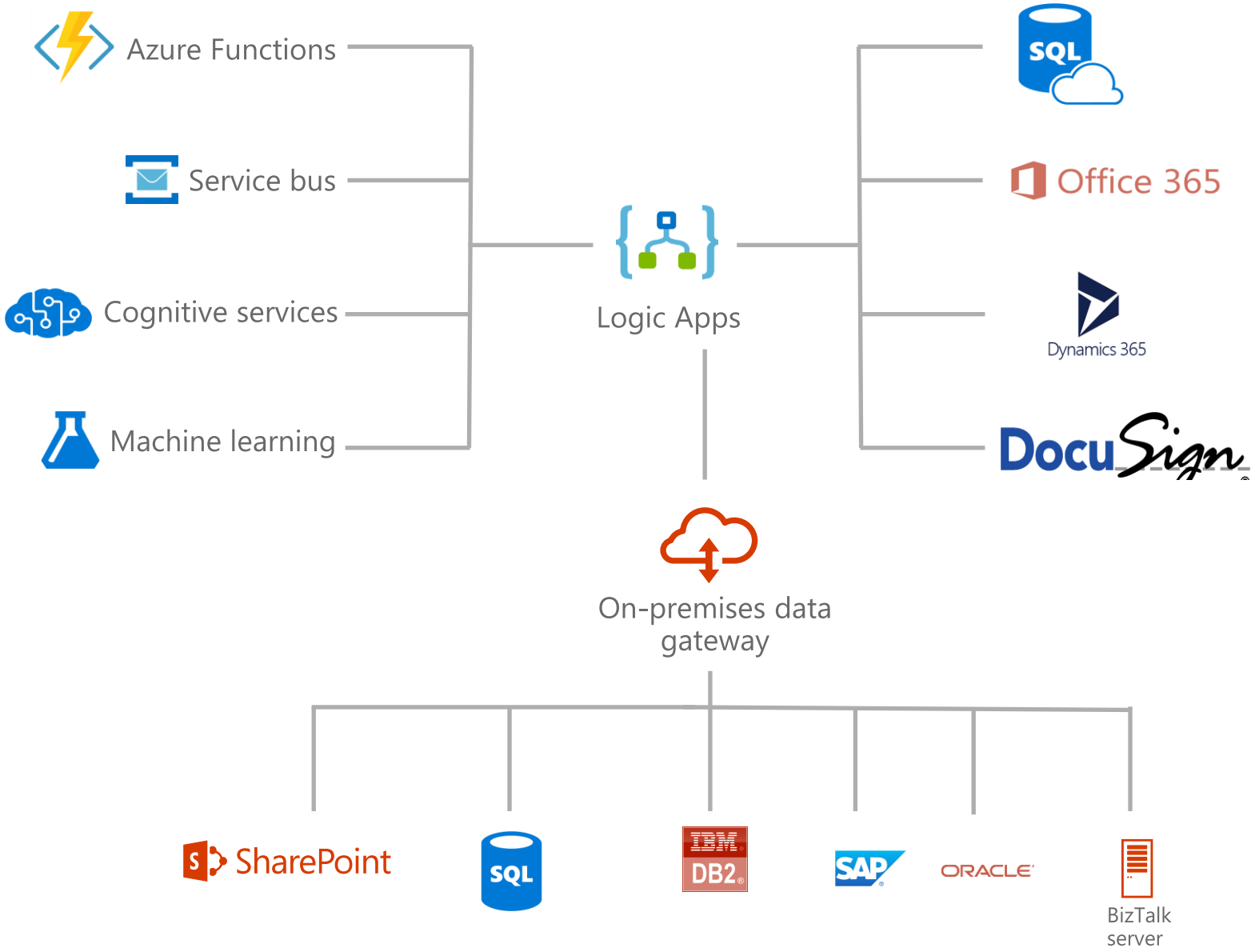
Azure Functions



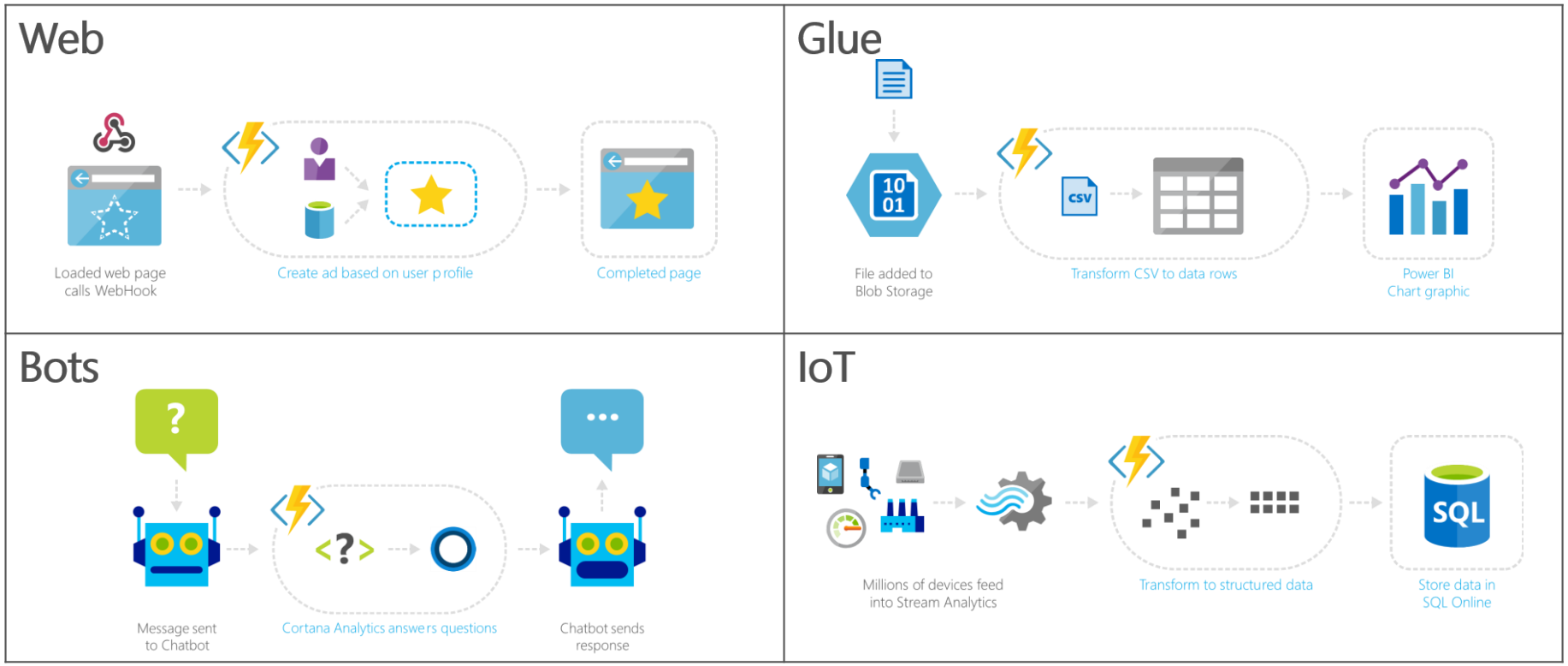
Azure Functions

- Methods of Execution:
  - Triggers
  - WebHooks
- Language of Choice:
  - C#, F#, Node.js, Python, PHP, batch, bash, Java
- Pricing Options:
  - Dynamic (pay-per-use)
  - App Service Plan
- Integrations:
  - DocumentDB, Event Hubs, Mobile Apps (tables), Notification Hubs, Service Bus, Storage
  - GitHub (webhooks), On-premises (using Service Bus)

Connecting Serverless Components



Serverless Business Scenarios



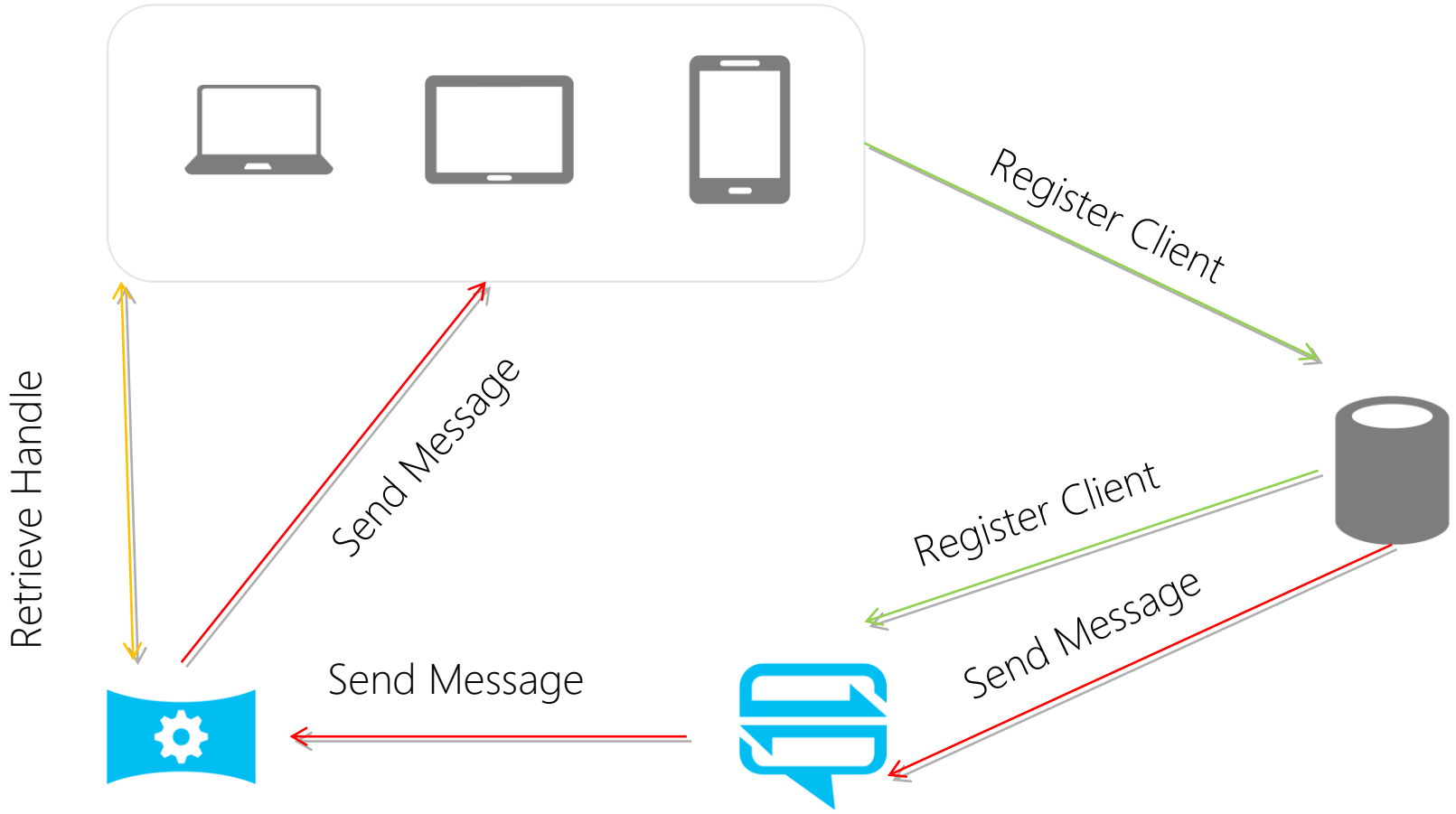
Notification Hubs

- Managed infrastructure for sending push notifications to mobile devices:
  - Multiplatform
  - Scalable
  - Simple SDK:
    - Available on many major mobile platforms
- Broadcast to many users or target specific users

Benefits

- Managed Infrastructure:
  - You don’t have to worry about scaling your application yourself
  - You can focus on messages and templates, not the mechanics of your service
- SDKs available for major platforms
- Template support
- Support for filtering recipients by tag

Platform


Register Client
Retrieve Handle
Send Message
Register Client
Send Message
Send Message

Event Hubs

Event Hubs is a partitioned consumer messaging services:

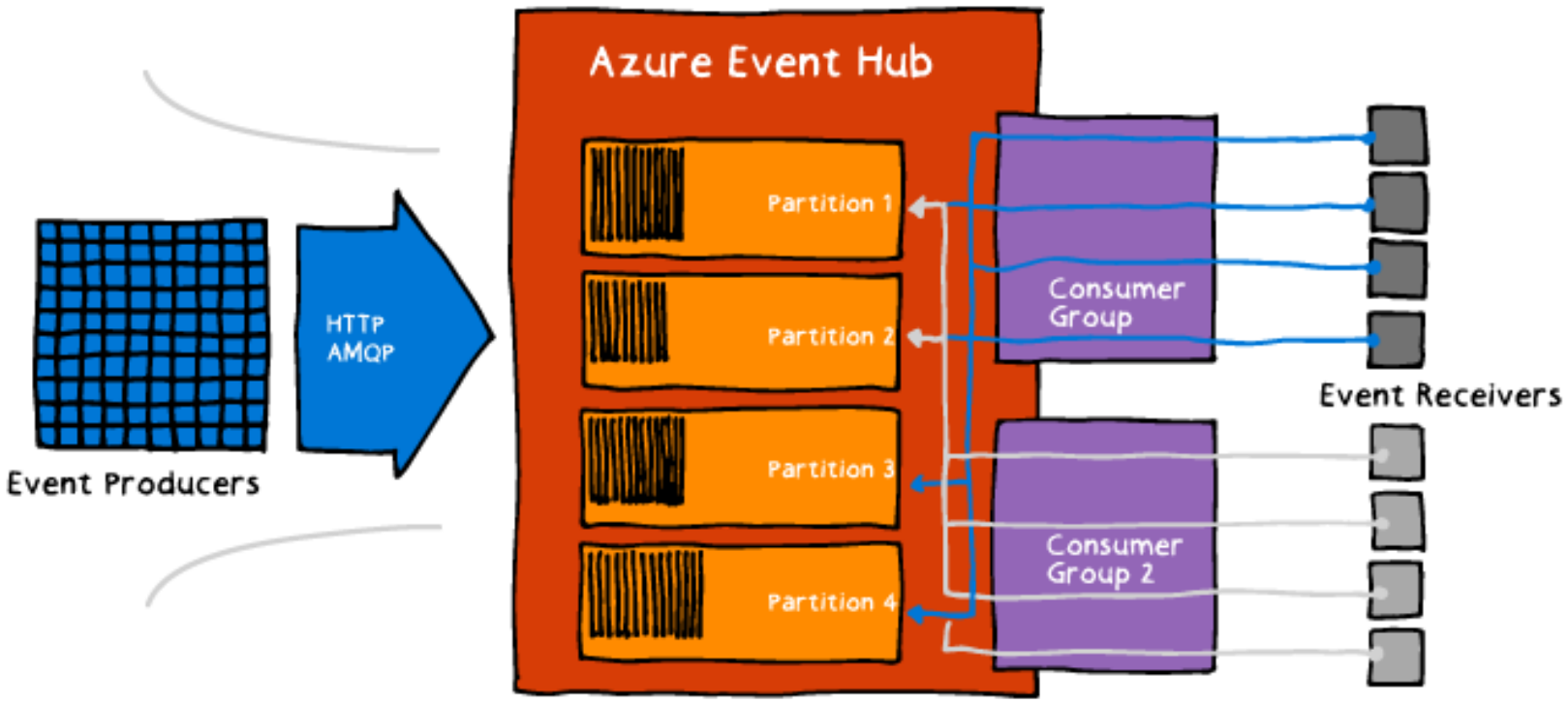
- Publish and subscribe to streams of records:
  - Similar to a message queue or enterprise messaging system
- Store streams of records in a fault-tolerant manner
- Process streams of records “as they occur”

- Ideal for building applications that transform or react to streams of data

Event Hubs

- Input Streaming:
  - Receives high-velocity message streams in a multi-consumer group
- Isolated Read:
  - Stores “pointers” for each reader so they can resume at a specific point-in-time in reading time-based messages from the queue
- Open Protocols:
  - Supports AMQP 1.0
  - REST API for management

Event Hubs Conceptual Diagram

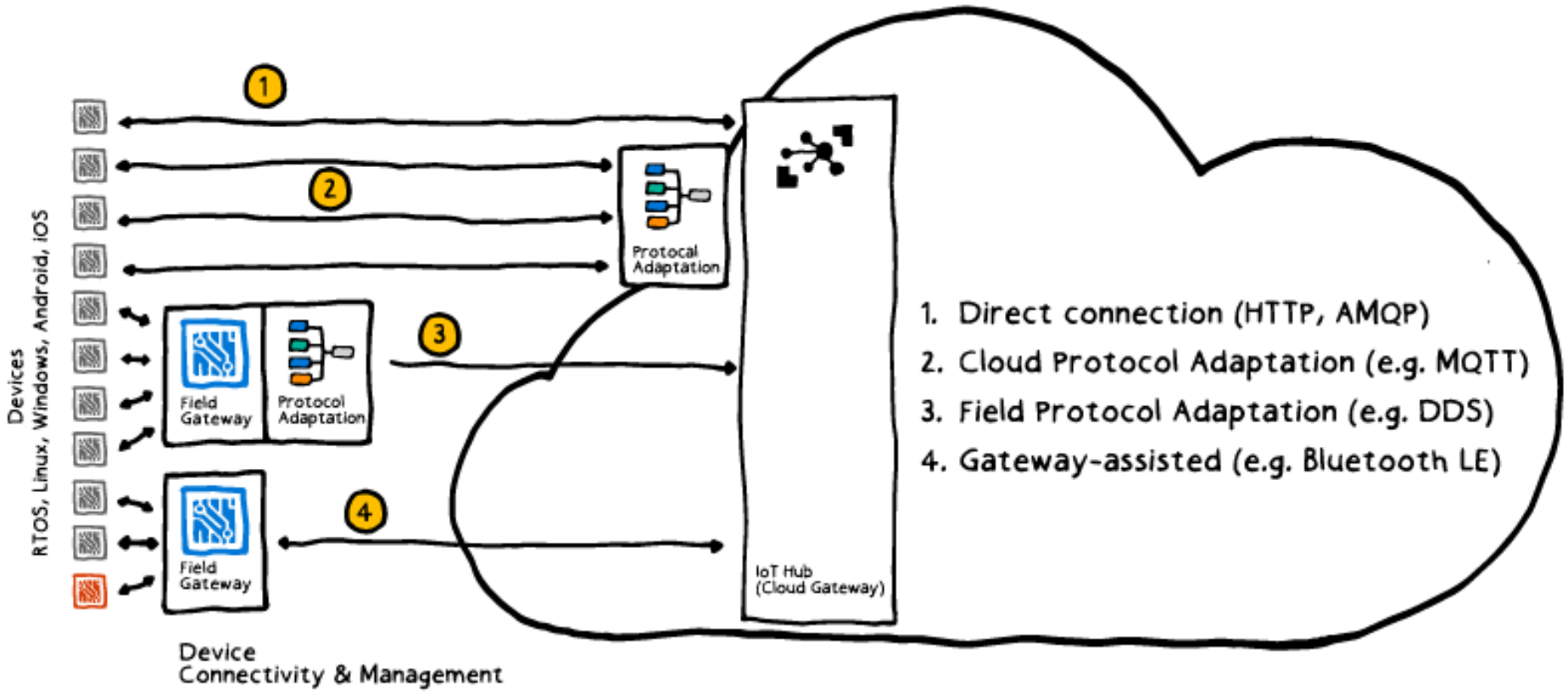


IoT Hubs

IoT Hubs builds on the features in Event Hubs by adding additional functionality that is commonly needed in IoT applicatons:

- Support across a wider variety of platforms and SDKs:
  - Ex. JavaScript and Java Support, RTOS and ARM Platform support
- Device-facing and Service-facing SDKs for registration and management
- Identity and access management across all devices connected to Hub

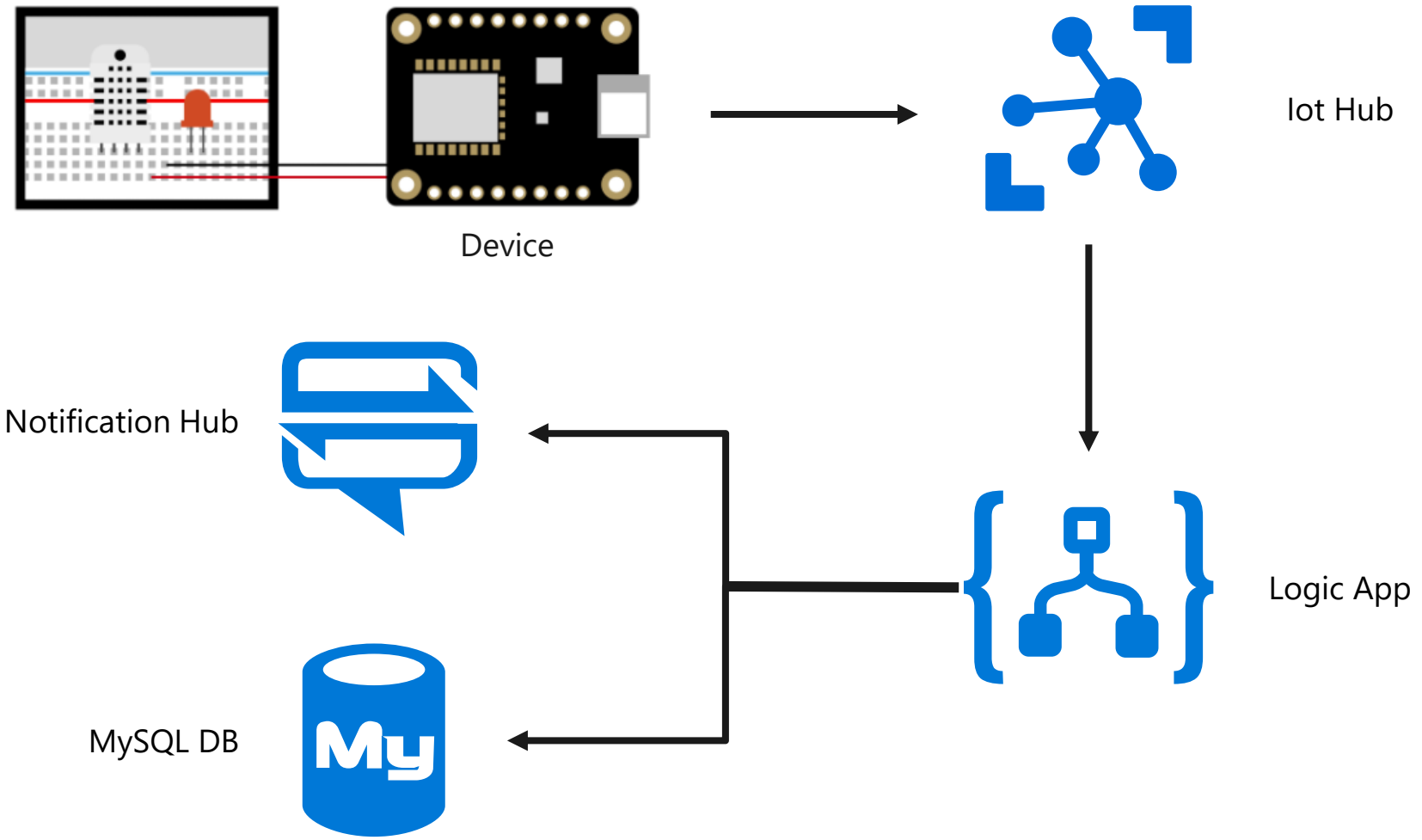
IoT Hubs


1
2
3
4
Devices
RTOS, Linux, Windows, Android, iOS
Protocal Adaptation
Field Gateway
Protocol Adaptation
Field Gateway
IoT Hub (Cloud Gateway)
1. Direct connection (HTTP, AMQP)
2. Cloud Protocol Adaptation (e.g. MQTT)
3. Field Protocol Adaptation (e.g. DDS)
4. Gateway-assisted (e.g. Bluetooth LE)
Device Connectivity & Management

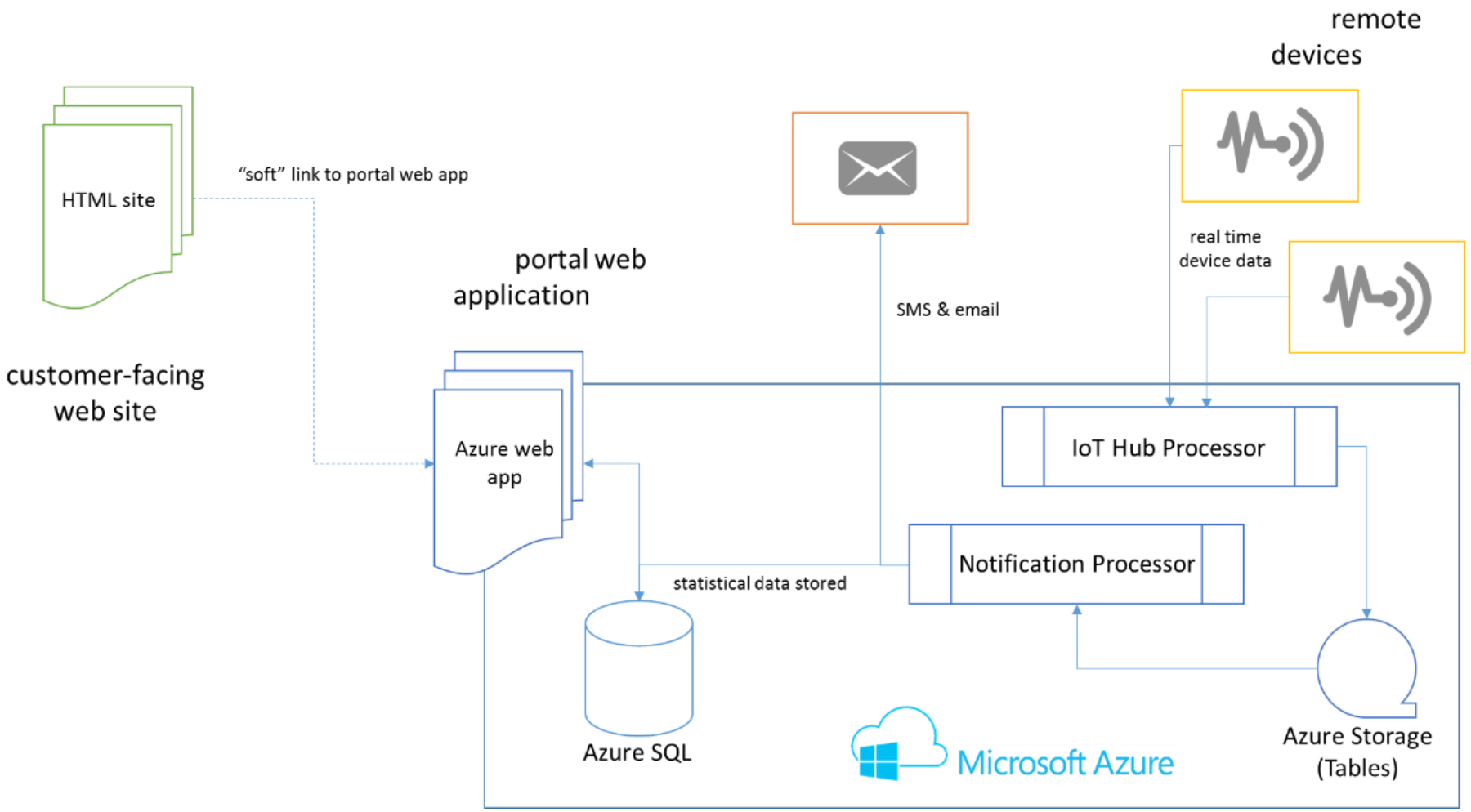
Azure IoT Device SDK

- Enable simple, secure device <-> cloud connectivity & management
- Client “agent” software for devices and gateways
- Libraries that OEMs/SIs/ISVs can use in new and existing systems
- Open source software framework

IoT Remote Monitoring



Example IoT Solution

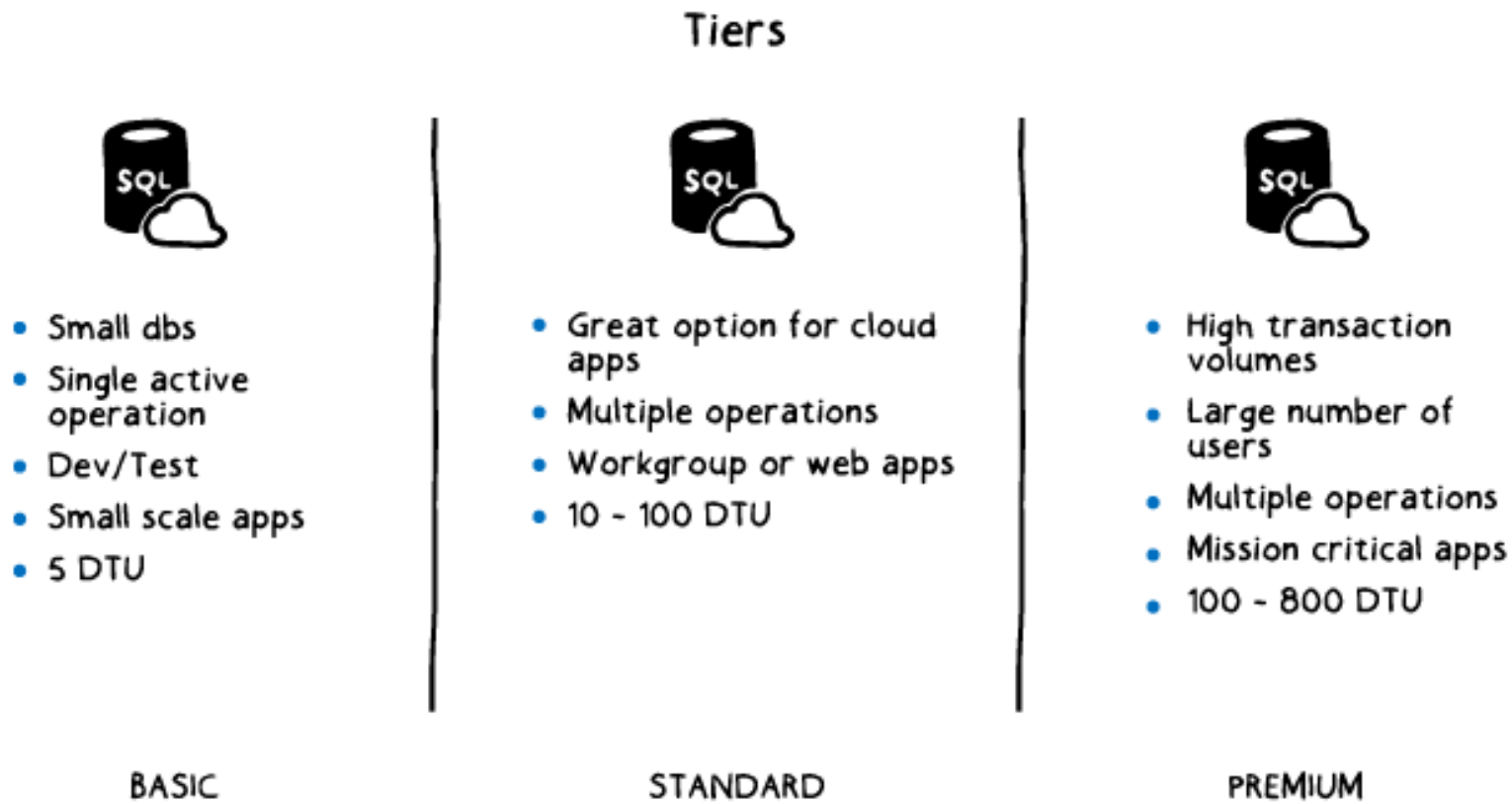


Comparing Database Options In Azure

Azure SQL Database

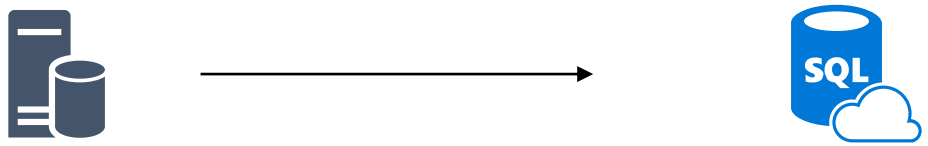
- SQL-as-a-Service Offering:
  - Fully managed
  - Automatically replicated
  - Compatible with existing TDS-capable software:
    - Visual Studio
    - SQL Server Management Studio
    - Entity Framework
  - Managed using existing tools, the CLI, PowerShell or the Portal
  - Performance measured in a predictable manner:
    - Database Throughput Units (DTUs)

Tiers


Tiers
SQL
Small dbs
Single active operation
Dev/Test
Small scale apps
5 DTU
BASIC
SQL
Great option for cloud apps
Multiple operations
Workgroup or web apps
10 - 100 DTU
STANDARD
SQL
High transaction volumes
Large number of users
Multiple operations
Mission critical apps
100 - 800 DTU
PREMIUM

Stretch Database

- Dynamically migrate transactional data from SQL Server to Azure SQL Database:
  - Keep cool data in lower-cost Azure storage
  - Keep hot data “closer” to your users in local server storage
  - Compatible with Always Encrypted and Row-Level Security



Elastic Scale

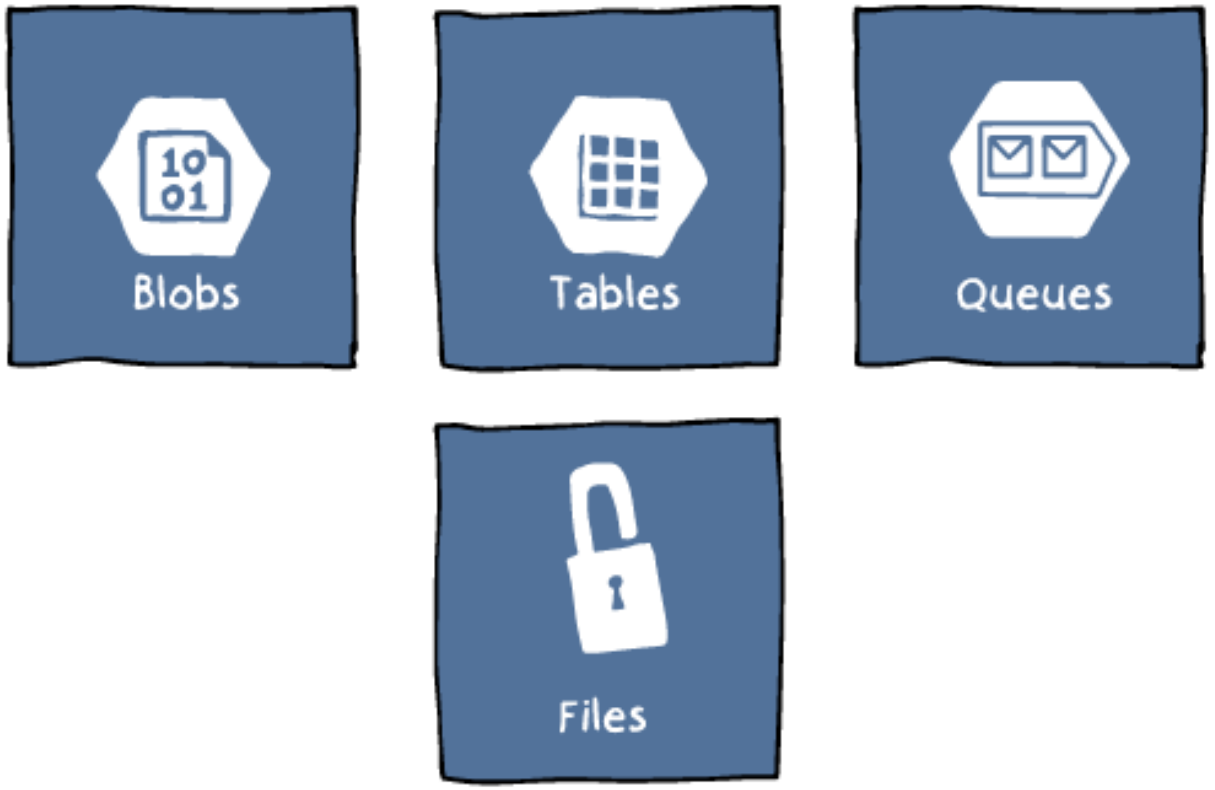
- Elastic Scale simplifies the scaling out (or in) of data in Azure SQL Database
- Composed of two parts:
  - An Elastic Scale library for client applications to configure shards and access shards
  - The Elastic Scale features in Azure SQL Database that implements the any changes requested by your application

Third-Party Databases in Azure

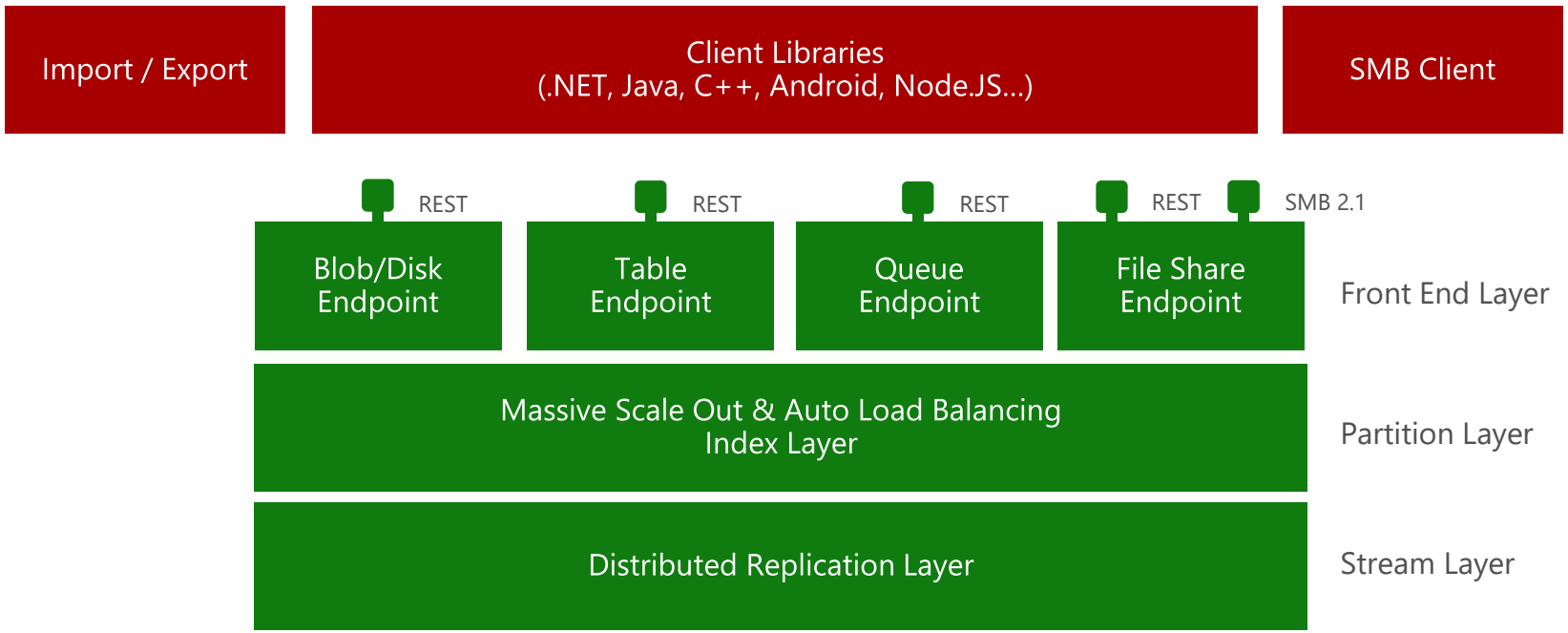
- Azure Database for MySQL:
  - MySQL Community Version
  - phpMyAdmin Already Installed
- Azure Database for PostgreSQL:
  - Supports PostgreSQL Extensions

Azure Storage

Service in Azure to store various media and files

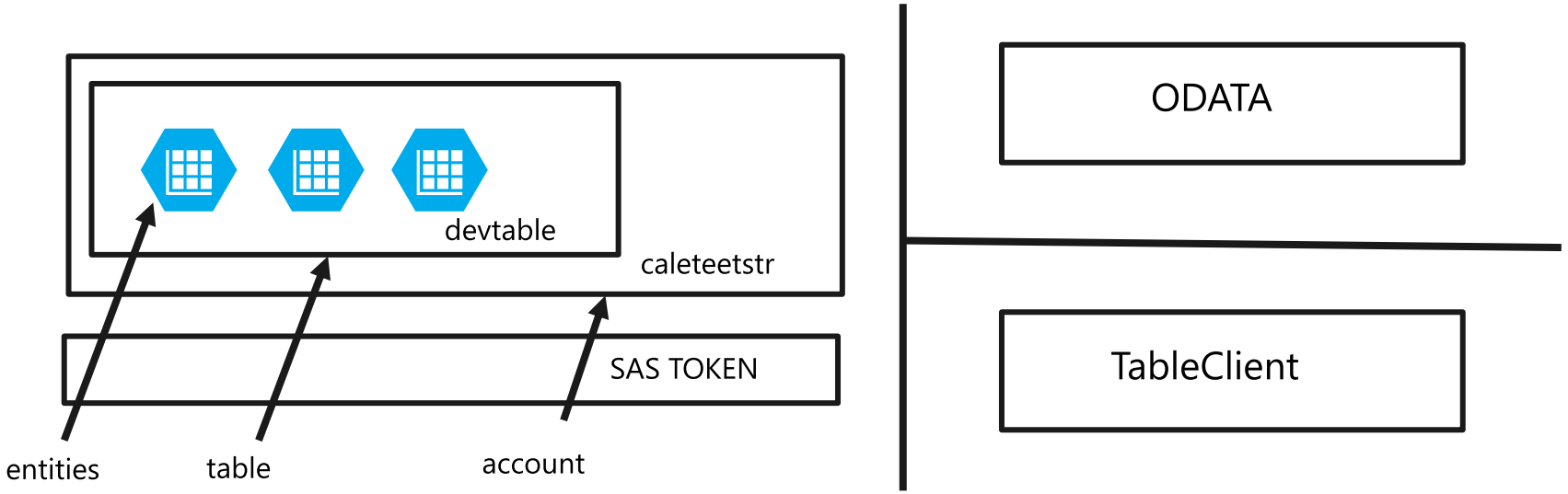


Storage Architecture



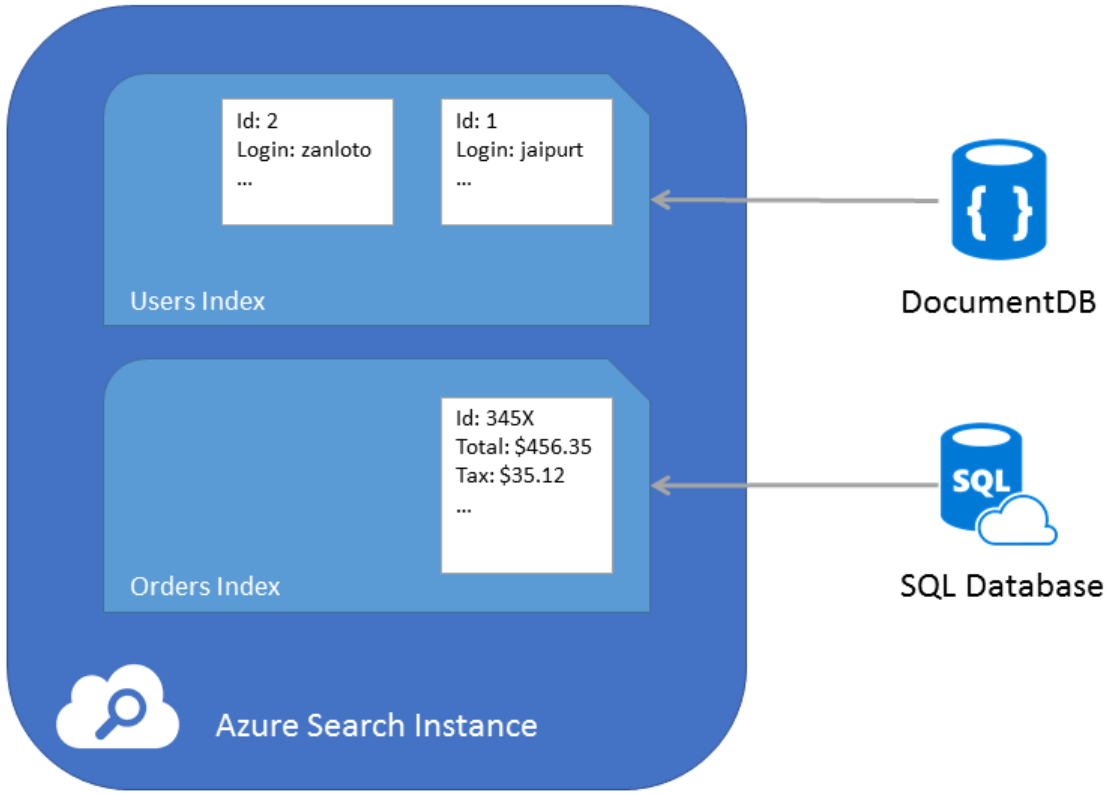
Storage Tables

- NoSQL database service using the key/value (or Dictionary) design paradigm:
  - Can be accessed using dedicated clients or OData protocol
  - Built for massive scale

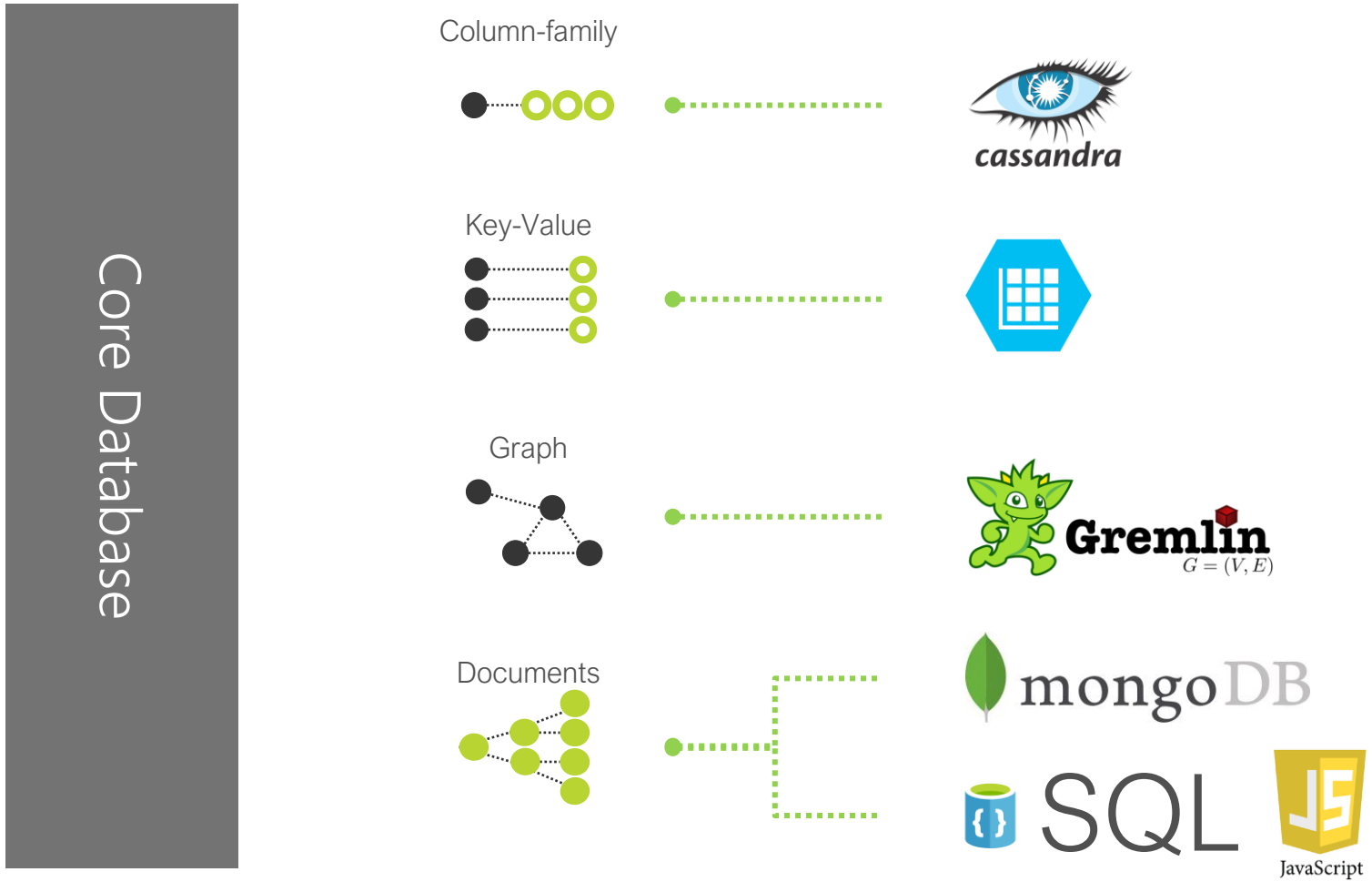


Azure Search Indexers

- Search can index existing data stores including:
  - CosmosDB DocumentDB API
  - Azure SQL Database



APIs

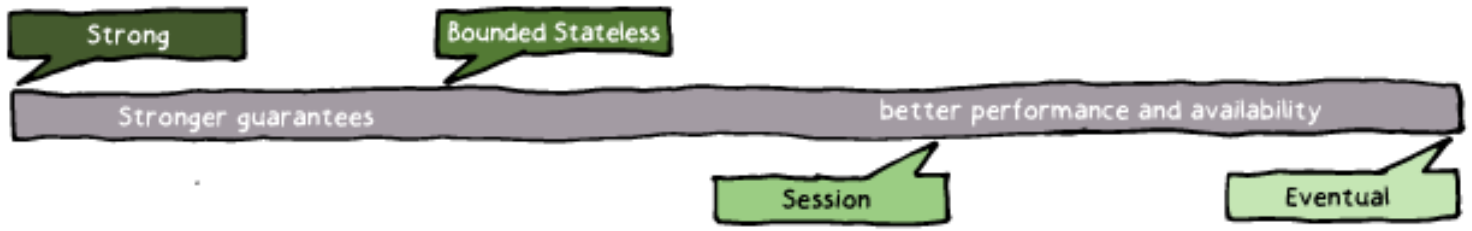

Core Database
Column-family
cassandra
Key-Value
Graph
Gremlin
$G = (V, E)$
Documents
mongoDB
SQL
JavaScript

Consistency Levels

The consistency levels range from:

- Strong consistency where reads are guaranteed to be visible across replicas before a write is fully committed across all replicas
- Eventual consistency where writes are readable immediately and replicas are eventually consistent with the primary

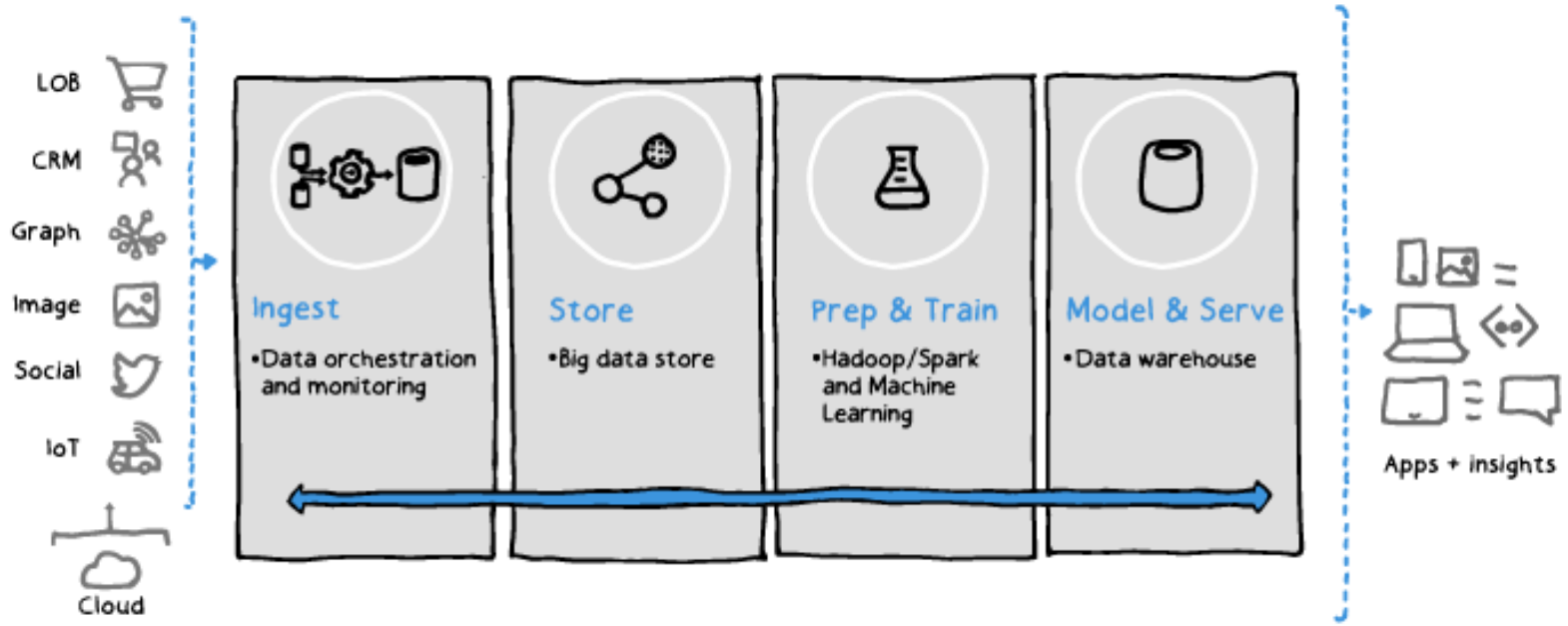
Consistency Level	Description
Strong	When a write operation is performed on your primary database, the write operation is replicated to the replica instances. The write operation is only committed (and visible) on the primary after it has been committed and confirmed by ALL replicas.
Bounded Stateless	This level is similar to the Strong level with the major difference is that you can configure how stale documents can be within replicas. Staleness refers to the quantity of time (or version count) a replica document can be behind the primary document.
Session	This level guarantees that all read and write operations are consistent within a user session. Within the user session, all reads and writes are monotonic and guaranteed to be consistent across primary and replica instances.
Eventual	This level is the loosest consistency and essentially commits any write operation against the primary immediately. Replica transactions are asynchronously handle and will eventually (over time) be consistent with the primary. This tier is the most performant as the primary database does not need to wait for replicas to commit to finalize its transactions.



Throughput

- Each collection is assigned a performance level and that performance level dictates throughput for that collection and its corresponding documents:
  - If a particular collection is seeing spikes in throughput, you can manage its performance level in isolation by increasing or decreasing the performance level. This change to the performance level of a particular collection will not cause side effects for the other collections. This allows you to adjust to meet the performance needs of any workload in isolation.

Data Storage & Integration Options



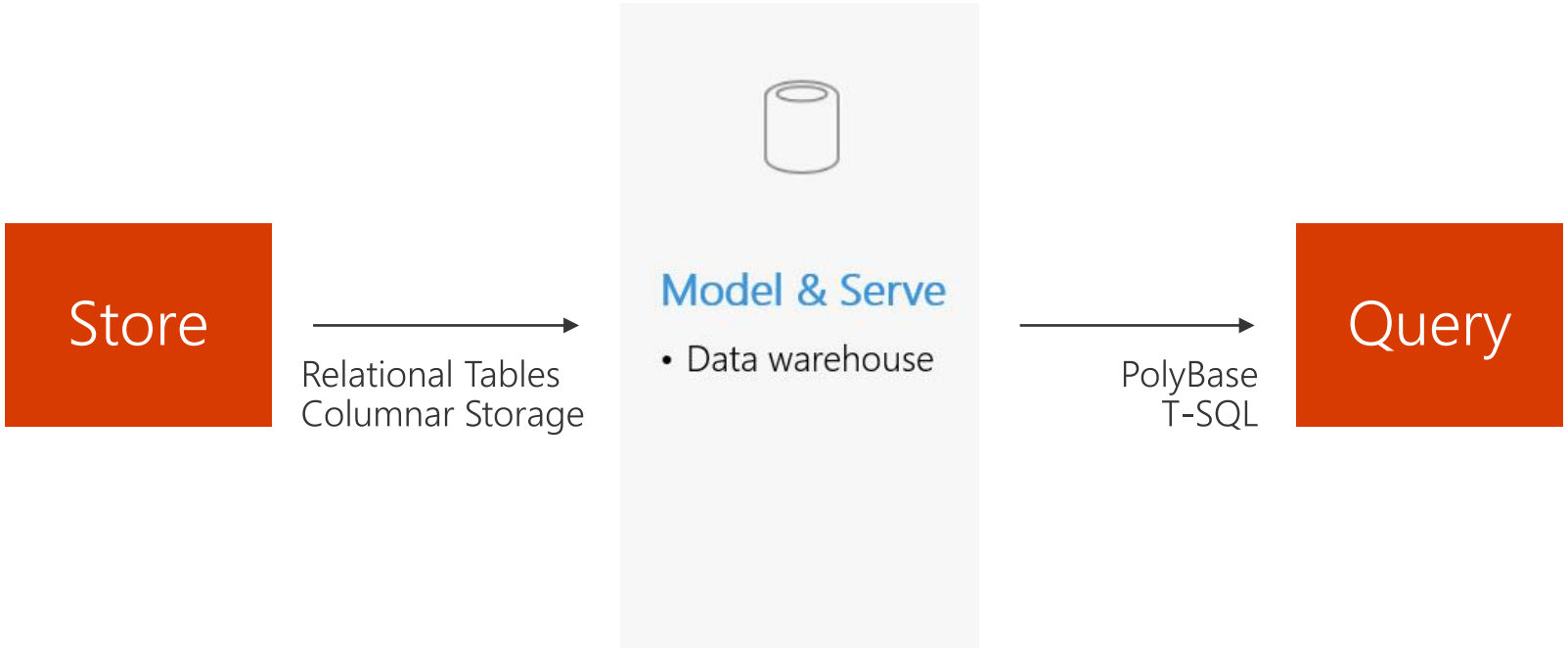
SQL Data Warehouse

- Model data from various sources:
  - Data can be ingested from sources including:
    - IoT
    - Devices
    - CRM
    - Graph Database
    - APIs
    - Other Databases

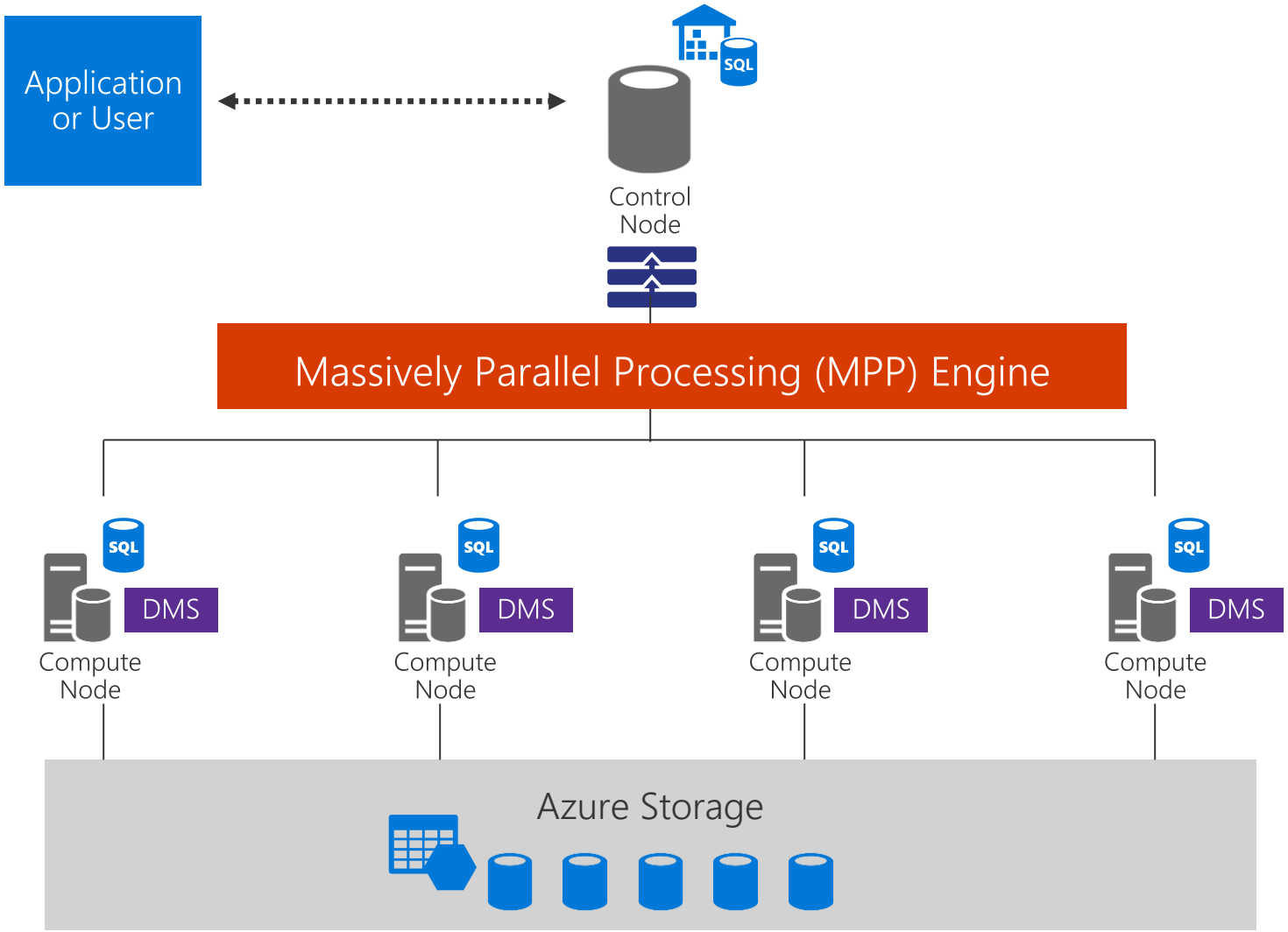
SQL Data Warehouse

- Query and serve data to your workloads and applications:
  - You can query data from Data Warehouse using PolyBase
  - PolyBase uses T-SQL language
- Data stored on well-known platform:
  - Data is stored, partitioned and managed using compute infrastructure nodes backed by Azure Storage

SQL Data Warehouse



SQL Data Warehouse

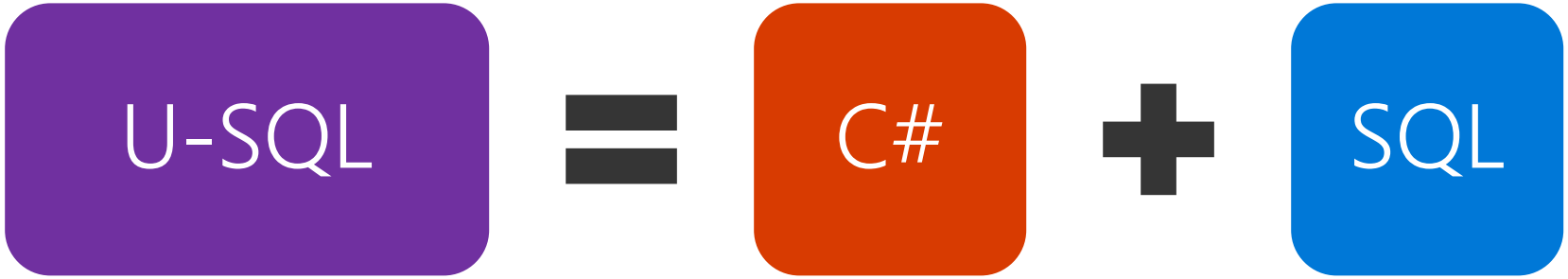


Data Lake

- Integrate a wide variety of data stores into existing workloads and applications:
  - Ideal for large volume scenarios that require high speed analysis and access
- Store various business data stores in a centralized location:
  - Search and analyze the data using a single platform
    a U-SQL

Data Lake

- New language designed specifically for Azure Data Lake:
  - Combines best parts of SQL and C#
  - Can process any data type even without schemas
  - Can be used to write expressive custom code using C# syntax



Data Integration

Azure Data Factory:

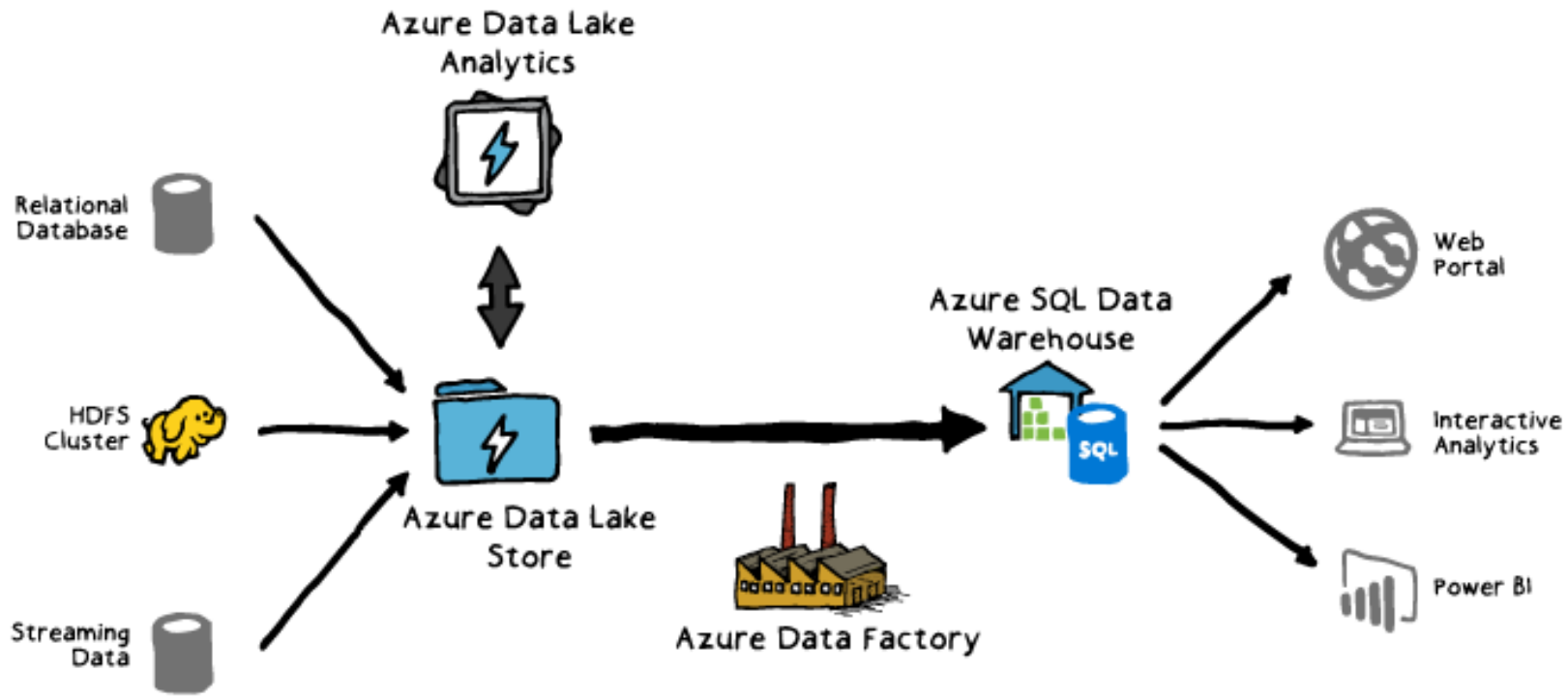
- Compose data processing, storage and movement services to create & manage analytics pipelines
- Originally focused on Azure & hybrid movement to/from on premises SQL Server:
  - Over time, expanded to more storage & processing systems throughout
- End-to-end pipeline monitoring and management

Data Factory

Each Data Factory Solution is composed of four key components

Data Factory

Azure Data Factory is an option to migrate data from Azure Data Lake to Azure SQL Data Warehouse

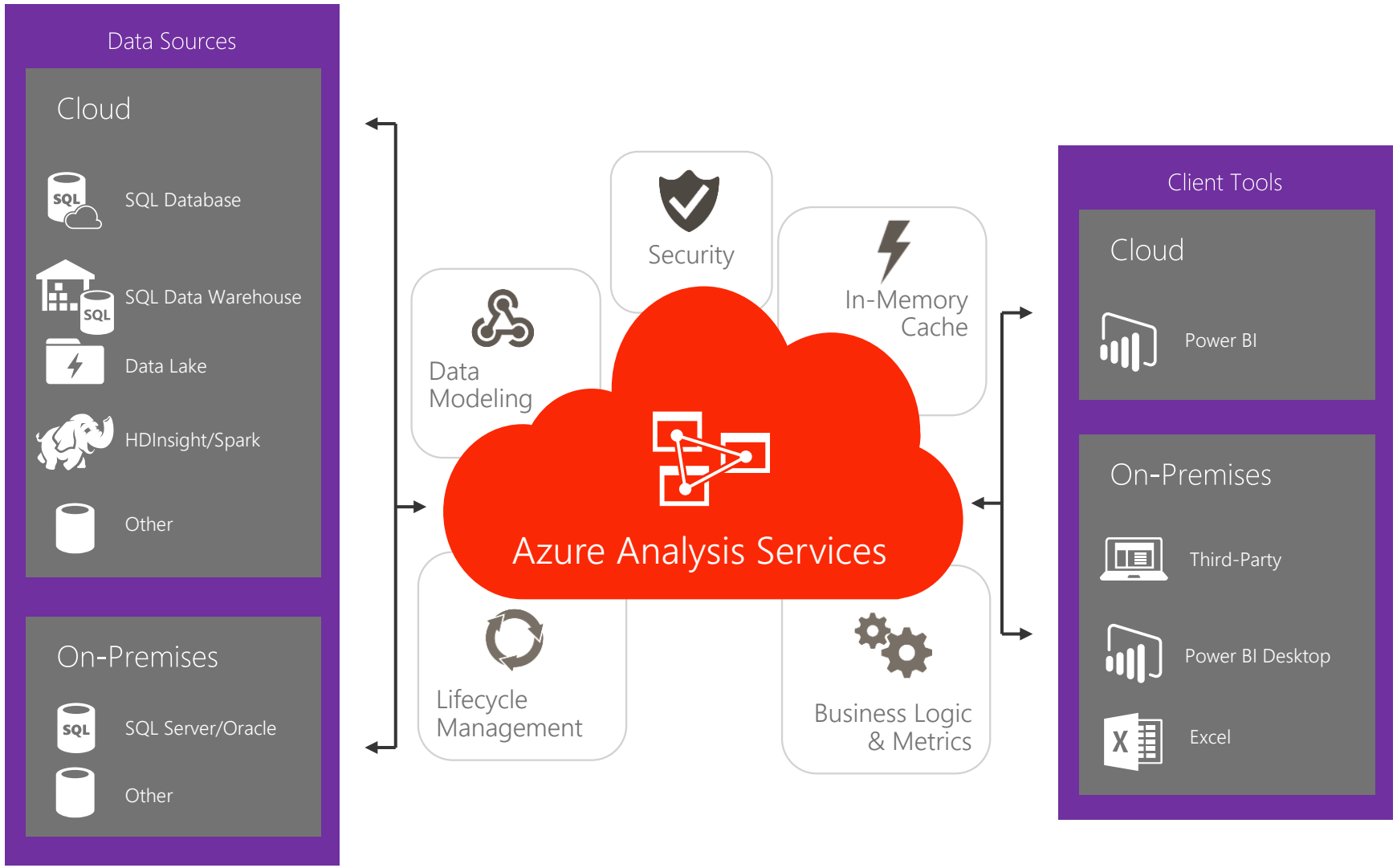


Data Analysis Options

Analysis Services:

- Enterprise BI-as-a-Service
- Increases efficiency of queries:
  - Complex raw data is optimized “behind the scenes” for search and processing
  - DirectQuery-caliber speeds are achievable on many data sources
- Easier for users to surface data:
  - Data is surfaced in user-friendly business models
  - Users can use well-known tools, like Excel or Power BI, to query the models

Analysis Services



HDInsight

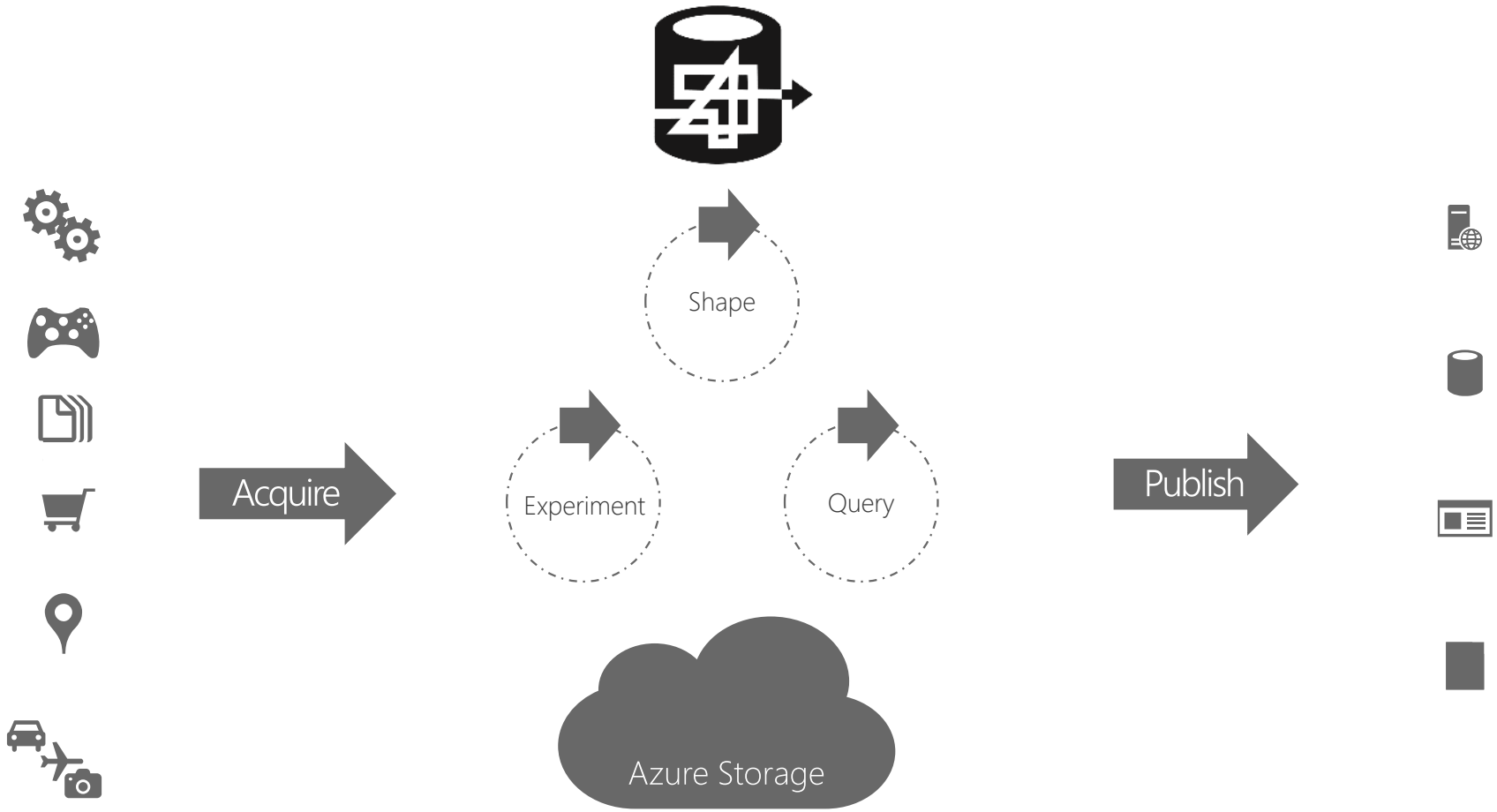
- Three Core Focuses:
  - Elastic:
    - Store any type of data you like (structured or unstructured)
    - Store when or how you like
  - Simple:
    - You should be able to create a Hadoop cluster in three minutes
  - Secure:
    - Instances are isolated by default
    - Built-on top of Azure Storage and Azure IaaS which both have well-known security best practices

HDInsight

- Build your solutions on Hadoop:
  - Storage + proliferation of compute models for data processing at scale
  - Began life as an open source implementation of Google's Map/Reduce and GFS papers
  - In use at many major web companies at massive scale (1000s of node, PB's of storage)

HDInsight

Big data processing on top of Azure Storage

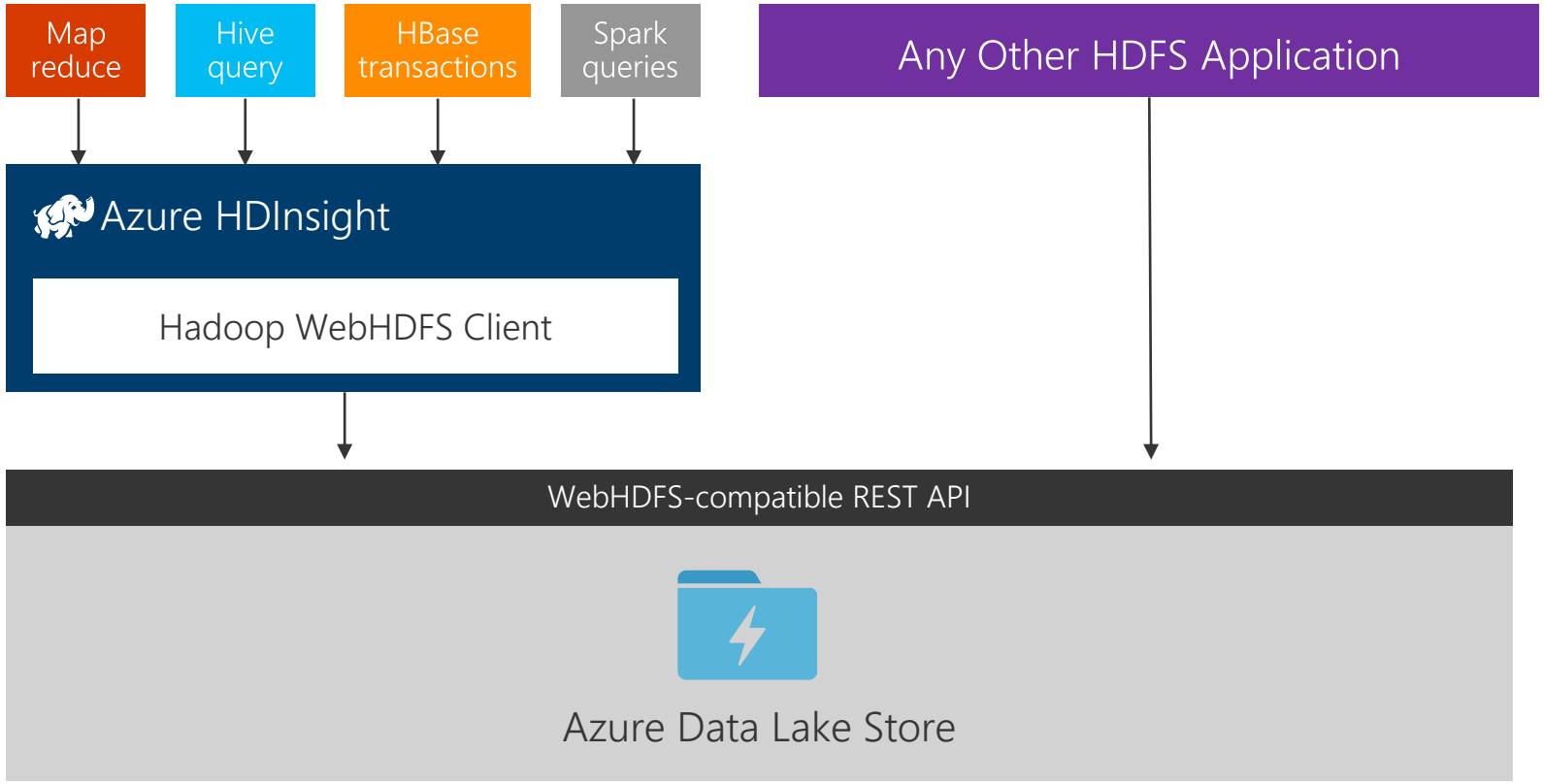


HDInsight

- Sentiment Analysis
- Clickstream Processing
- Machine/Sensor
- Server Logs
- Geo-Location

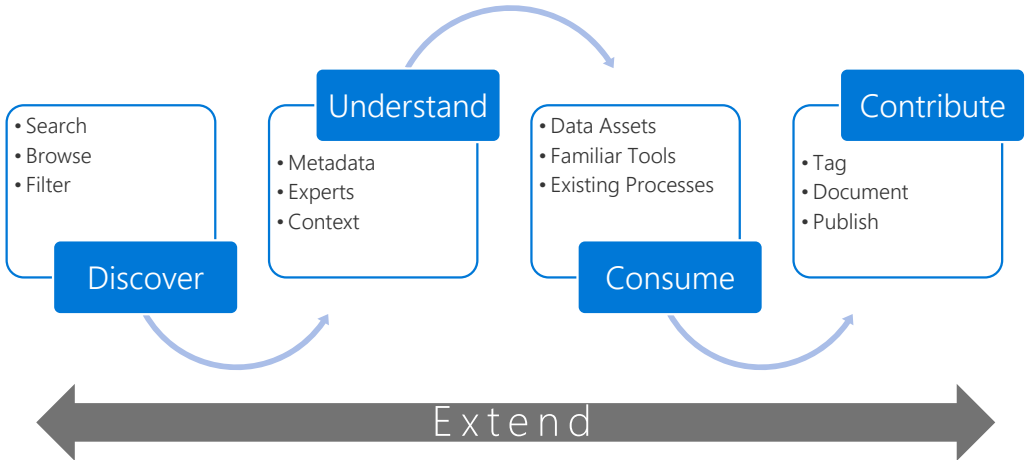
HDInsight

You can use Azure Data Lake with an Azure HDInsight cluster



Data Catalog

- Surfaces enterprise data for workloads and ad-hoc queries:
  - Employees can find data sets that are normally difficult to find
  - Data Assets can be shared among enterprise applications
- Control and delegate access to data assets
- Integrate data assets into existing processes using REST APIs



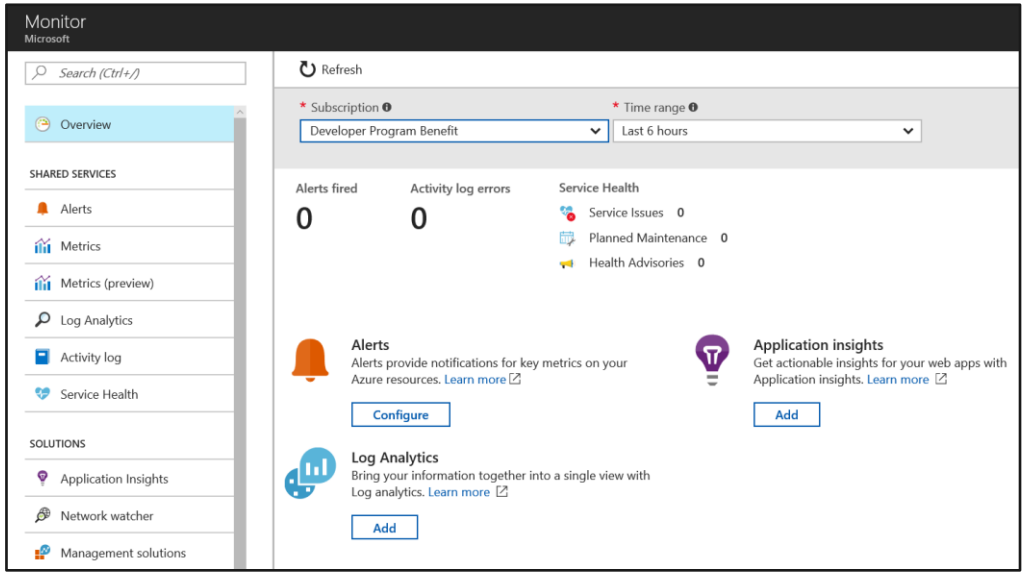
Monitoring And Automating

Azure Network Watcher

- Networking feature, providing:
  - Topology
  - Variable Packet Capture
  - IP Flow Verify
  - Next Hop
  - Diagnostics Logging
  - Security Group View
  - NSG Flow Logging
  - VPN Gateway Troubleshooting
  - Network Subscription Limits
  - Role Based Access Control
  - Connectivity

Azure Network Monitor

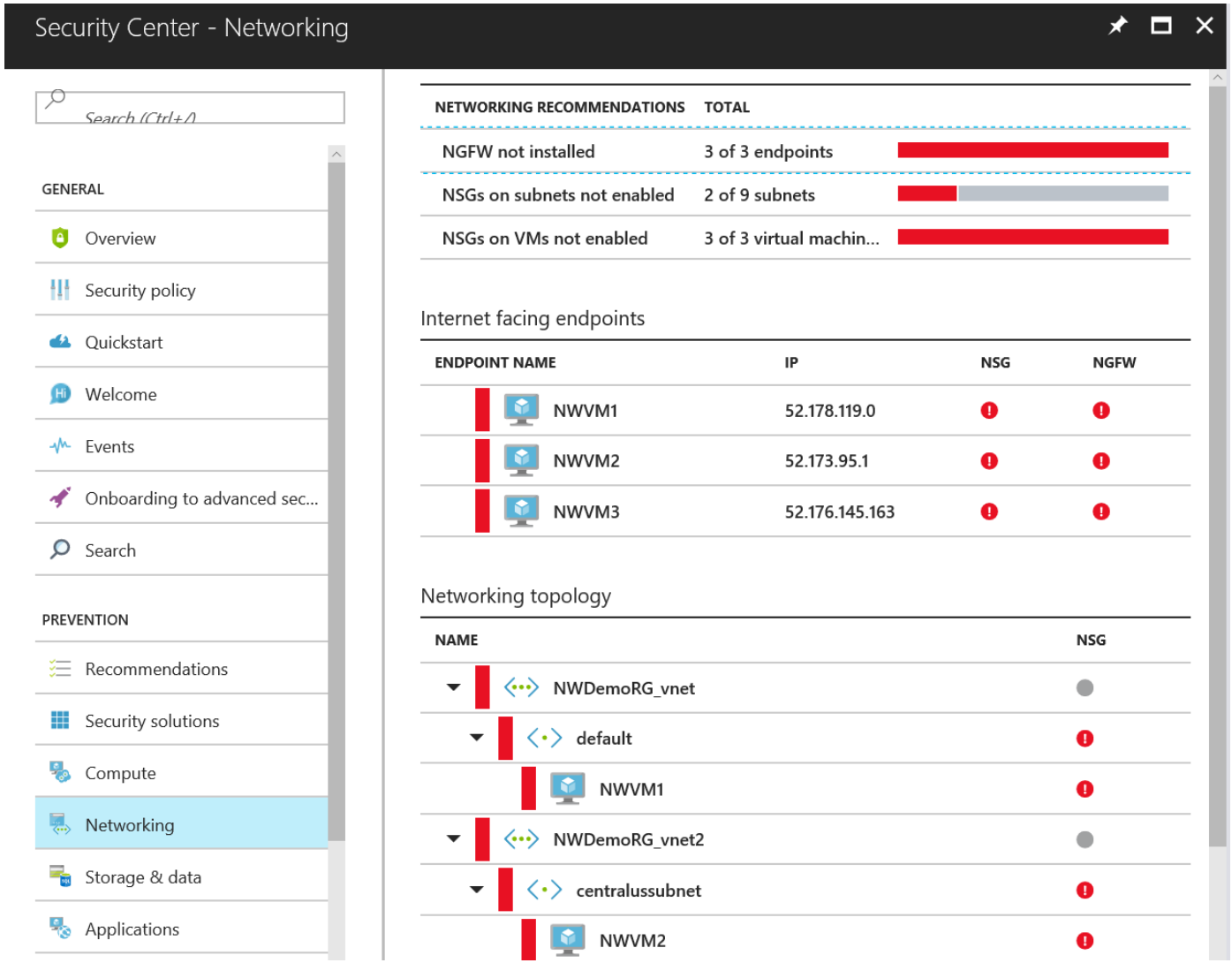
- Centralized hub for different Azure Resources Monitoring aspects:
  - Alerts
  - Metrics
  - Log Analytics
  - Service Health
  - Application Insights
  - Network Watcher



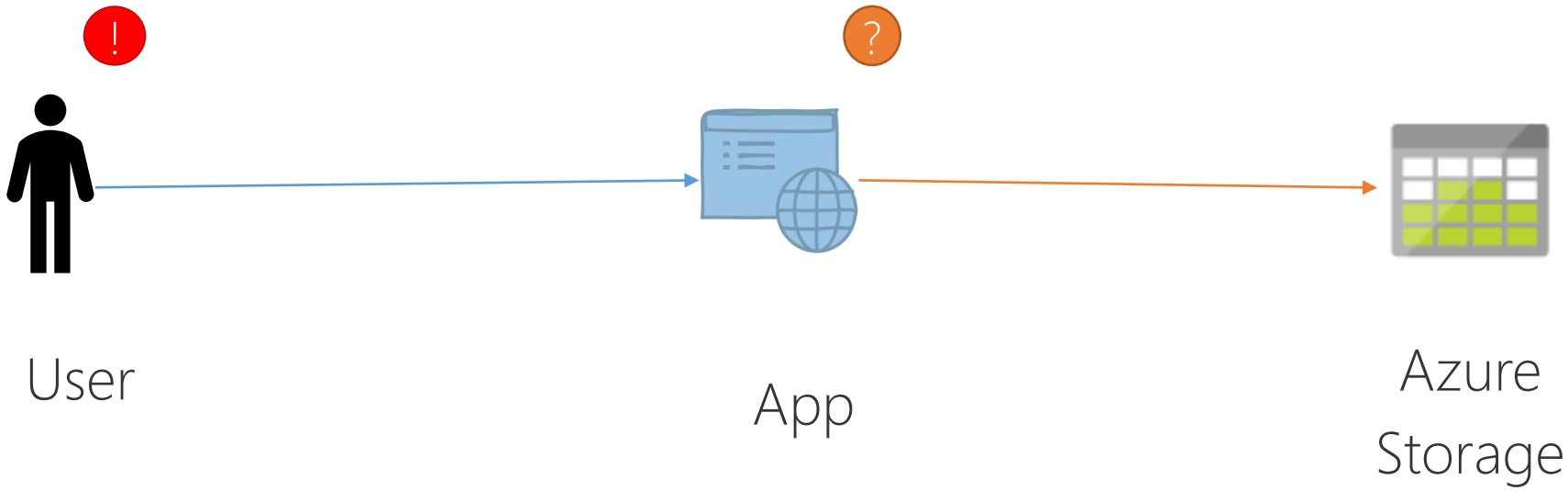
Azure Security Center

- Centralized Dashboard, focusing on Security posture of Azure and hybrid systems and applications
- Active in 3 different areas:
  - General Security View
  - Prevention
  - Detection
- Networking Features:
  - Networking Recommendations
  - Internet Facing Endpoints security view
  - Networking Topology security view

Azure Security Center



Azure Monitor & Diagnostics



Azure Advisor

Recommendations are sourced from the Azure Architecture Center

Azure Architecture Center

Azure Application Architecture Guide

A guide to designing scalable, resilient, and highly available applications, based on proven practices that we have learned from customer engagements.

Reference Architectures

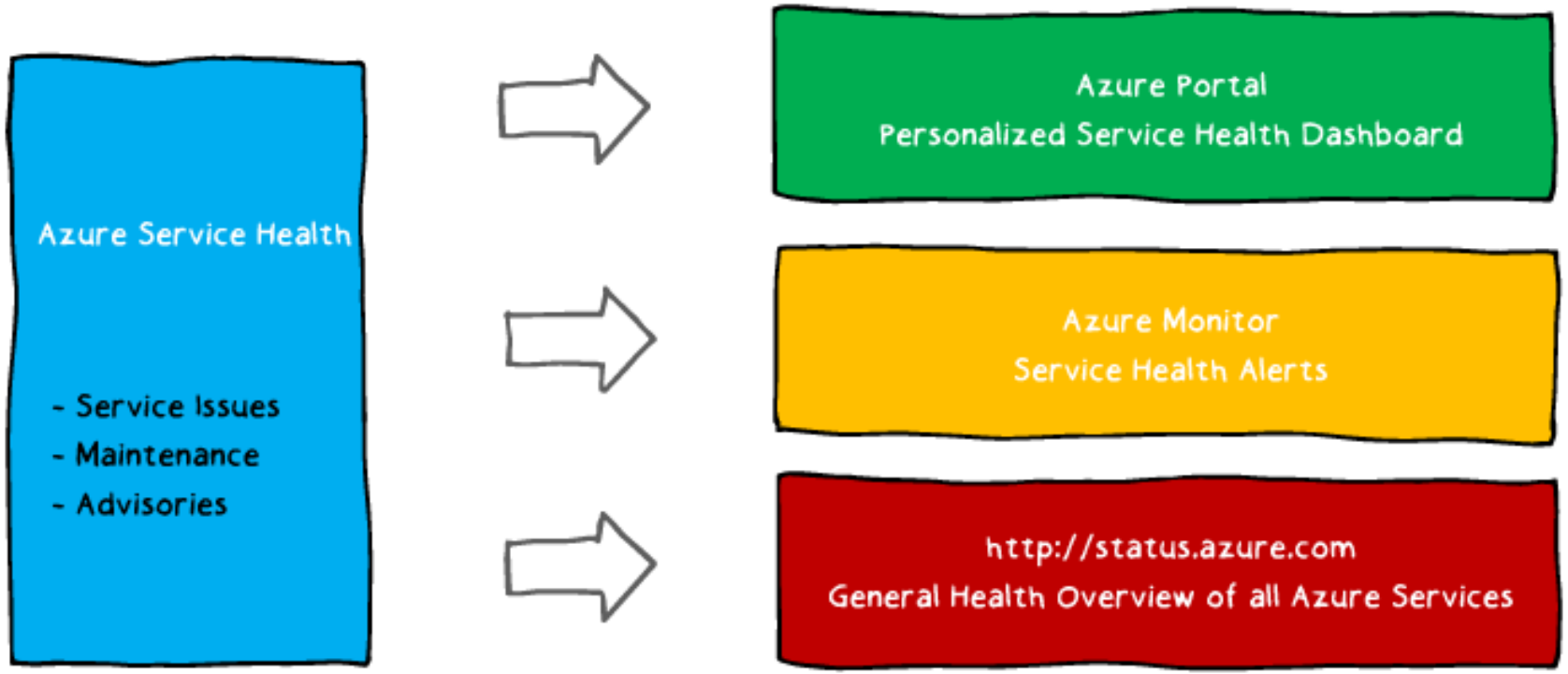
A set of recommended architectures for Azure. Each architecture includes best practices, prescriptive steps, and a deployable solution.

Cloud Design Patterns

Design patterns for developers and solution architects. Each pattern describes a problem, a pattern that addresses the problem, and an example based on Azure.

Azure Service Health

"Provides timely and personalized information when problems in Azure services impact your services."



Azure Service Health

- Service Issues:
  - Shows any ongoing problems in the Azure Platform, having impact on YOU
- Planned Maintenance:
  - Provides information on scheduled maintenance of YOUR impacted Azure Resources
- Health History:
  - Shares feedback of past issues with impact on YOUR Azure Resources

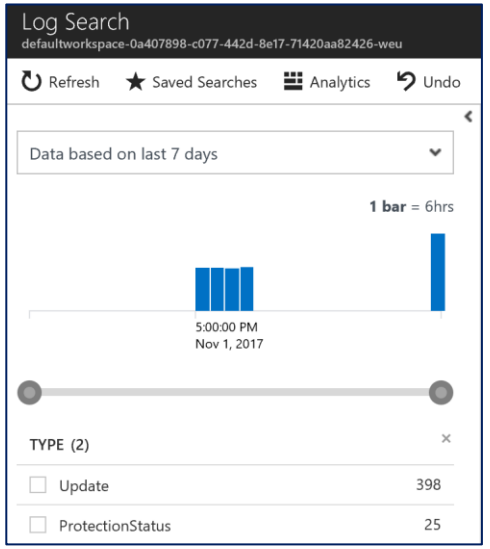
Operations Management Suite – Log Analytics

- Separate the signal from the noise
- See the full picture in meaningful detail
- Integrating application monitoring
- Azure Resources & Hybrid
- OMS Agents
- Supports “Any” Log File format

Operations Management Suite – Log Analytics

- Powerful Query Language
- Click-to-filter scenarios
- Saved Search
- Export to CSV
- Use “Azure Log Analytics” for more advanced querying (portal.loganalytics.io)

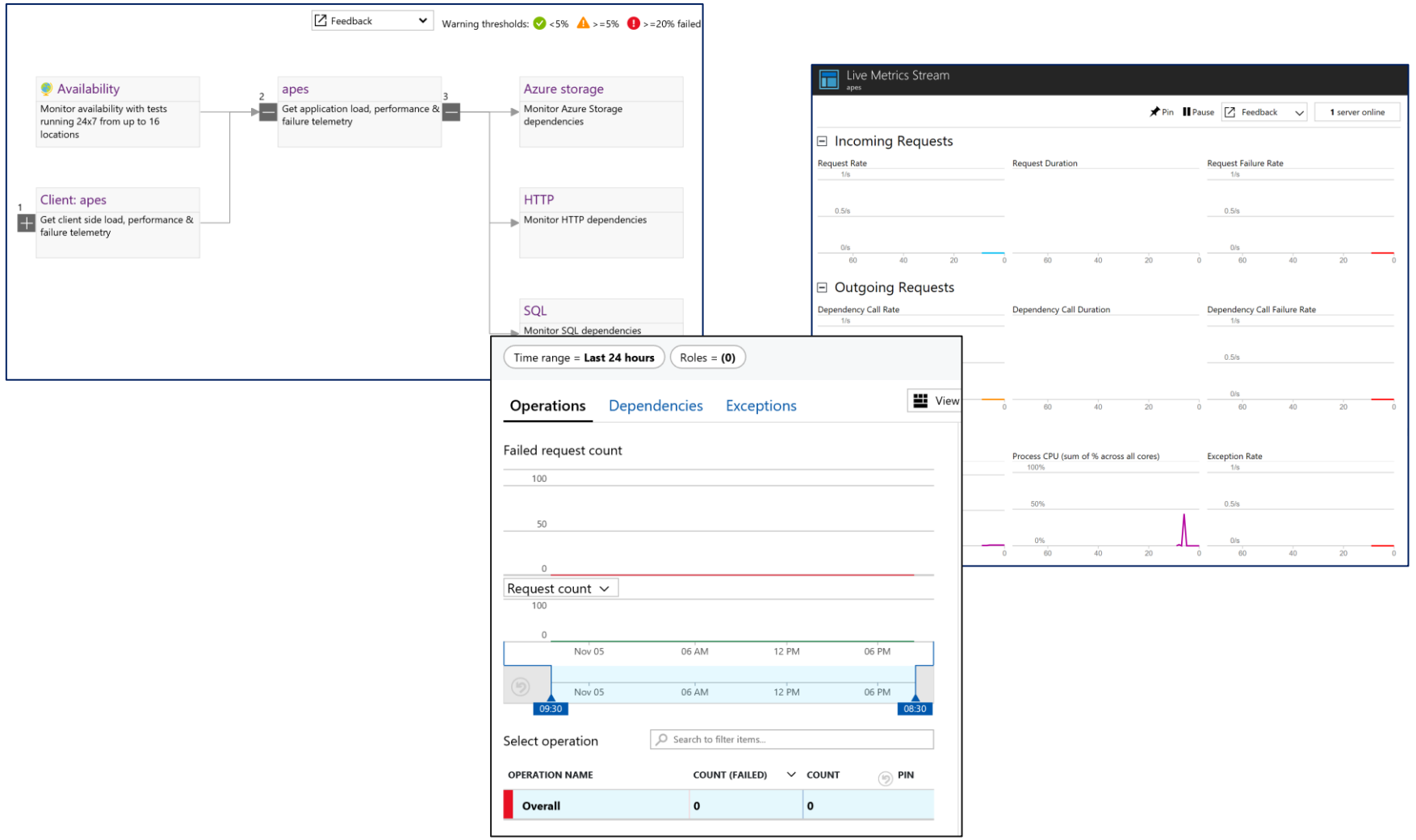
```
search * | where Type == "Heartbeat"
```



Application Insights

- Application Map:
  - Diagram of App Components and interactions between all services
- Live Metrics:
  - Real-Time Requests information
- Servers:
  - Detailed Performance per Instance view
- Availability:
  - Run scheduled tests for Uptime

Application Insights



Power BI

"Workspace approach, integrating with Power BI Apps, allowing for detailed reporting and data analytics"

Connect to different data sources, create reports and data charts

Get access to powerful dashboards, alerts and drill down for info

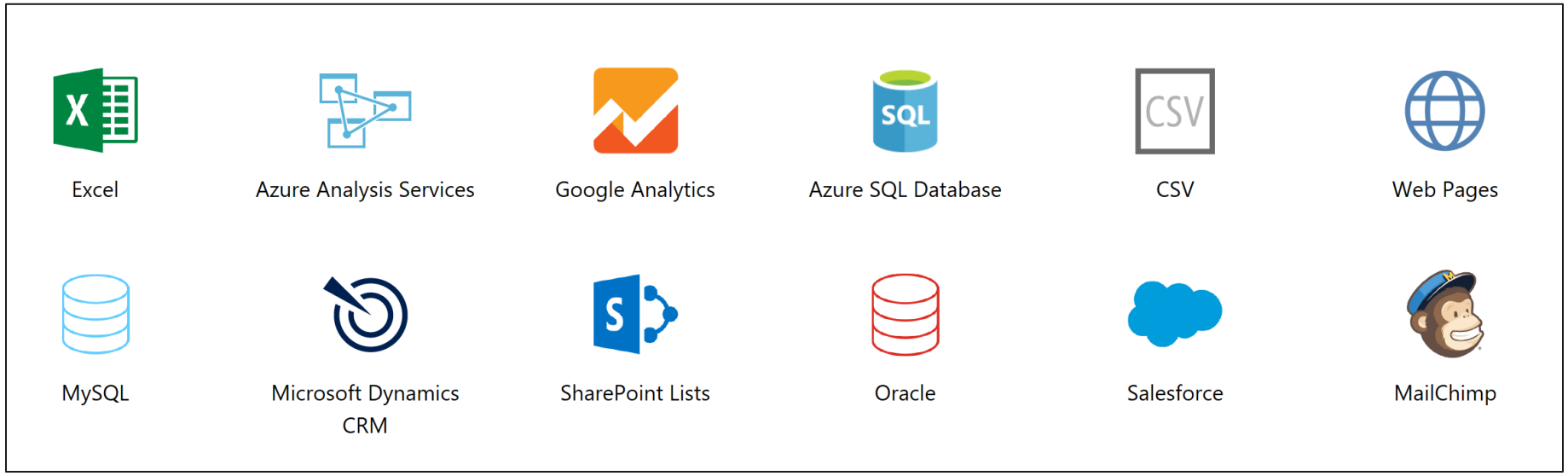
Simplify Mgmt, expose IT data to non-IT teams, achieve compliance

Embed interactive data visuals and reporting features into your apps

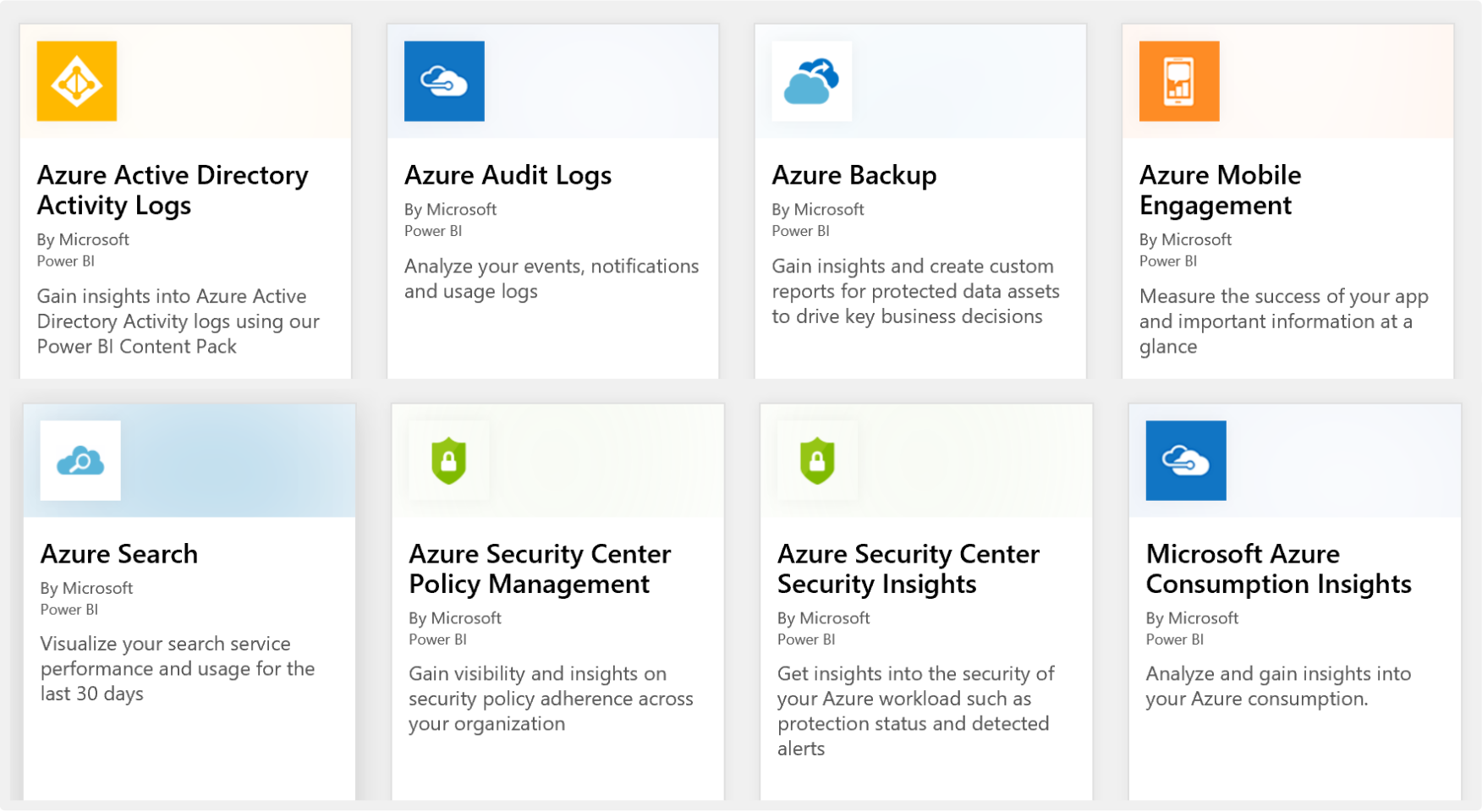
Monitoring, Management + Business Continuity & Disaster Recovery

Power BI

Integrating with Industry-Standard Data Sources



Power BI Integrations

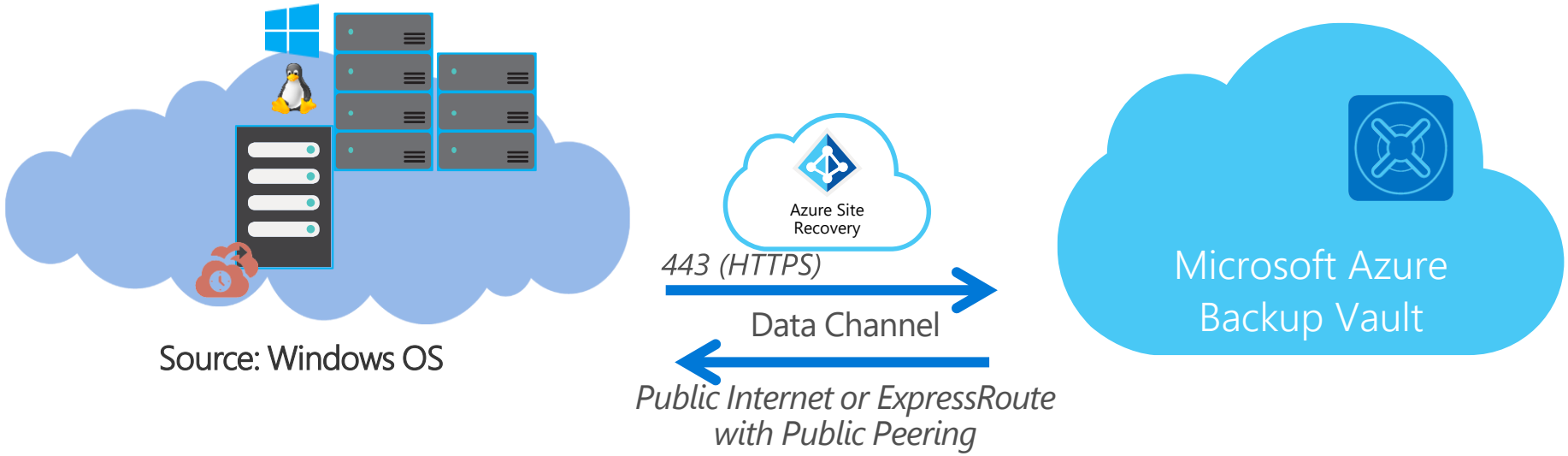


Azure Backup

- There are three popular scenarios where Azure is selected as the ideal backup target:
  1. On-Premises backups of Files & Folders into Azure Backup Vault
  2. On-Premises backups of full Windows & Linux VMs into Azure Backup Vault
  3. Azure VM backup to Azure Backup Vault

Backup Options

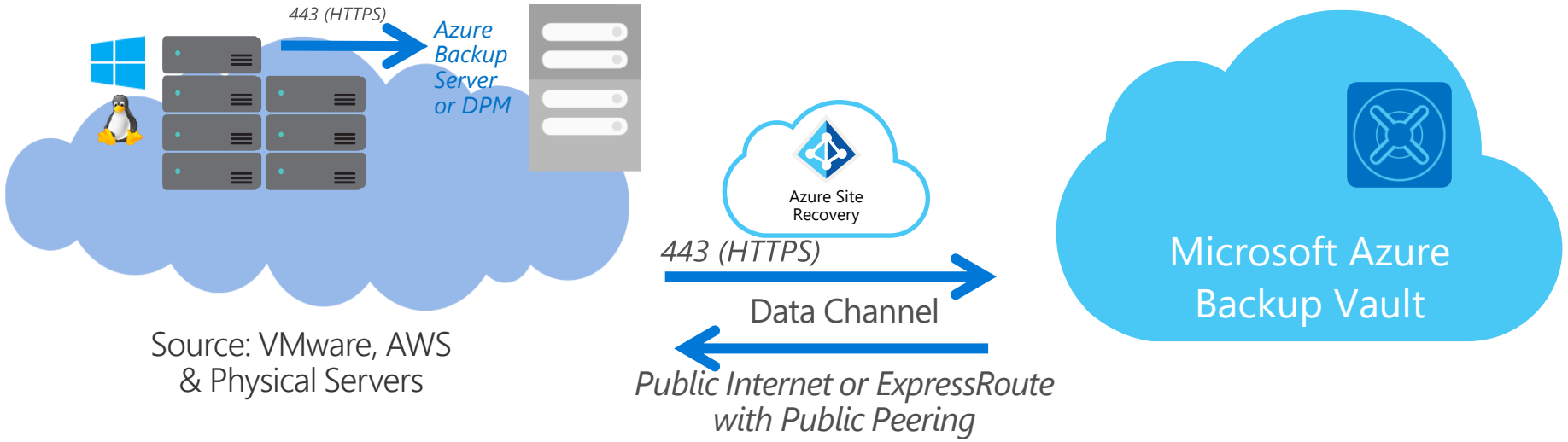
Azure Backup / Restore of On-Premises Files & Folders



Microsoft Azure Recovery Services Agent
Replicates data to Azure

Backing up OS, Sysvol and Applications

Azure Backup / Restore of On-premises running full workloads (OS, Sysvol, and Applications)



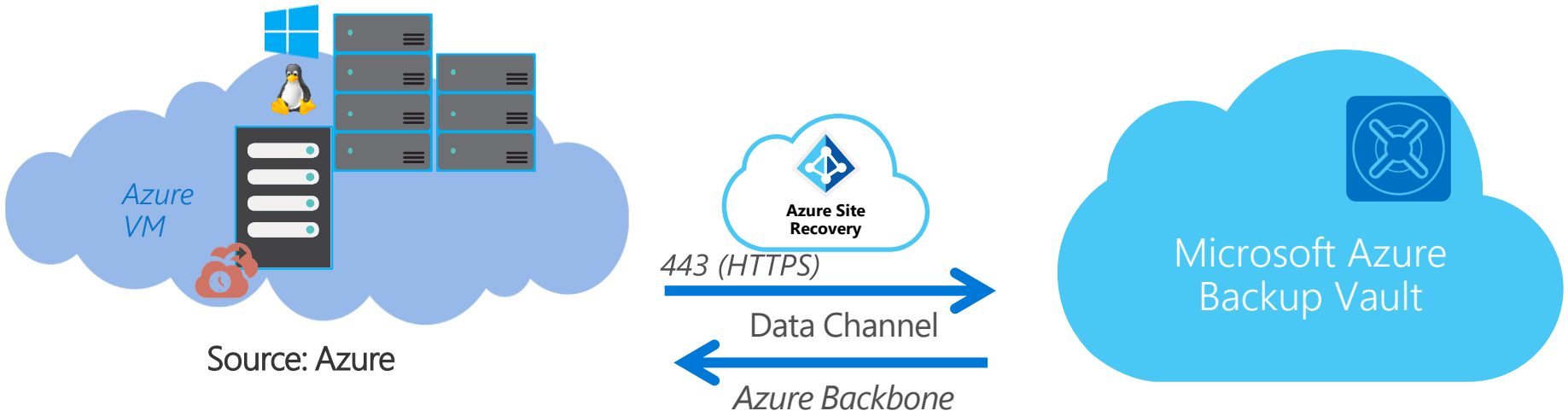
Azure Backup Server
Used for caching, compression, and encryption

SysCtr DPM
If you already have SC on-premises

Azure Backup Recovery Services Agent

Backing Up Full VMs

Azure VM Backup / Restore to Azure Backup Vault



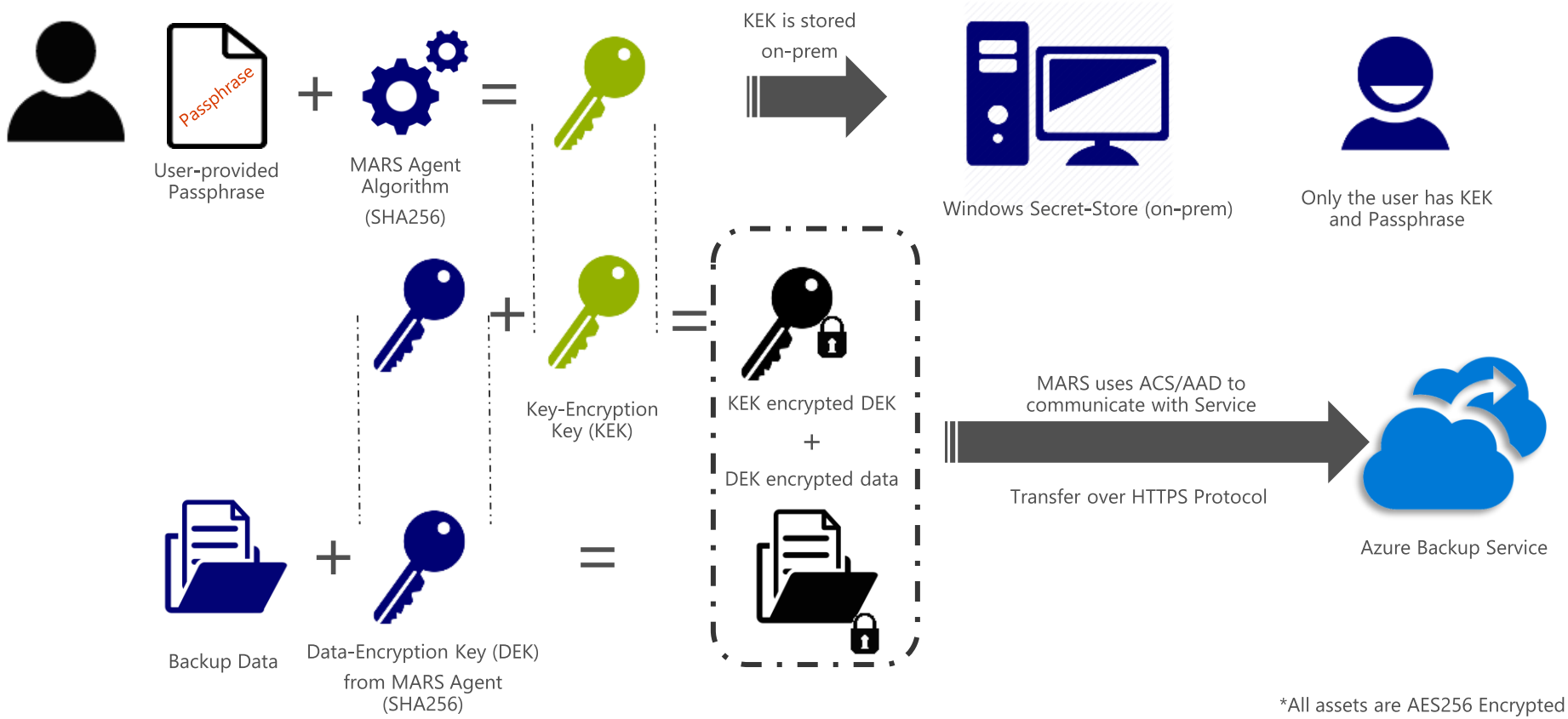
Microsoft Azure Backup
Extension for VMs

Specialized Backup

You can do more than simply backup VMs or Data using Azure Backup:

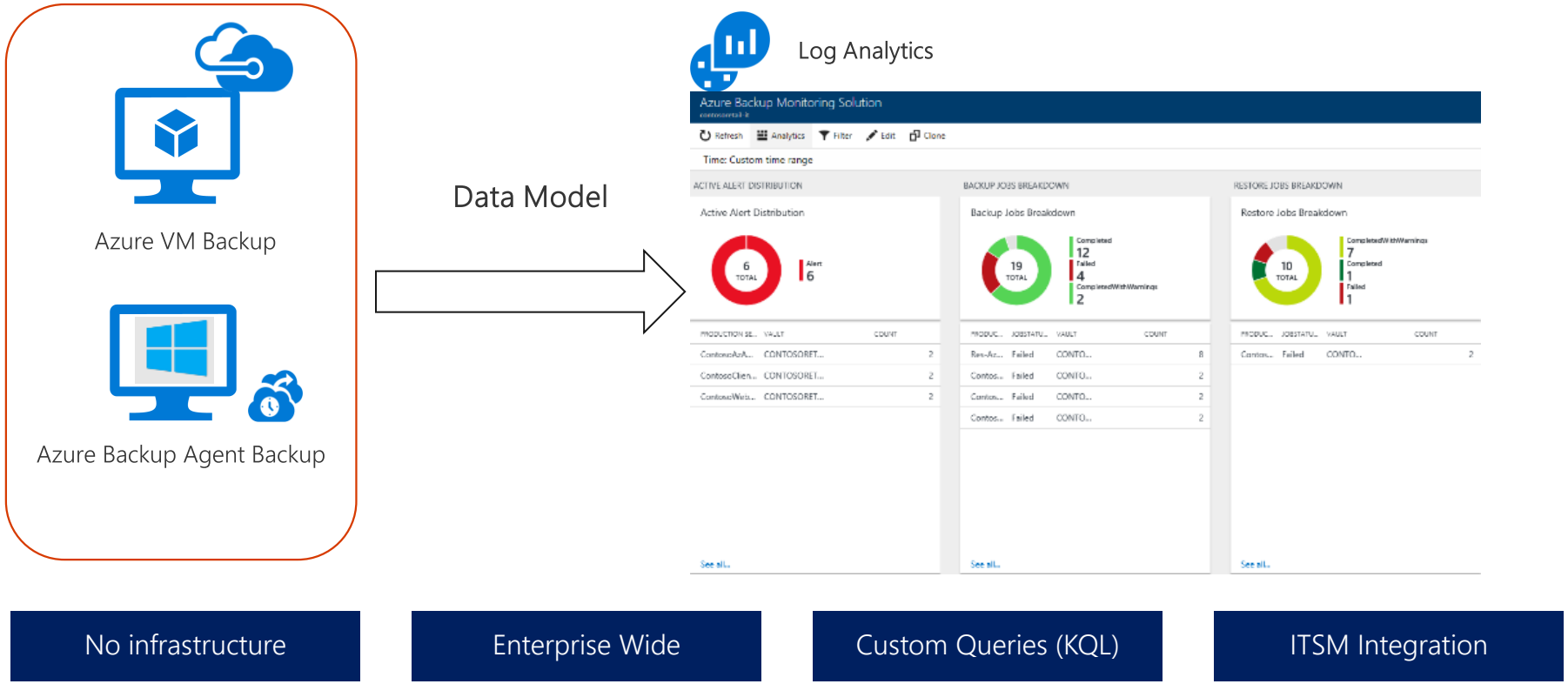
- Hybrid Backup Encryption
- Azure Backup Monitoring with Log Analytics
- Azure Backup Reports with Power BI
- Linux Application Consistent Azure Backup

Hybrid Backup Encryption



*All assets are AES256 Encrypted

Azure Backup Monitoring with Log Analytics



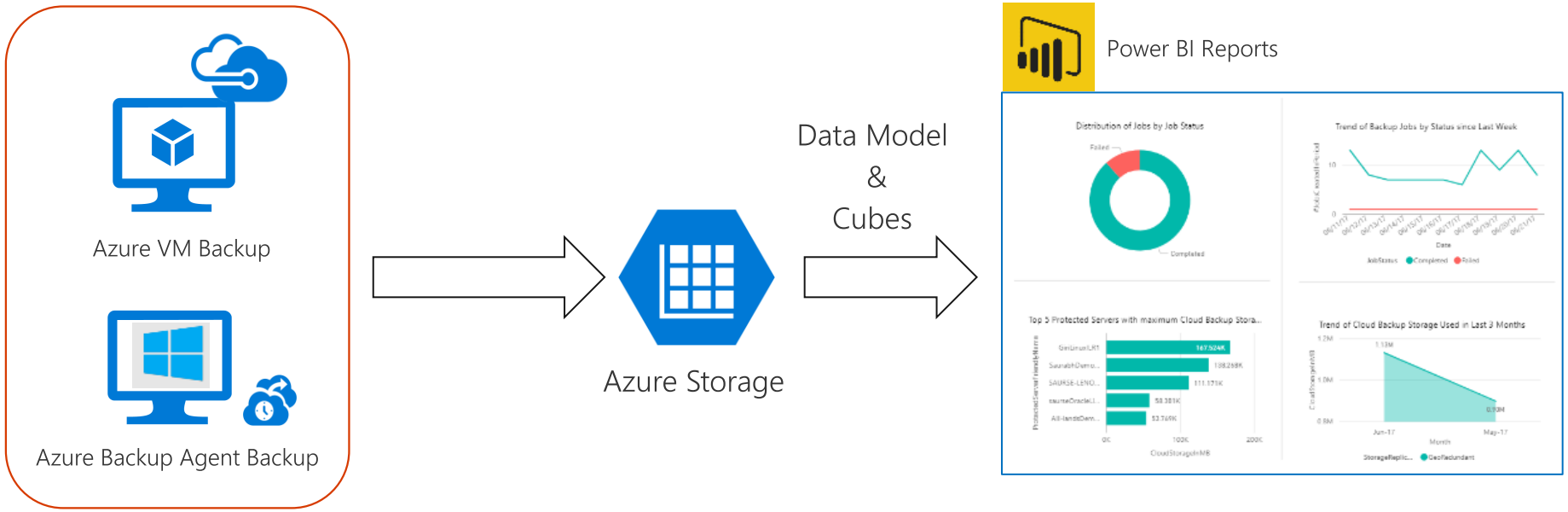
No infrastructure

Enterprise Wide

Custom Queries (KQL)

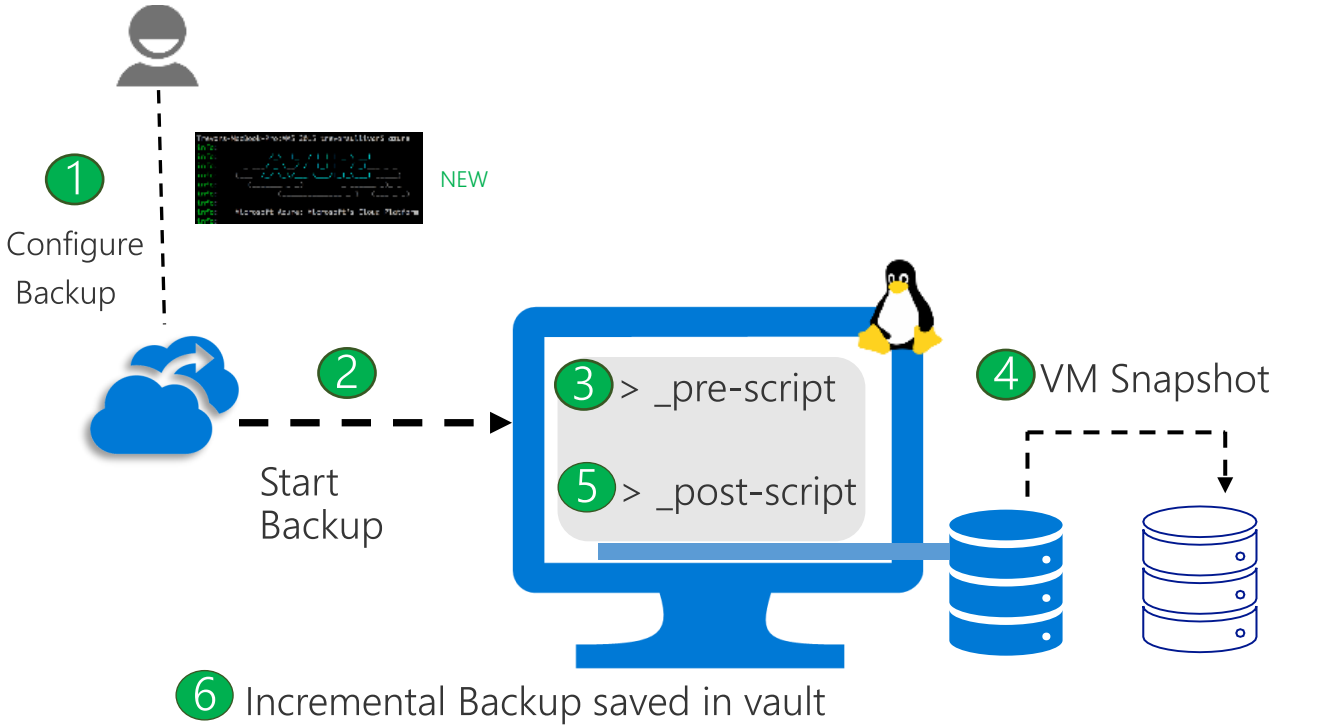
ITSM Integration

Azure Backup Reports with Power BI



No infrastructure | Enterprise Wide | Custom Reports | Access Control

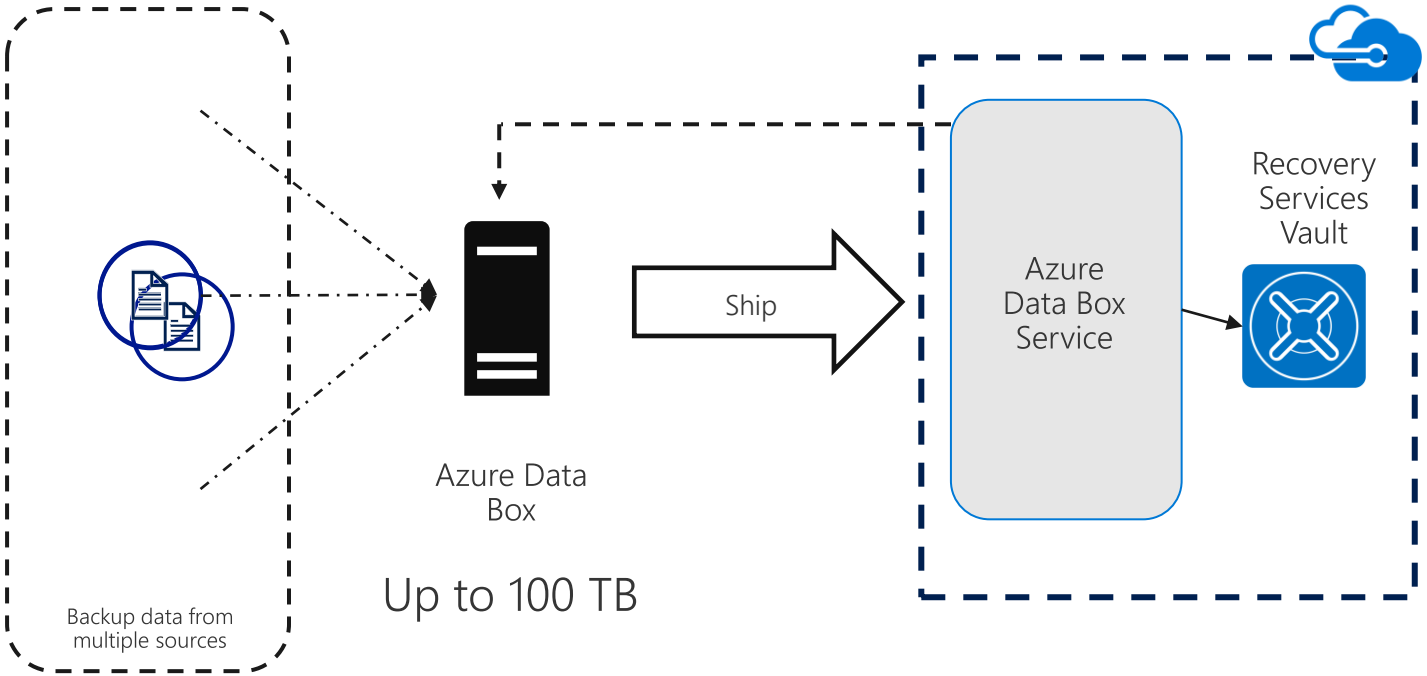
Linux Application Consistent Azure Backup



App consistent backup

Open support platform

Azure Data Box



No procuring of disks | Parallel transfers | Safe and secure

Offline Data Shipping

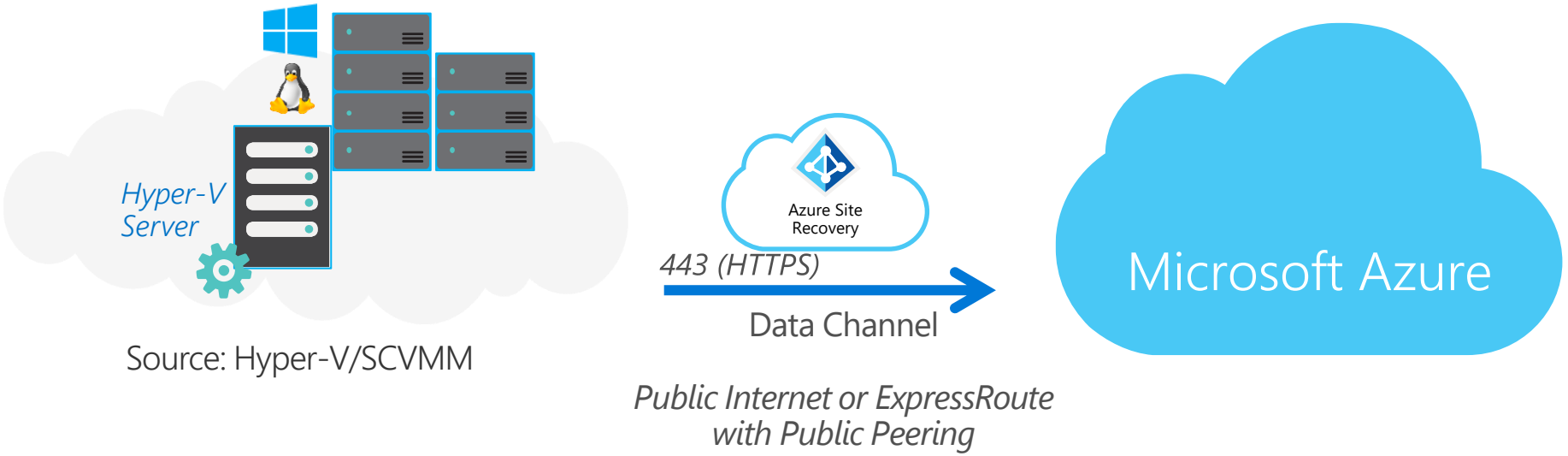
Site Recovery

- Designed for zero-data loss during migration
- Near-zero downtime for their users
- Comprehensive coverage for all applications
- Ability to test application in the new cloud before migration

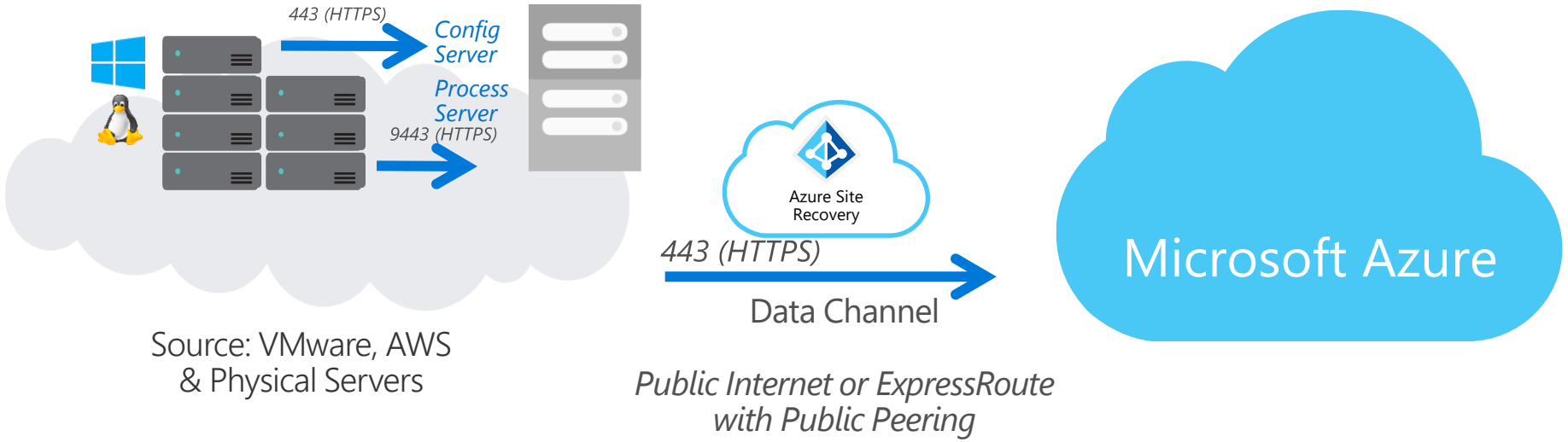
Site Recovery Advantages

- Zero application data loss during migration
- Near-zero application downtime during migration
- Broad coverage for hypervisors, applications, operating systems, and Azure features
- No-impact application testing in Azure

Disaster Recovery or Workload Migration from Hyper-V/SCVMM



Disaster Recovery or Workload Migration from VMware/AWS/physical

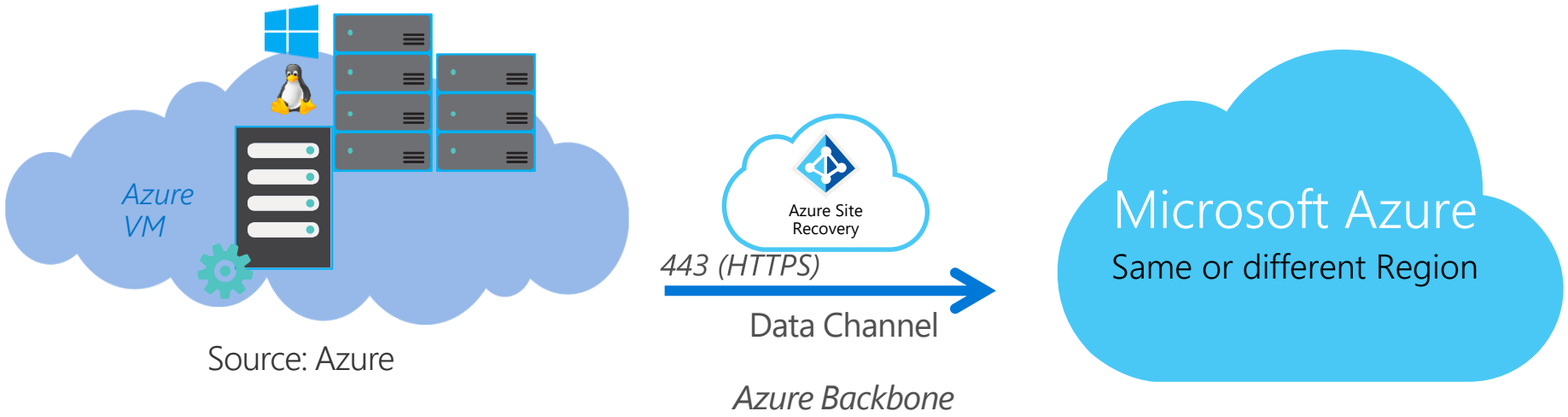


Process Server
Used for caching, compression, and encryption

Configuration Server
Used for centralized management

Mobility Service
Captures all data writes from memory

Disaster Recovery or Workload Migration from Azure to Azure



Microsoft Azure Recovery Services Agent
Replicates data to Azure

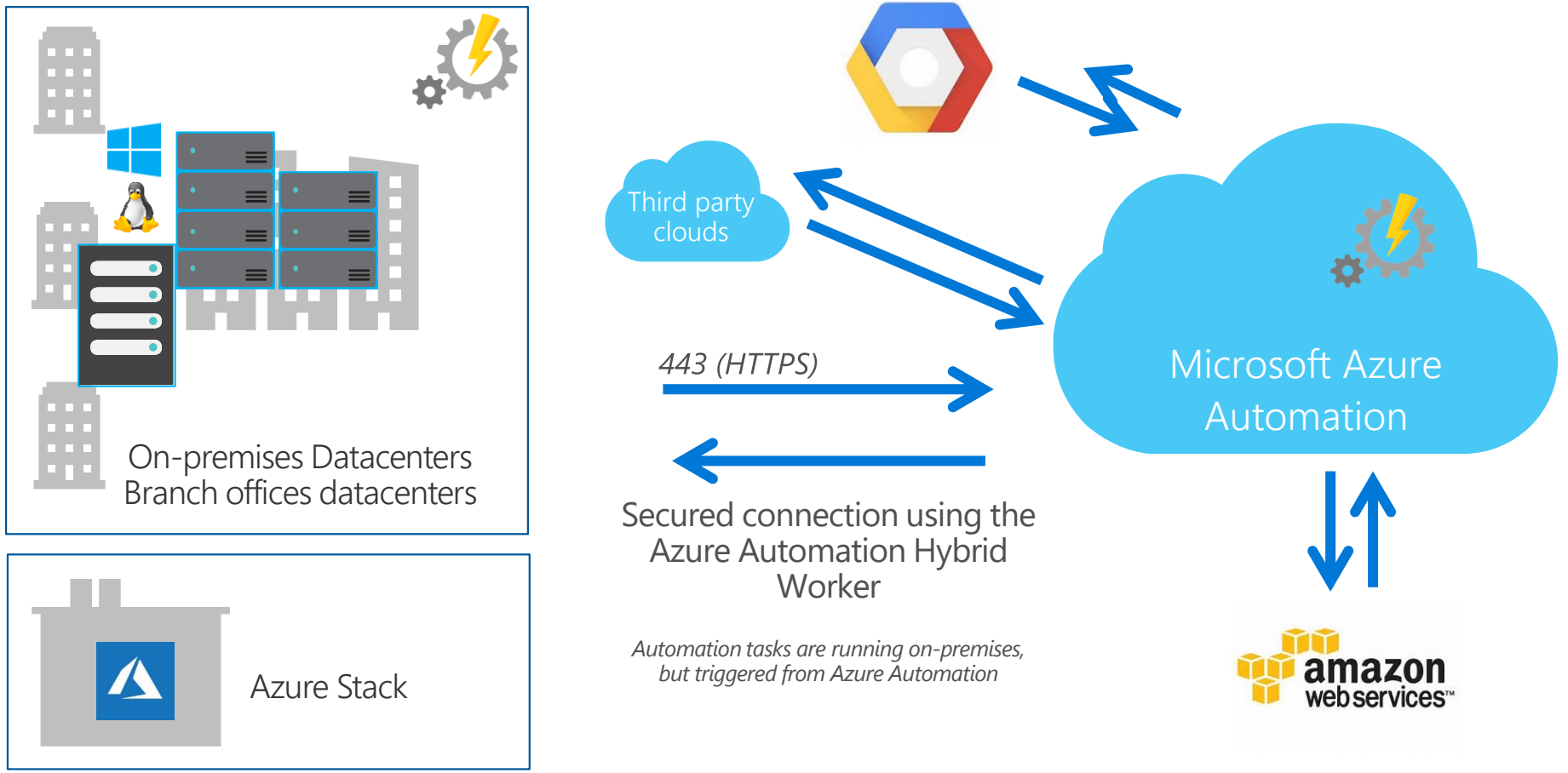
Azure Automation

- Configuration and control plane for Azure, on-premise and other cloud providers:
  - Robust configuration management toolkit built-in
  - Access governance and control
  - Serverless execution of management scripts
  - Integration with existing platforms, systems and OS features

Features

- Process Automation:
  - Author runbooks - PowerShell, scripts PowerShell workflow, Graphical, Python2
  - Hybrid Runbook Workers with Proxy support
- Configuration Management:
  - DSC Configurations, Pull service
  - Node Management & Reporting
  - Change tracking & Inventory
- Update Management:
  - Insights across a hybrid Environment
  - Orchestrated updates and troubleshooting

Cross-Cloud


On-premises Datacenters
Branch offices datacenters
Azure Stack
Third party clouds
443 (HTTPS)
Secured connection using the Azure Automation Hybrid Worker
Automation tasks are running on-premises, but triggered from Azure Automation
Microsoft Azure Automation
amazon web services

Azure Automation Desired State Configuration

- Host DSC Scripts and clients pull their configurations automatically
- Support for cloud or on-premises VMs and hosts
- Simple onboard process for Azure Virtual Machines

- Characteristics & Use Cases:
  - Import, Authoring, Compiling
  - Integrated source control,
  - Controlled Distribution to nodes
  - Reporting

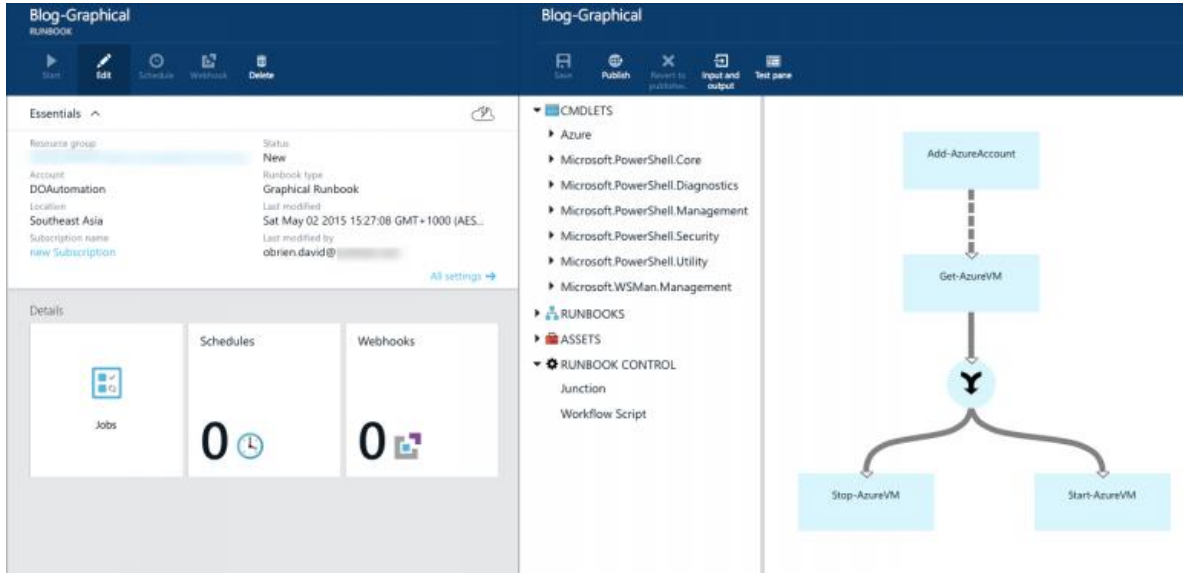
Desired State Configuration

Automation DSC can be used to manage various machines:

- Azure virtual machines running Windows or Linux
- Amazon Web Services (AWS) virtual machines running Windows or Linux
- Physical/virtual Windows computers on-premises, or in a cloud other than Azure or AWS
- Physical/virtual Linux computers on-premises, or in a cloud other than Azure or AWS

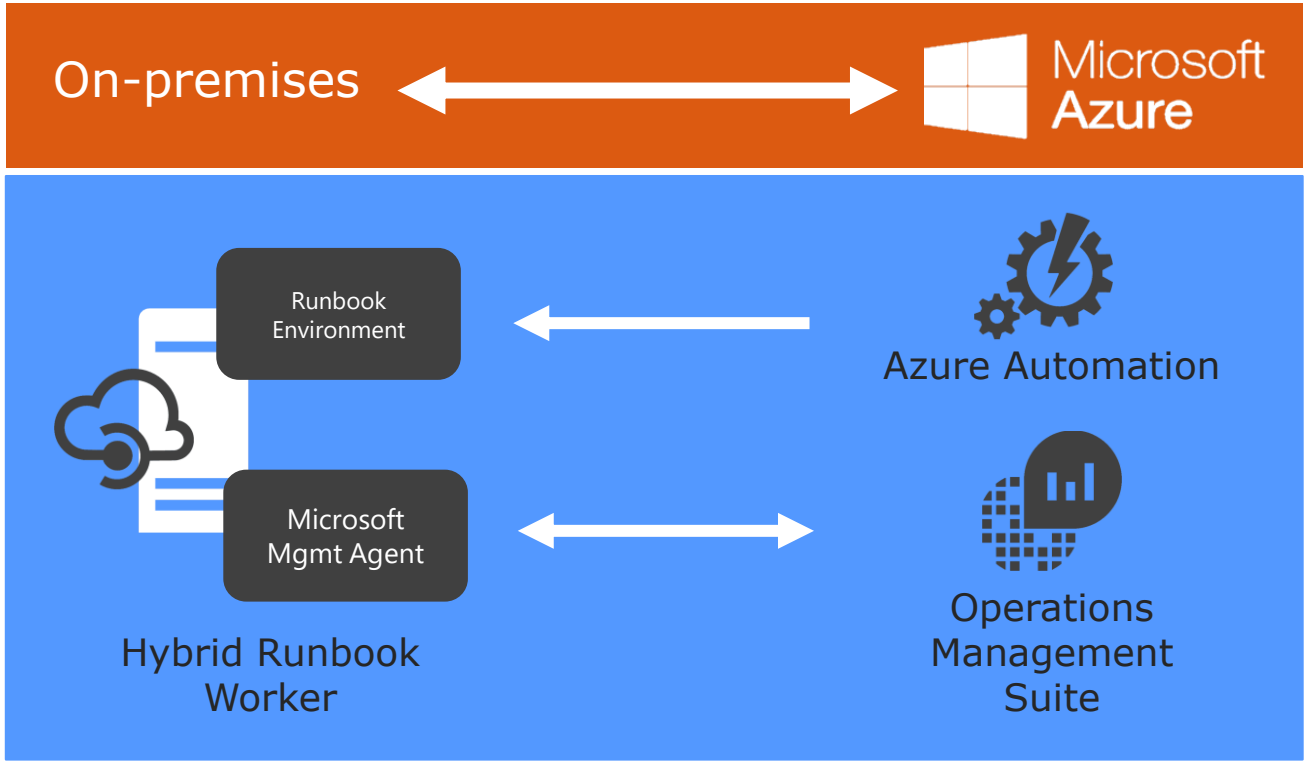
Desired State Configuration

- Built-in integration with on-premises systems and PowerShell DSC nodes
  - Run Azure Automation runbooks on-premises
  - Automation accessible via new REST API (including GitHub, VSO and ARM)
  - Graphical workflow-authoring tool
  - Runbook Management from the new Microsoft Azure portal

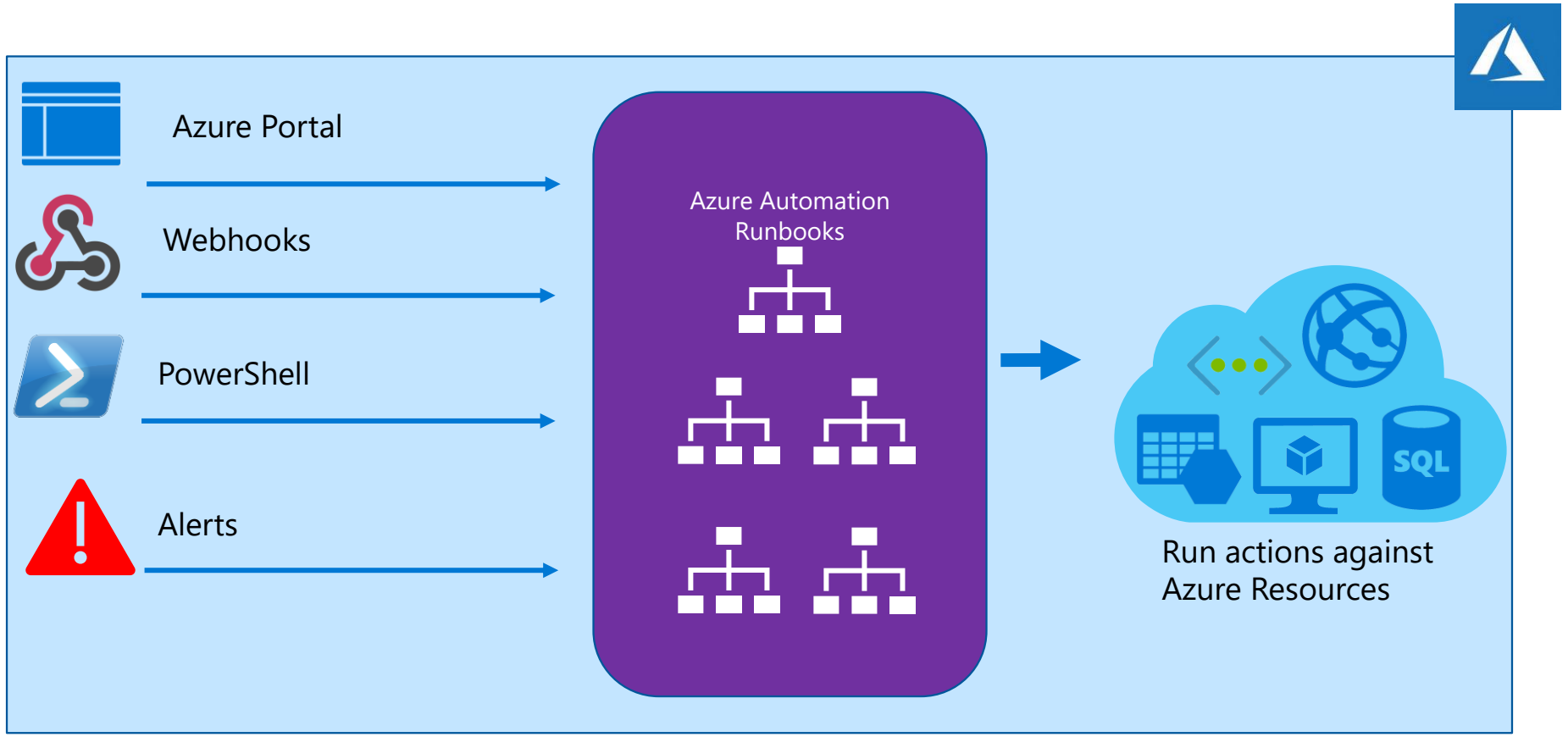


Hybrid Runbook Worker

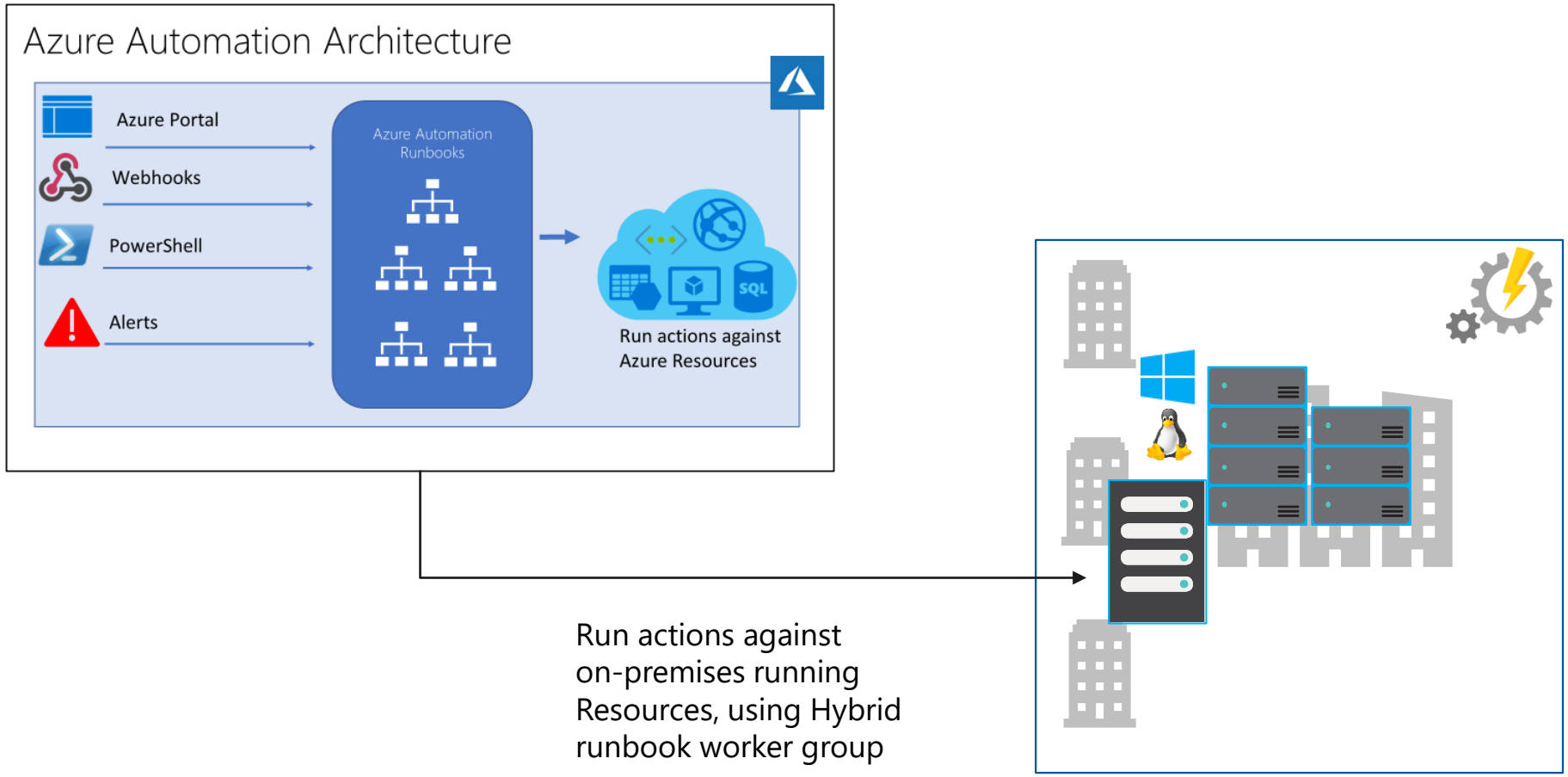
- An on-prem server running MS Mgmt Agent
- Executes runbooks downloaded from AA
- Reports results back to AA and OMS
- Can be deployed in groups for high availability
- Requires no ports (outside-in)



Automation Flow



Automation Flow



Lab Exercises

- https://github.com/MicrosoftLearning/AZ-301-MicrosoftAzureArchitectDesign/tree/master/Instructions
- Deploying Messaging components to facilitate communication between Azure resources
- Deploying Serverless Workloads to Azure
- Deploying Database Instances in Azure

Microsoft

Demonstration