Week 6

Artificial Intelligence Program

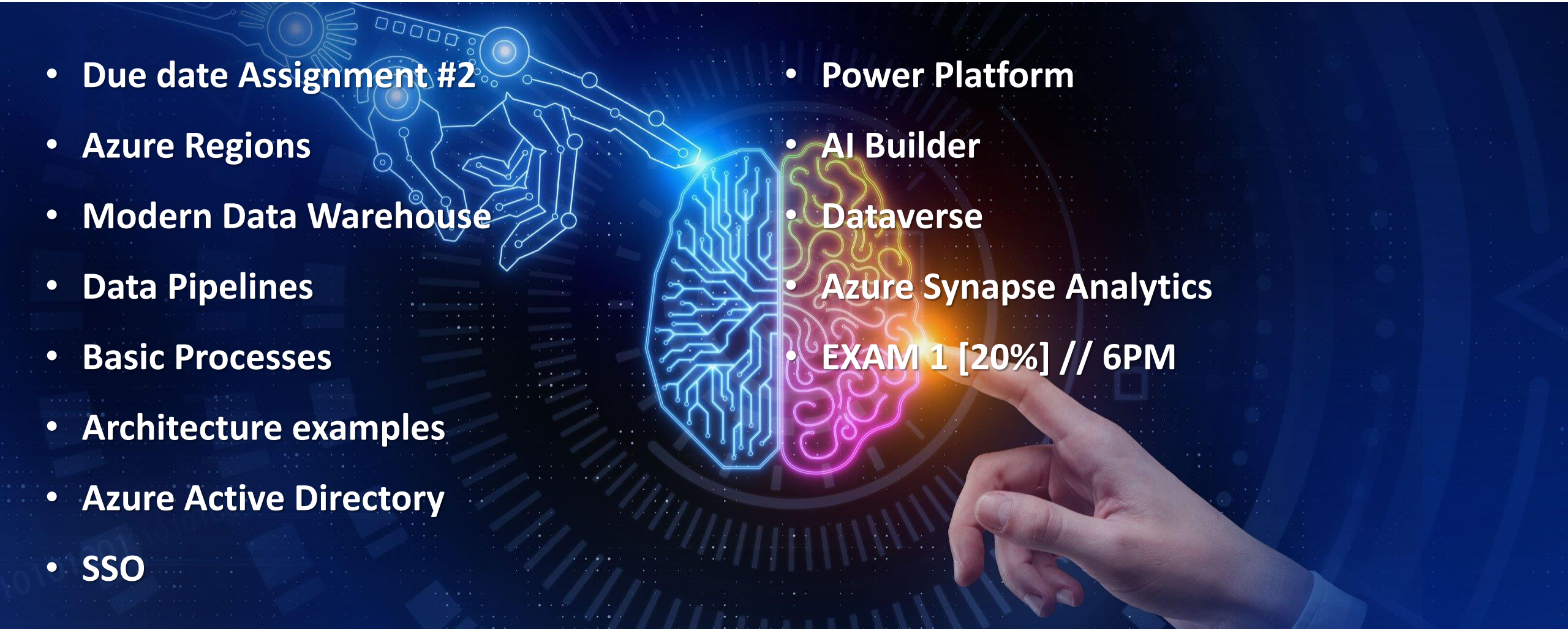
Infrastructure and Architecture

> Agenda // Program

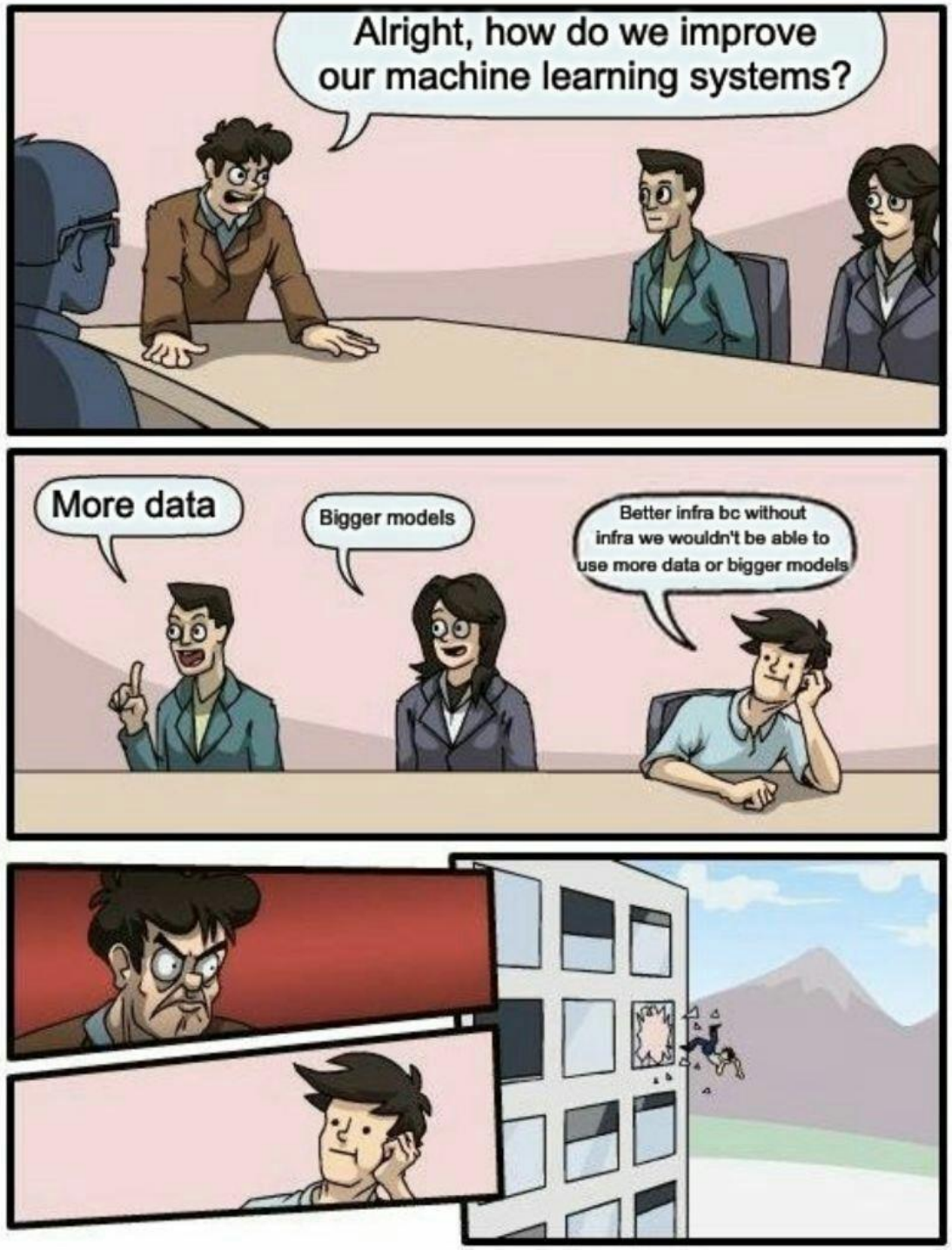
Assignments [60%]
EXAMS [40%]

WEEK	SUBJECT	ASSIGNMENT / TO BE DELIVERED	DATES
2	Intro / AI Function / Enablers		Sep 13
3	Infra and Architecture / On-prem vs. Cloud / CSPs	C 1	Sep 20
4	Data Pipeline / Processes / Framework / AutoML	#1 Image Classifier **[5%]**	Sep 27
5	Data Pipeline / Processes / Framework / AutoML	C 2	Oct 4
6	More Data / SSIS / ADF / Data Quality	#2 Machine Learning Studio **[10%]**	Oct 11
7	Azure services – Intro **EXAM 1 [20%]**	C 3	Oct 18
8	**READING WEEK**	**NO CLASSES**	**Oct 25**
9	Azure services – Cognitive Services 1	41	Nov 1
10	Azure services – Cognitive Services 2	#3 Draw your own Architecture (in class) **[5%]** 42	Nov 8
11	Azure services – Cognitive Services 3	43	Nov 15
12	Azure services – Cognitive Services 4	#4 Azure pipeline // Sentiment Analysis **[20%]** 44	Nov 22
13	AWS Academy – Cloud Foundations		Nov 29
14	AWS Academy – Machine Learning	#5 AWS Academy – Cloud Foundations **[10%]**	Dec 6
15	Enterprise Architecture **EXAM 2 [20%]**	#6 AWS Academy – Machine Learning **[10%]**	Dec 13

> Agenda



- Due date Assignment #2
- Azure Regions
- Modern Data Warehouse
- Data Pipelines
- Basic Processes
- Architecture examples
- Azure Active Directory
- SSO
- Power Platform
- AI Builder
- Dataverse
- Azure Synapse Analytics
- EXAM 1 [20%] // 6PM


Alright, how do we improve our machine learning systems?
More data
Bigger models
Better infra bc without infra we wouldn't be able to use more data or bigger models

Toughest jobs in the world:

4- Oil rig worker

3- Alaskan crab fisherman

2- Cell tower climber

1- The data scientist who has cleaned this dataset!

You need a mixture of hard and soft skills, a lot of patience, and coffee!

Agree?

Documentations

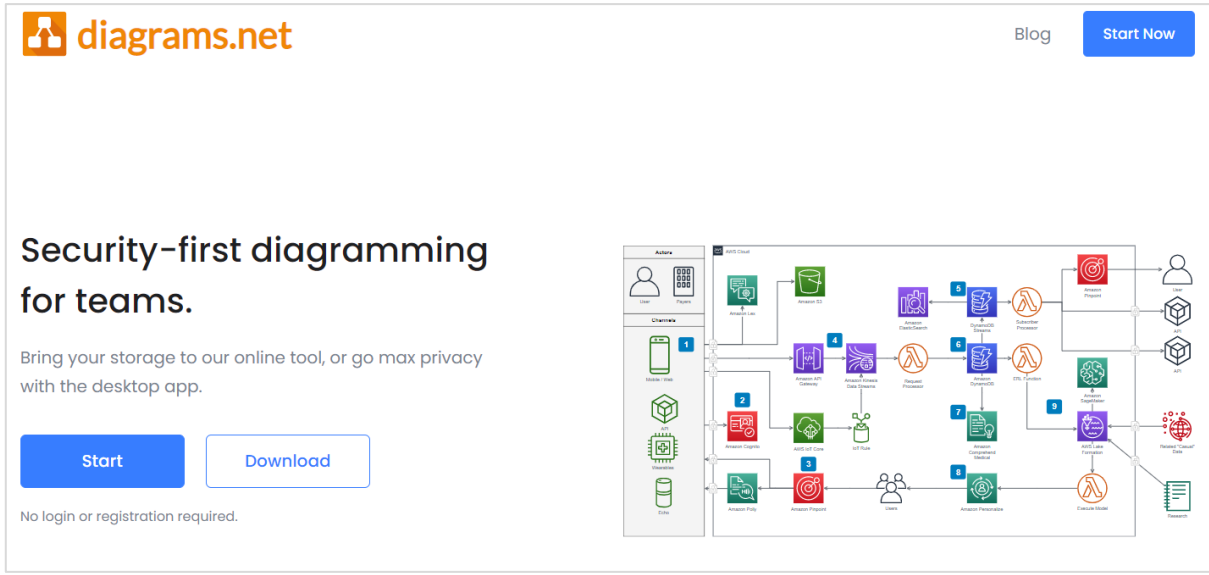
> Documentations

What is the most boring part (but super important!) of the data scientist's work? Yup... documentations.

If you are looking for a tool that would make the documentation process more joyful and colorful, I highly recommend diagrams.net (or draw.io). As the name implies, this awesome tool enables to draw diagrams to describe processes such as data architecture, relationships between functions, modeling, etc.

It is a free and open-source tool under the Apache-2 license available in desktop and web versions.

Website: https://www.diagrams.net/
Source code (and desktop version installation): https://lnkd.in/gkuKA4s



Azure Week 1

Microsoft

> Azure Regions

54 regions worldwide **140** available in 140 countries

EXAM

> Why are Regions Important?

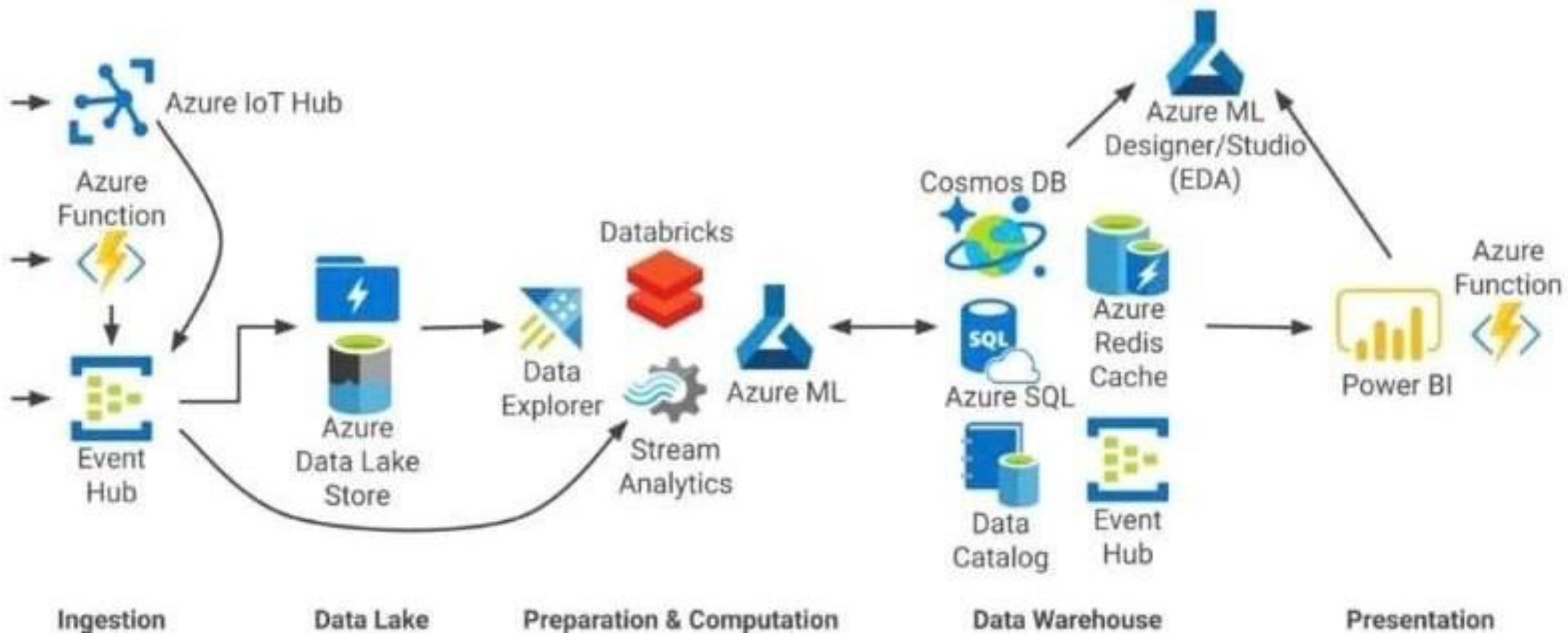
Regions allow you to locate your cloud resources close to your customers, both internal or external. **The closer your customers are to the region where your cloud resources are located, the faster and better their experience will be.** For example, if your customers are located in Germany, it makes sense to choose a European region for your cloud region, even if your office is in Delaware.

Regions are also commonly used as part of disaster recovery (DR) strategy. While many public cloud users depend on the reliability and redundancy of inter-region resources for DR, some use multiple regions to achieve the same result. Sometimes this is required for regulatory or compliance reasons, but sometimes it's simply company policy.

HOW TO CHOOSE A REGION?

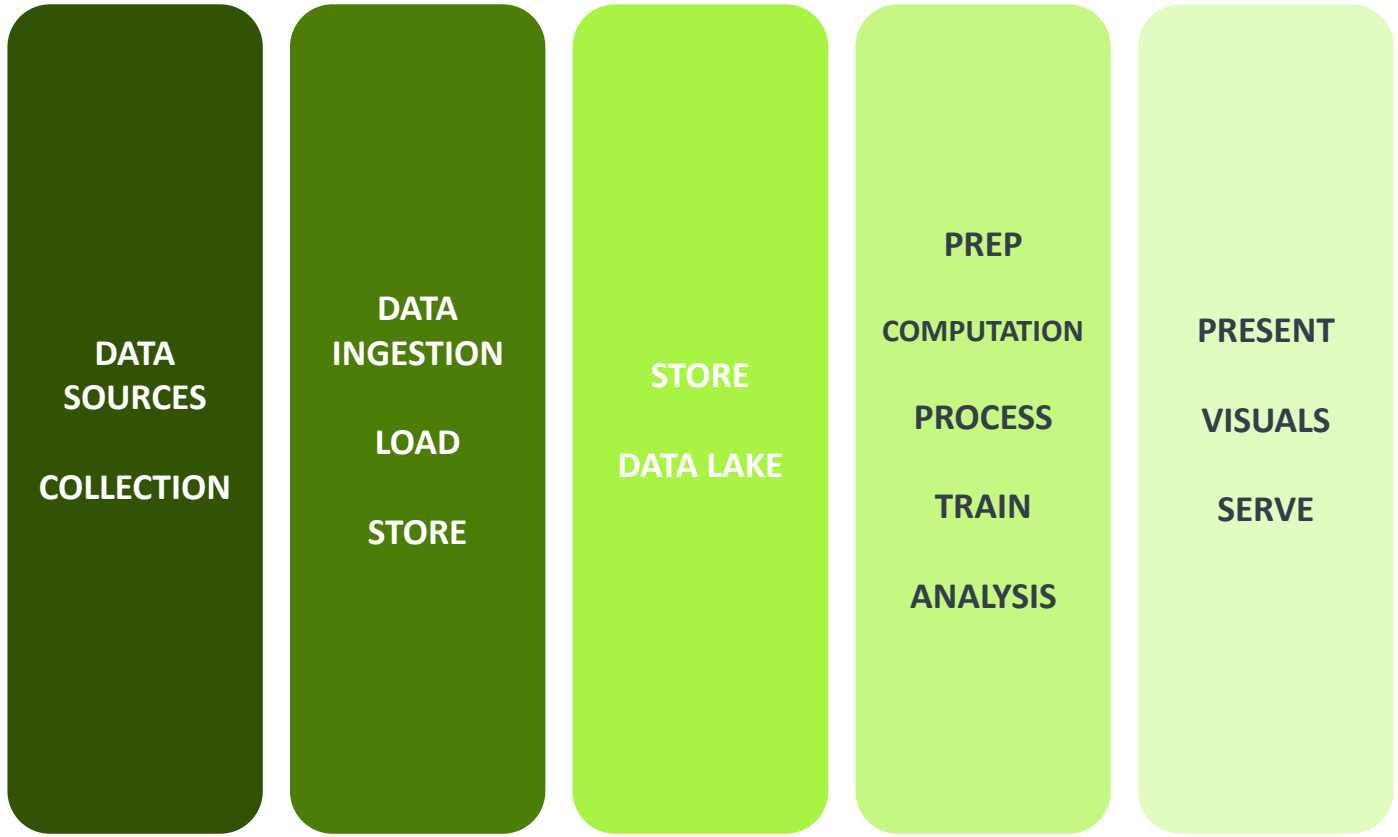
- Latency
- Cost
- Compliance and security
- Compute and processor features
- Services and features
- Disaster recovery

> Data Pipelines // Azure

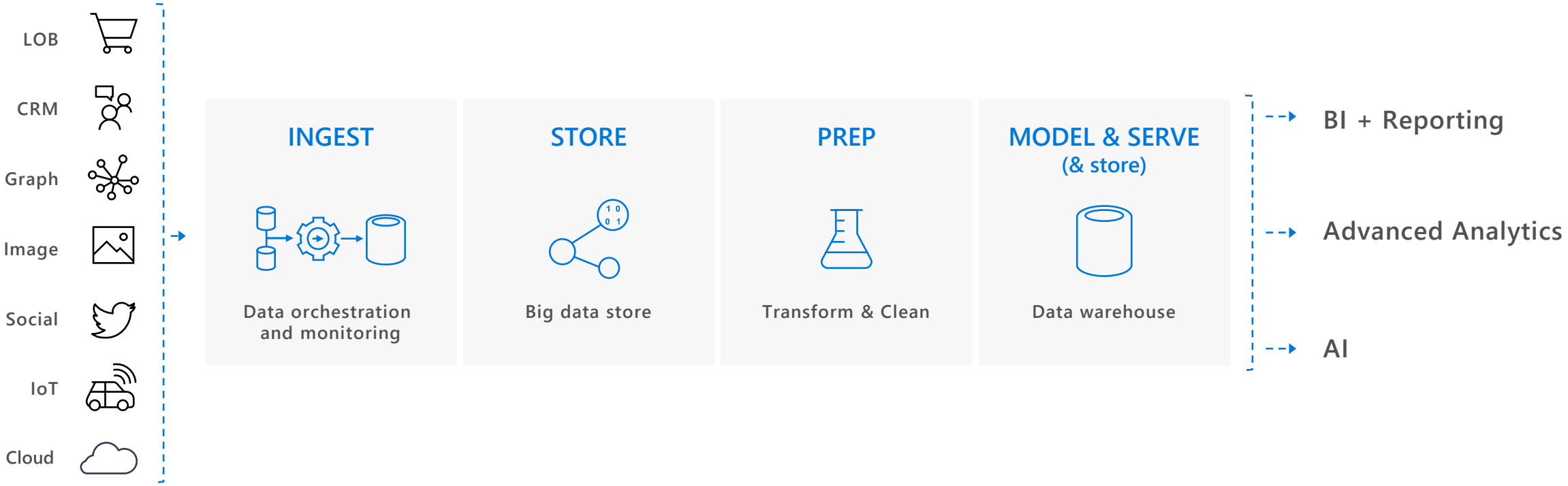


> Basic Process

- Data Sources / Collection
- Ingest / Load / Store
- Store / DataLake
- Prep / Process / Train
- Present / Visualize / Serve



Modern data warehousing pattern



Microsoft Azure

Azure Data Platform End-to-End

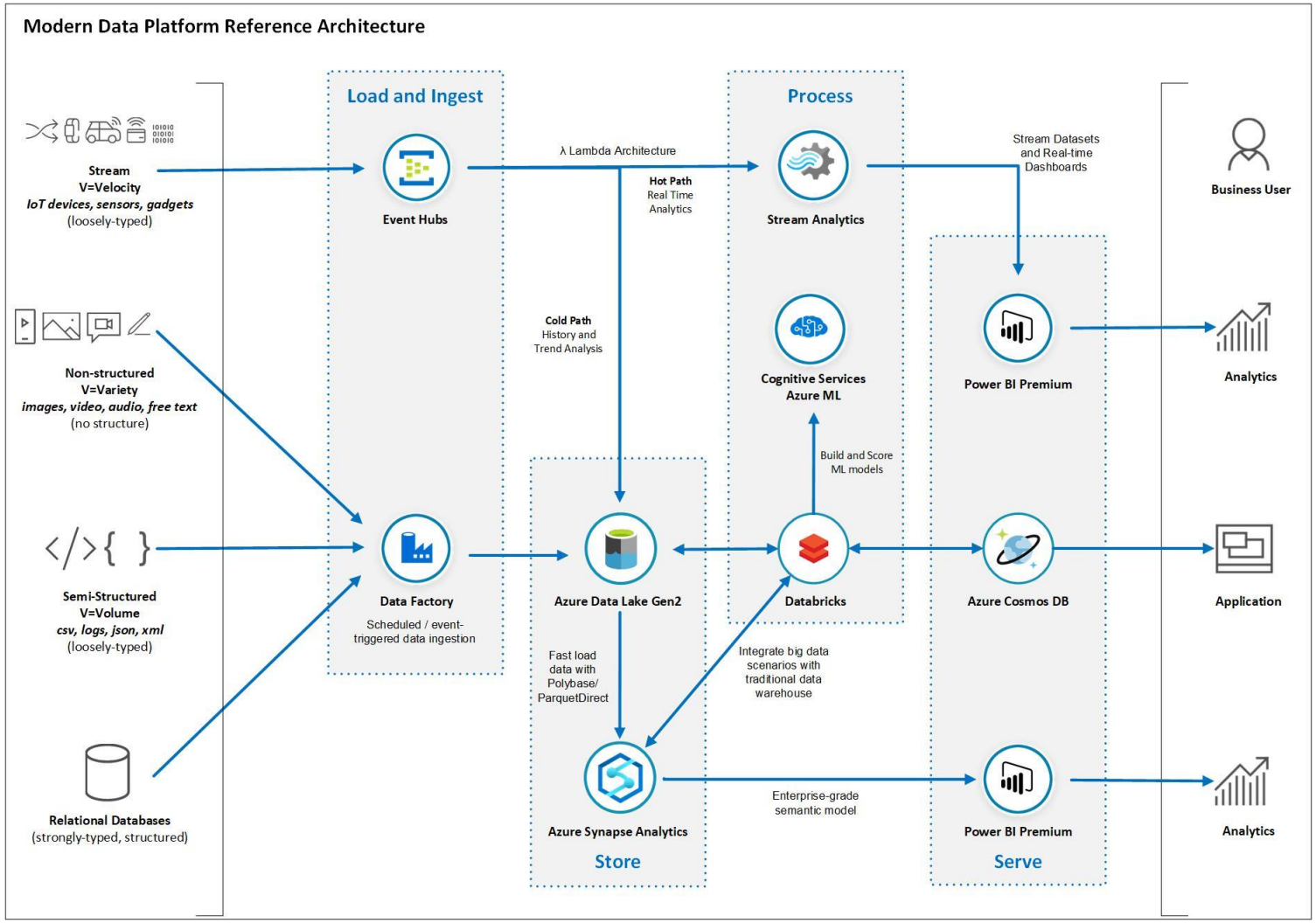
Implement a Modern Data Platform Architecture

<your name>
<your role>
<your email>

Begin with the end in mind

EXAM

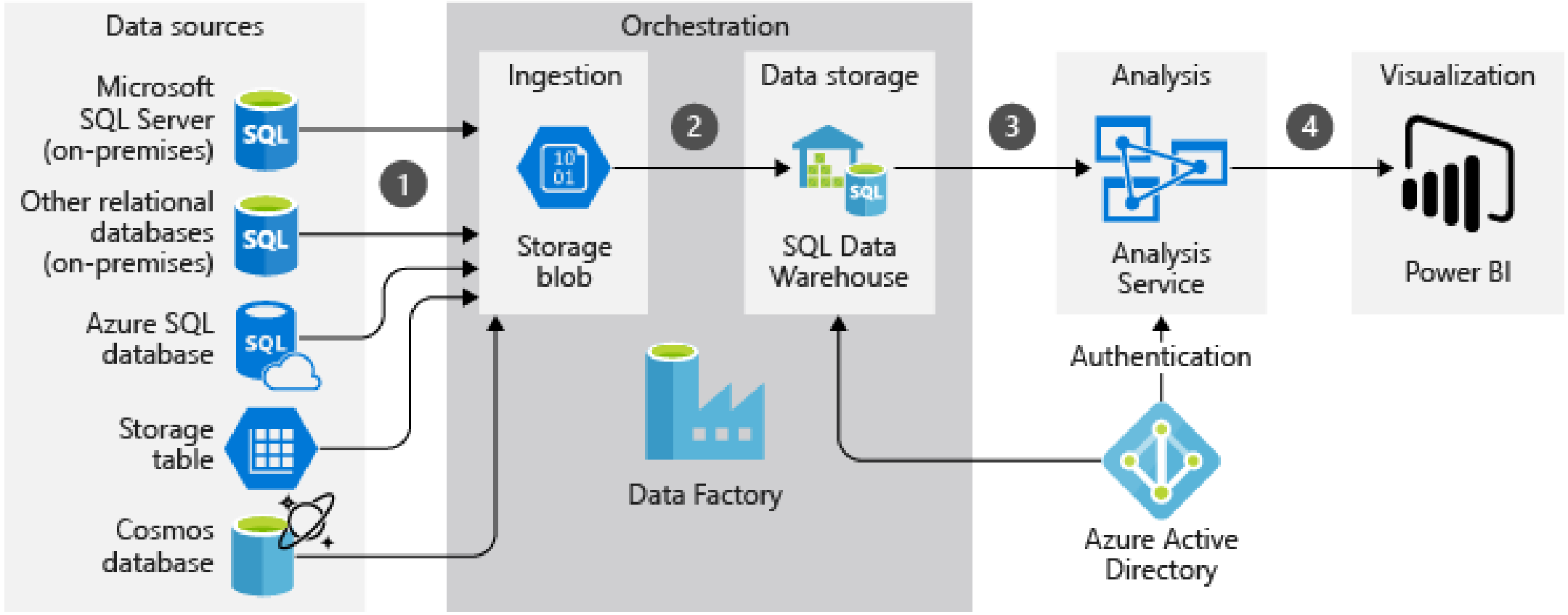
> Data Sources // Collection



https://docs.microsoft.com/en-us/azure/architecture/example-scenario/dataplate2e/data-platform-end-to-end

EXAM

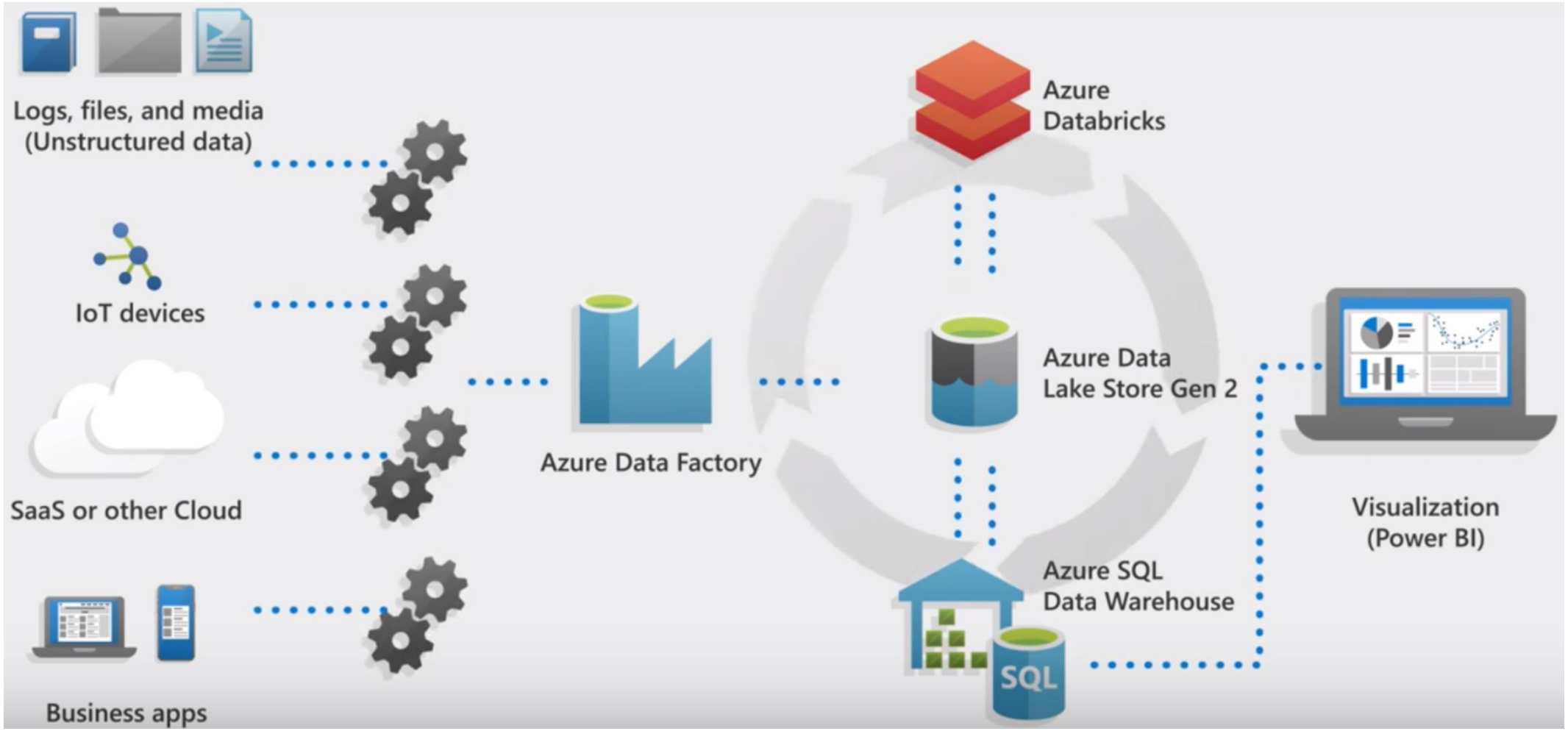
> Load // Ingestion // Storage // Orchestration



https://docs.microsoft.com/en-us/azure/architecture/example-scenario/data/data-warehouse

EXAM

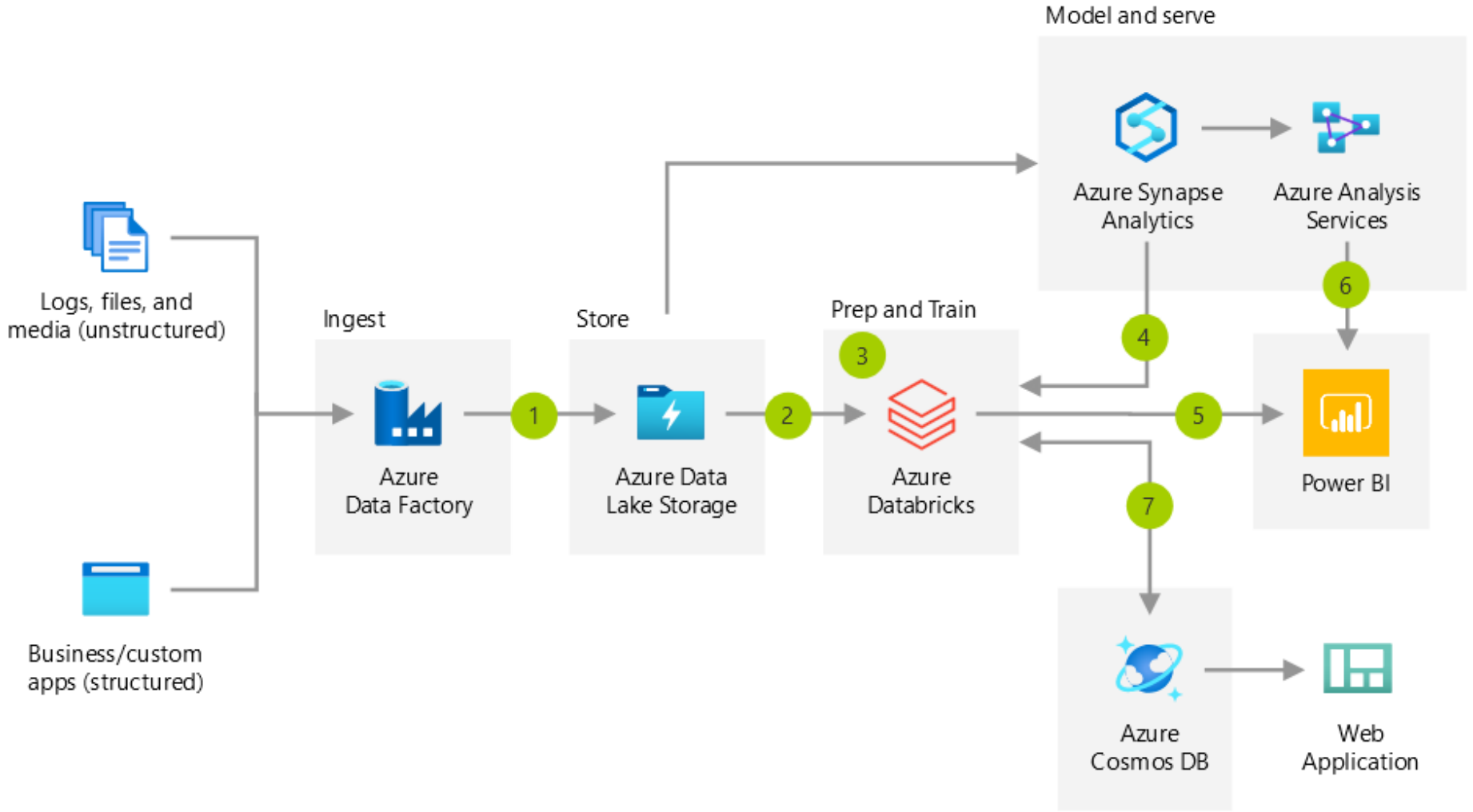
> Data Prep // Process // Computation // Train



https://docs.microsoft.com/en-us/azure/synapse-analytics/sql-data-warehouse/sql-data-warehouse-videos

EXAM

> Presentation // Visuals // Serve // Self Service BI

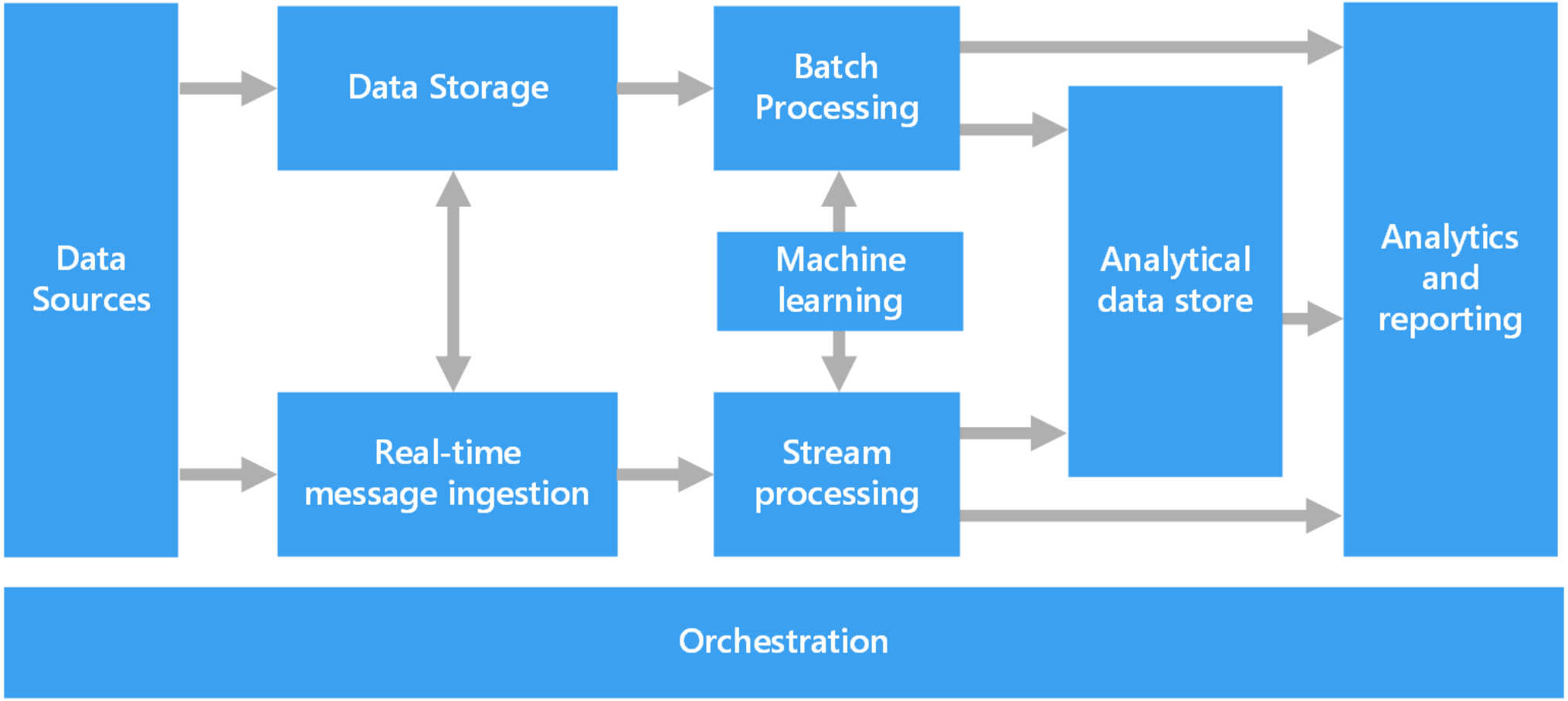


https://docs.microsoft.com/en-us/azure/architecture/solution-ideas/articles/advanced-analytics-on-big-data

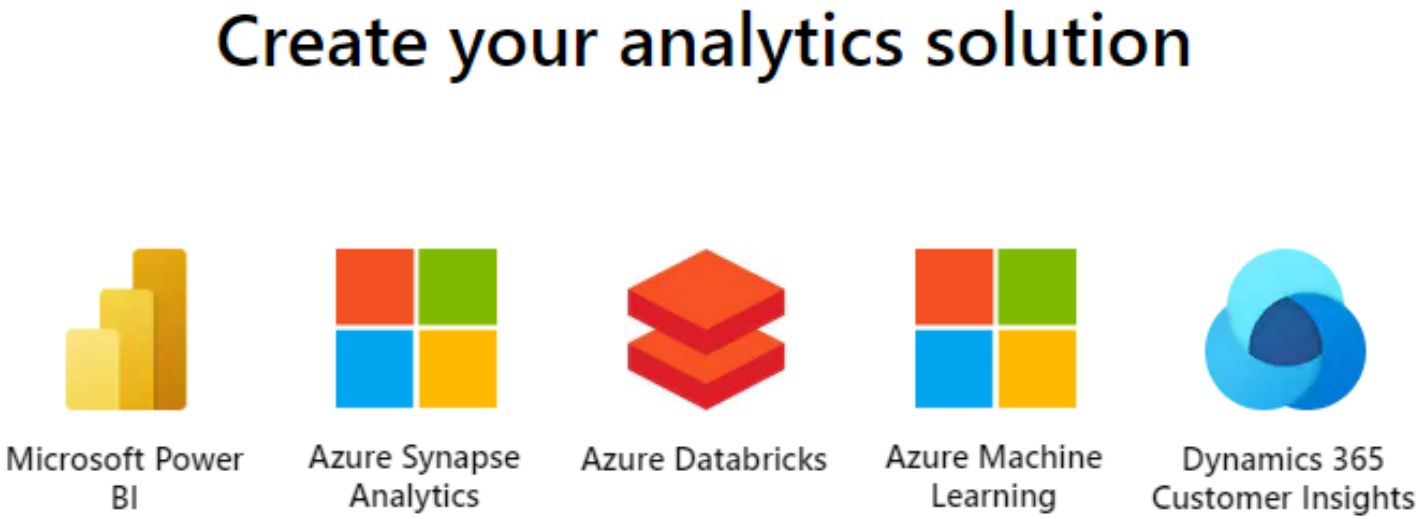
Azure Data Architecture Guide

Valuable collection of architecture principles to help you with your technology choices

https://aka.ms/adag

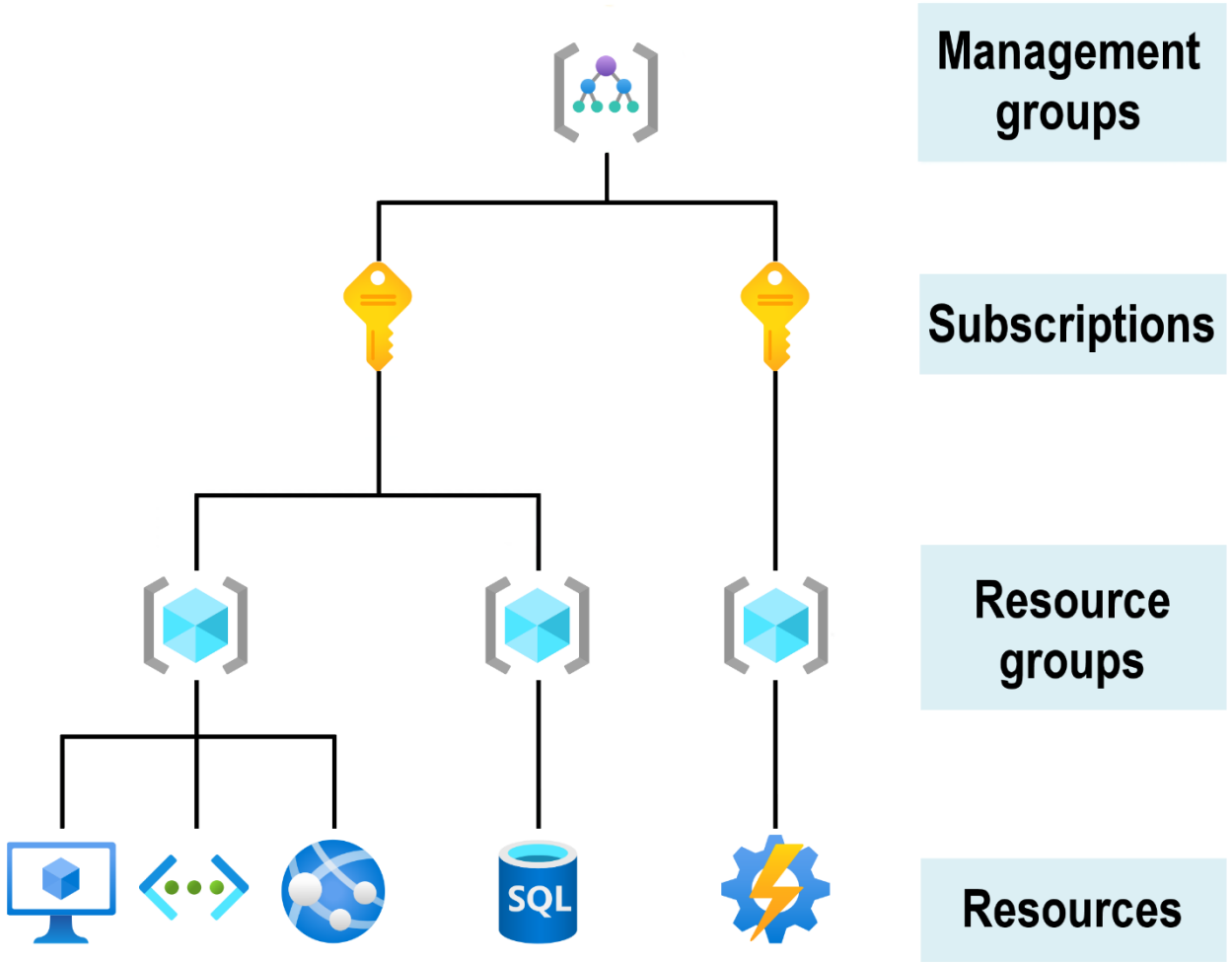


> Basic MS Solution



EXAM

> Azure Overview



Management groups: These groups help you manage access, policy, and compliance for multiple subscriptions. All subscriptions in a management group automatically inherit the conditions applied to the management group.

Subscriptions: A subscription groups together user accounts and the resources that have been created by those user accounts. For each subscription, there are limits or quotas on the amount of resources that you can create and use. Organizations can use subscriptions to manage costs and the resources that are created by users, teams, or projects.

Resource groups: Resources are combined into resource groups, which act as a logical container into which Azure resources like web apps, databases, and storage accounts are deployed and managed.

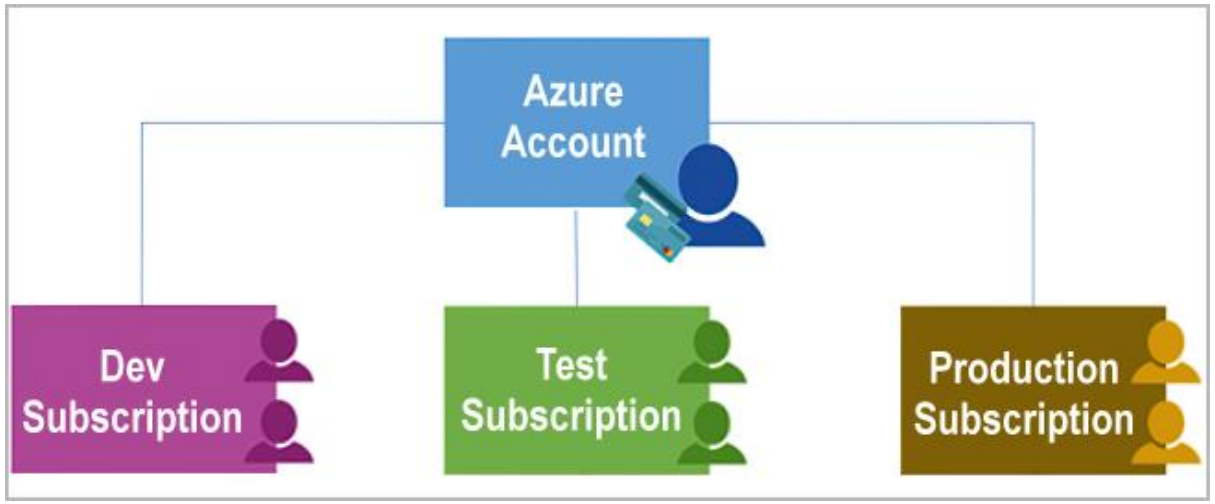
Resources: Resources are instances of services that you create, like virtual machines, storage, or SQL databases.

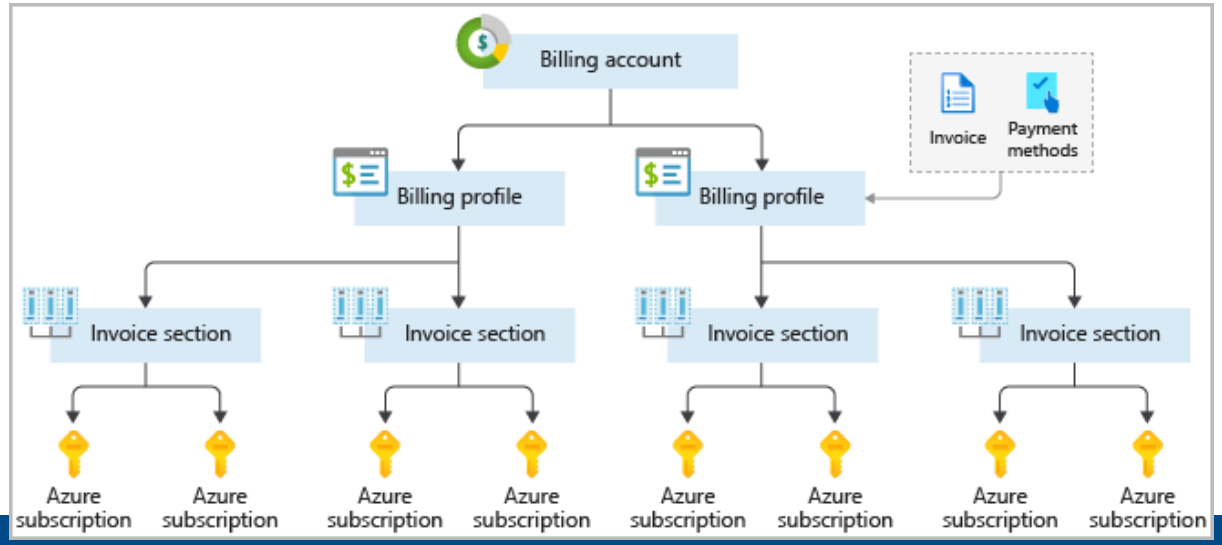
https://docs.microsoft.com/en-us/learn/modules/azure-architecture-fundamentals/overview

EXAM

> Azure Subscriptions

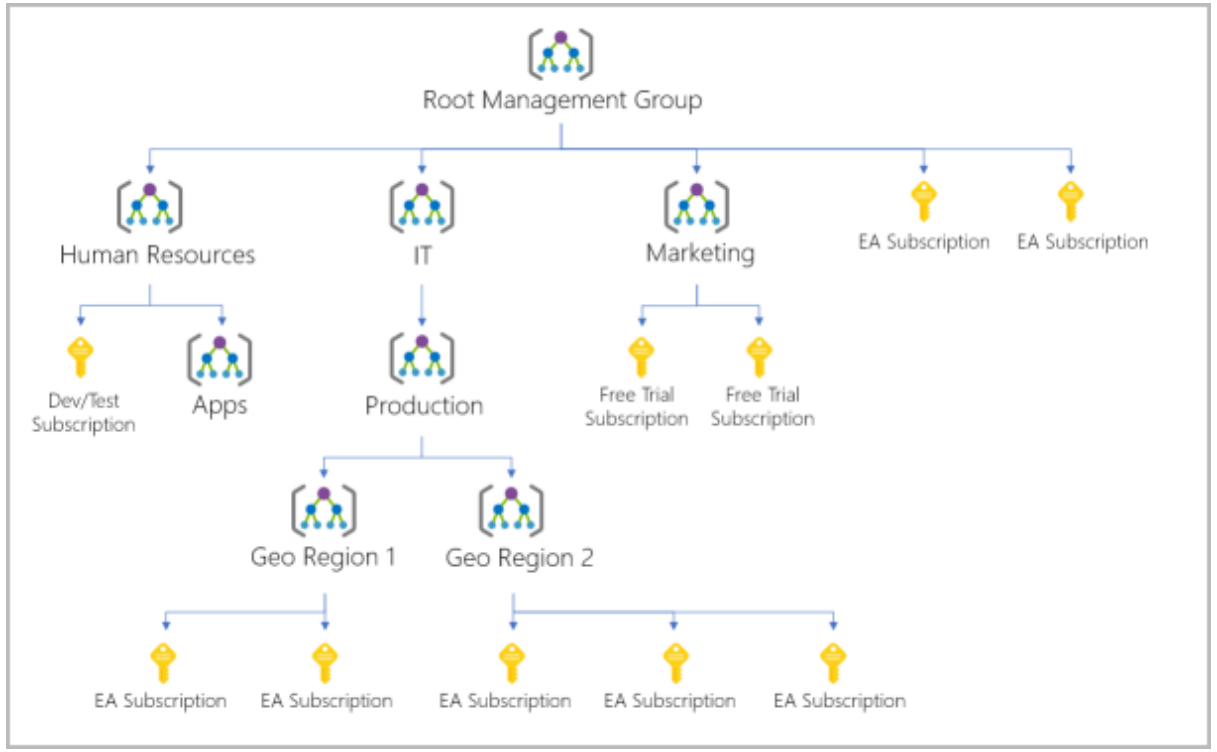
Using Azure requires an Azure subscription. A subscription provides you with authenticated and authorized access to Azure products and services. It also allows you to provision resources. An Azure subscription is a logical unit of Azure services that links to an Azure account, which is an identity in Azure Active Directory (Azure AD) or in a directory that Azure AD trusts.





https://docs.microsoft.com/en-us/learn/modules/azure-architecture-fundamentals/overview

> Azure Management Groups



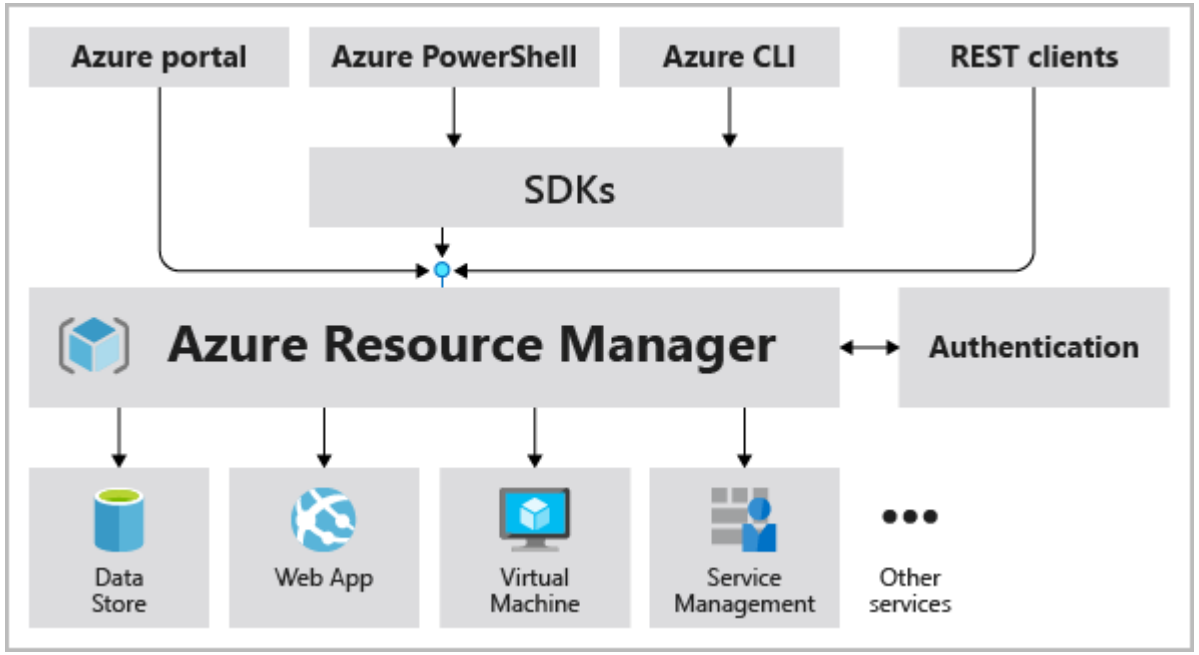
You can create a hierarchy that applies a policy. For example, you could limit VM locations to the US West Region in a group called Production. This policy will inherit onto all the Enterprise Agreement subscriptions that are descendants of that management group and will apply to all VMs under those subscriptions. This security policy can't be altered by the resource or subscription owner, which allows for improved governance.

Another scenario where you would use management groups is to provide user access to multiple subscriptions. By moving multiple subscriptions under that management group, you can create one role-based access control (RBAC) assignment on the management group, which will inherit that access to all the subscriptions. One assignment on the management group can enable users to have access to everything they need instead of scripting RBAC over different subscriptions.

https://docs.microsoft.com/en-us/learn/modules/azure-architecture-fundamentals/overview

> Azure Resource Manager

- Manage your infrastructure through declarative templates rather than scripts. A Resource Manager template is a JSON file that defines what you want to deploy to Azure.
- Deploy, manage, and monitor all the resources for your solution as a group, rather than handling these resources individually.
- Redeploy your solution throughout the development life cycle and have confidence your resources are deployed in a consistent state.
- Define the dependencies between resources so they're deployed in the correct order.
- Apply access control to all services because RBAC is natively integrated into the management platform.
- Apply tags to resources to logically organize all the resources in your subscription.
- Clarify your organization's billing by viewing costs for a group of resources that share the same tag.



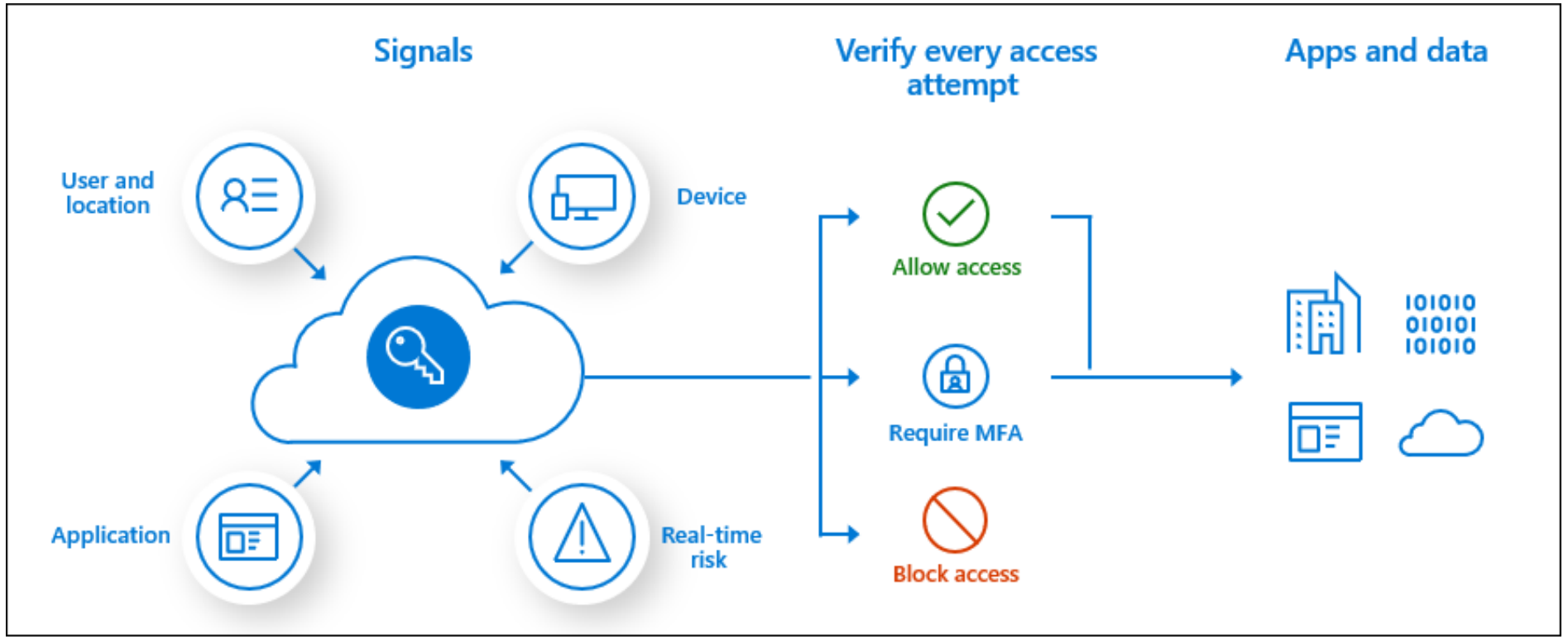
https://www.microsoft.com/en-us/videoplayer/embed/RE4Llw9?postJsllMsg=true

> Azure Active Directory

Azure AD conditional access

Azure AD uses conditional access to bring signals together, to make decisions, and enforce organizational policies.

The following graphic shows how conditional access uses signals to make an access decision and follows it up with enforcement.



> Azure Active Directory

Conditional access policies, at their simplest, are if-then statements. If users want to access a resource, then they must complete an authentication action. For example, a payroll manager wants to access the payroll application and must use multi-factor authentication to access it.
By using conditional access policies, you can apply the right access controls to keep your organization secure. You can further control Dynamics 365 and Power Platform applications access by using the Azure AD conditional access feature.

Conditional access brings multiple signals together to decide if a user can access an application. Signals can include user or group membership, IP location, device, application, and real-time risk detection. With these signals, you can configure conditional access policies to enforce organizational policies. Outcome of policies can be to block or grant access with additional requirements like multi-factor authentication or the device being marked compliant as necessary.

> Authentication

Single sign-on (SSO) adds security and convenience when users sign into applications in Azure Active Directory (Azure AD). It provides users the security and convenience of accessing multiple Azure AD applications within the same tenant with a single sign-in. The SSO system maps Microsoft Windows accounts to back-end credentials. SSO simplifies the management of user IDs and passwords, both for users and administrators. It enables users to access back-end systems and applications by signing in only one time to the Windows network.

Users can launch applications from the Microsoft 365 portal or the Azure AD MyApps panel. Customers that have existing on-premises servers can take advantage of the hybrid identity capabilities of Azure AD to allow users to access both on-premises and cloud applications. Hybrid identity creates a common user identity for authentication.

https://docs.microsoft.com/en-us/learn/modules/recognize-dynamics-365-security/4-authentication

> Authentication

Microsoft Identity and Access Management offer the following benefits:

- Enable strong authentication: Reduce the risk of security breaches with strong authentication. Turn on the multi-factor authentication (MFA) options to protect your users from 99.9 percent of identity attacks.
- Enforce intelligent access policies: Use cloud-powered AI and machine learning signals to protect against identity risk before providing access automatically. Limit access, not productivity, and use adaptive policies to protect data.
- Monitor and audit access: Manage your identities efficiently and securely by ensuring the right people have the right access to the right resources. Protect, monitor, and audit access to critical assets while helping ensure employee productivity.
- Connect and protect your applications: Grant one-click access to all on-premises and cloud applications with SSO and free your workforce from having to remember and enter individual account passwords.

https://docs.microsoft.com/en-us/learn/modules/recognize-dynamics-365-security/4-authentication

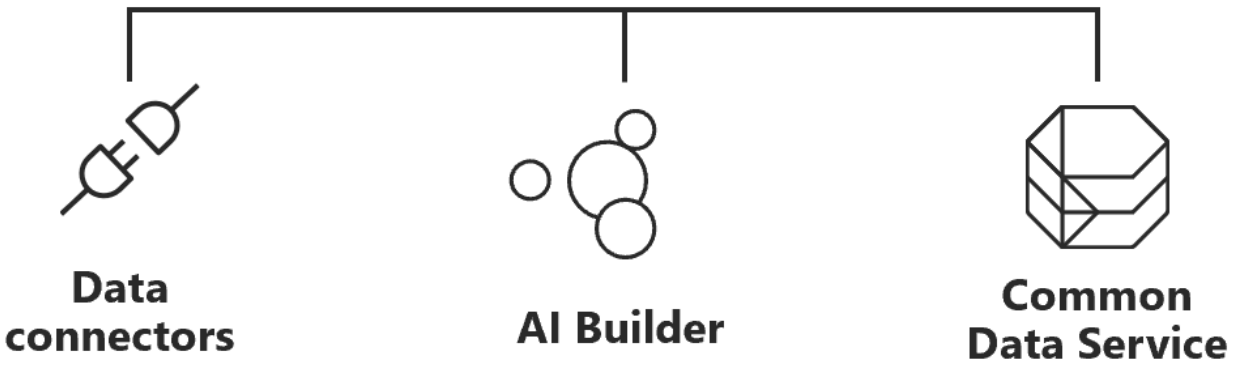
> Power Platform

Power BI
Business analytics

Power Apps
Application development

Power Automate
Process automation

Power Virtual Agents
Intelligent virtual agents



https://docs.microsoft.com/en-us/learn/modules/connect-analyze-dynamics-365-data/2-power-platform

> Power Platform

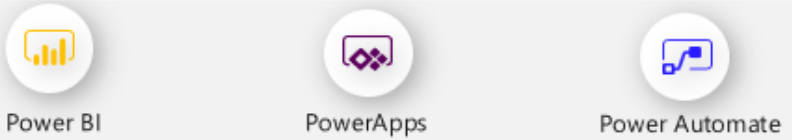
Business application Power Platform innovation

Build modern business apps fast

Compose analytics, user experiences, and automation using an integrated set of services from Microsoft

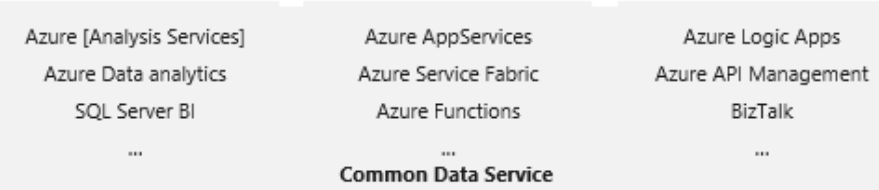
Power users

People who understand their business needs best can now build apps quickly without writing code



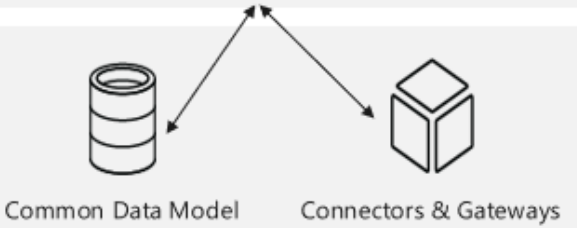
More efficient developers

Seamlessly extend capabilities for power users and leverage powerful Azure platform services, only if extension is needed.



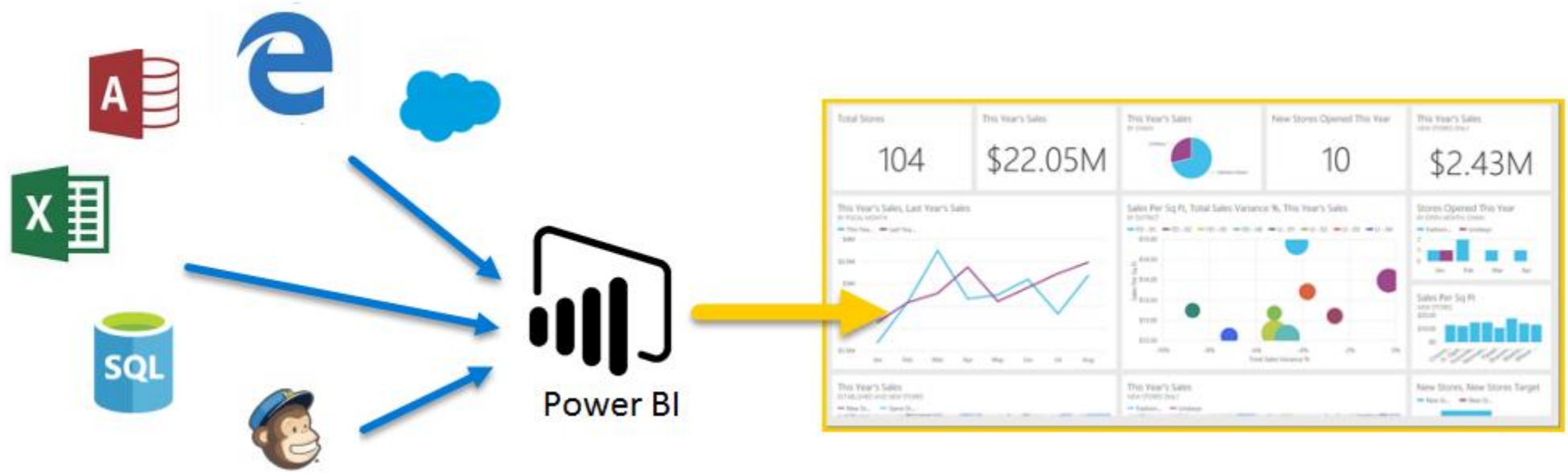
Connected data across apps

Whether built on the Common Data Model or integrated with existing systems, get more value from your data



https://docs.microsoft.com/en-us/learn/modules/connect-analyze-dynamics-365-data/2-power-platform

> Power Platform



https://docs.microsoft.com/en-us/learn/modules/connect-analyze-dynamics-365-data/2-power-platform

> Power Automate

Microsoft Power Automate

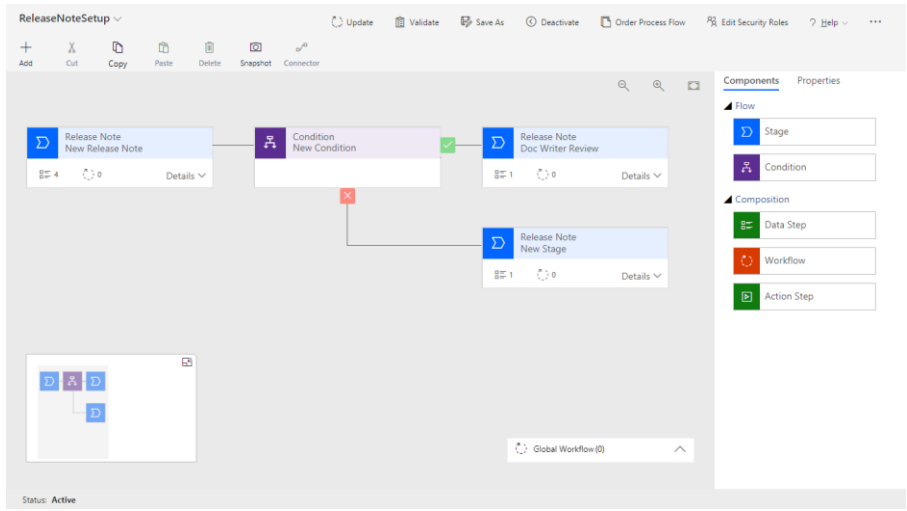
Power Automate is a cloud-based SaaS offering that allows you to automate repetitive business processes with its no-code/low-code platform. It lets computers do what they do best. You can build more than just simple flows. Power Automate can:

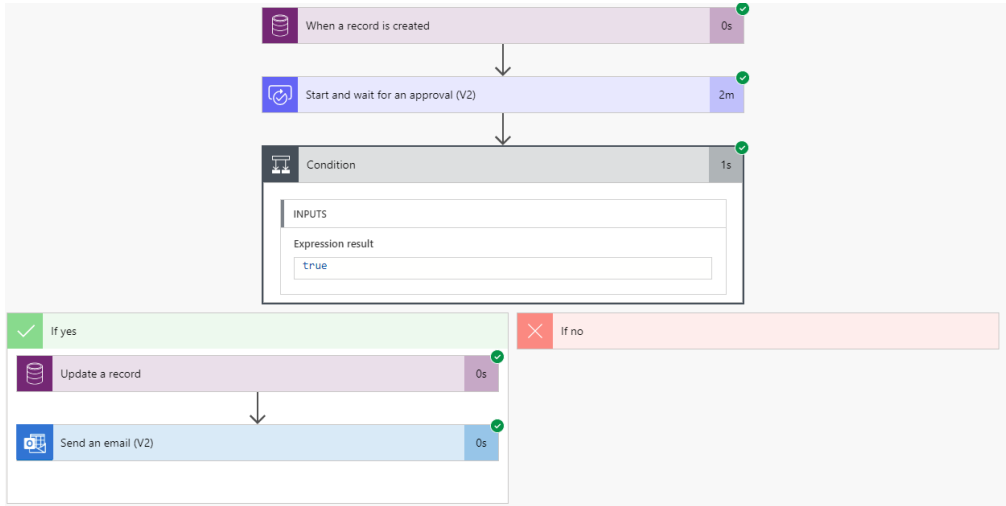
Send reminders on past due tasks.

Move business data between systems on a schedule.

Talk to over 275 data sources or any publicly accessible API.

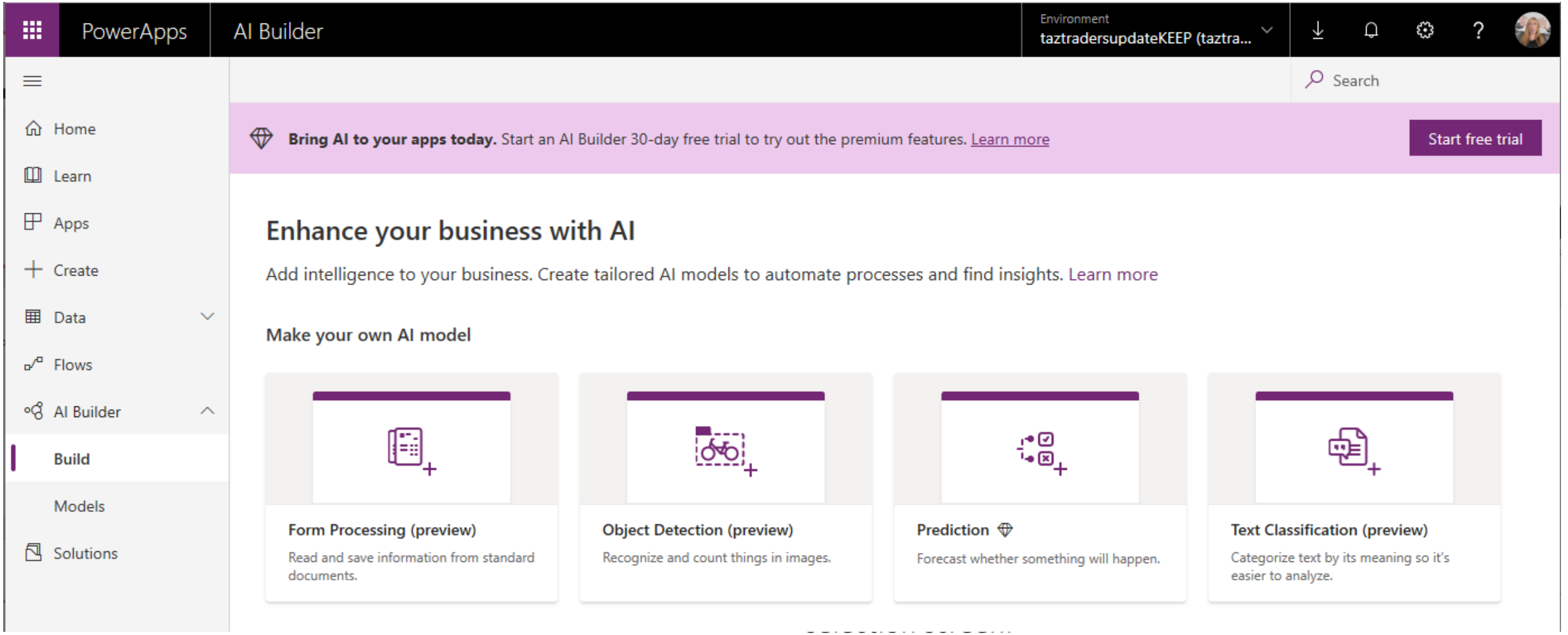
Automate tasks on your local computer like computing data in Excel.





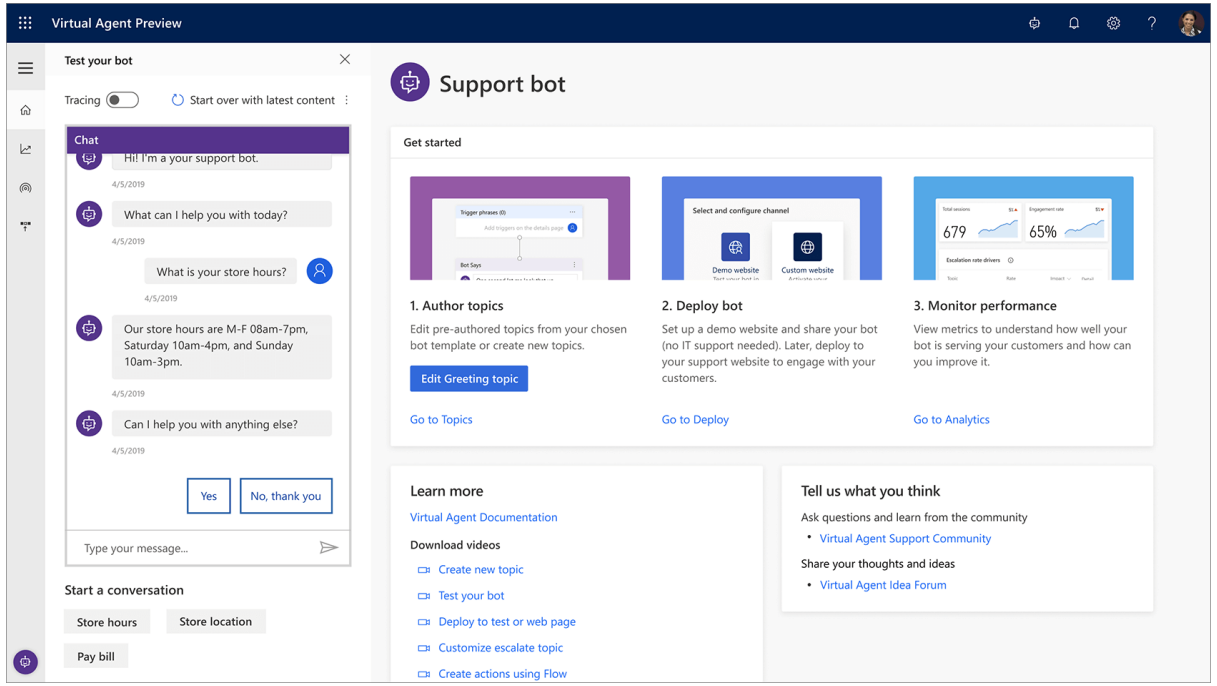
https://docs.microsoft.com/en-us/learn/modules/connect-analyze-dynamics-365-data/2-power-platform

> AI Builder



https://docs.microsoft.com/en-us/learn/modules/connect-analyze-dynamics-365-data/2-power-platform

> AI Builder



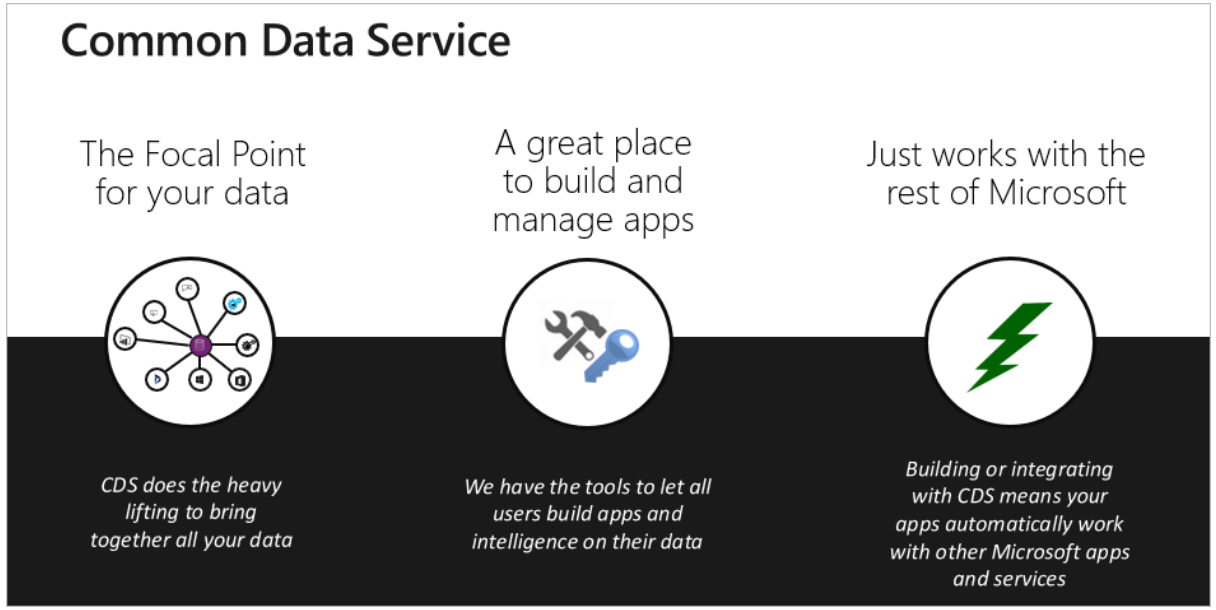
Power Virtual Agents provides customer service with intelligent, adaptable bots. A bot is a computer program that uses conversational artificial intelligence (AI) and can conduct text conversations with your customers to direct them to what they need without requiring human intervention.

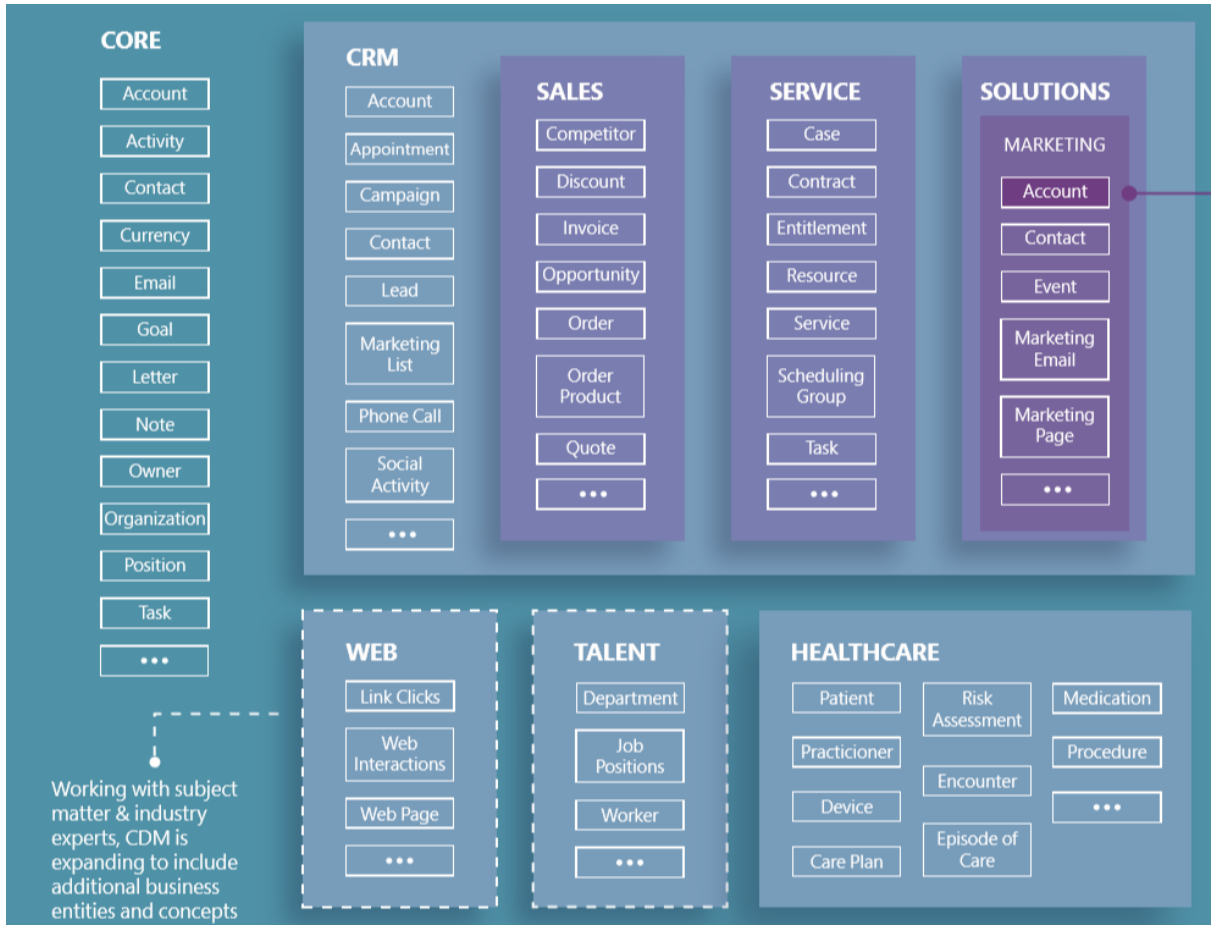
Bots are a great way to answer simple, repetitive questions from your customers. Bots also help customers with common tasks like finding out how to return or exchange an item, join your rewards program, or cancel an order. Customer service bots save your agents time and your company money by freeing your agents to focus on more complex problem-solving and manage valuable customer interactions.

https://docs.microsoft.com/en-us/learn/modules/connect-analyze-dynamics-365-data/2-power-platform

> Microsoft Dataverse

Microsoft Dataverse manages business data that supports interconnected business application and processes. It also lets you store and manage data securely that's used by business applications.





https://docs.microsoft.com/en-us/learn/modules/connect-analyze-dynamics-365-data/2-power-platform

> Microsoft Dataverse

Note

Effective November 2020

- Common Data Service has been renamed to Microsoft Dataverse. **Learn more**.
- Some terminology in Microsoft Dataverse has been updated. For example, *entity* is now *table* and *field* is now *column*. **Learn more**.

Modules will be updated soon to reflect the latest terminology.

https://docs.microsoft.com/en-us/learn/modules/connect-analyze-dynamics-365-data/2-power-platform

Which tool for the job?

Logic Apps

Built for:	Pro Developers
Managed by:	IT / Pro Developers
Support model:	PaaS
Business Model:	PaaS
Best for:	Integration

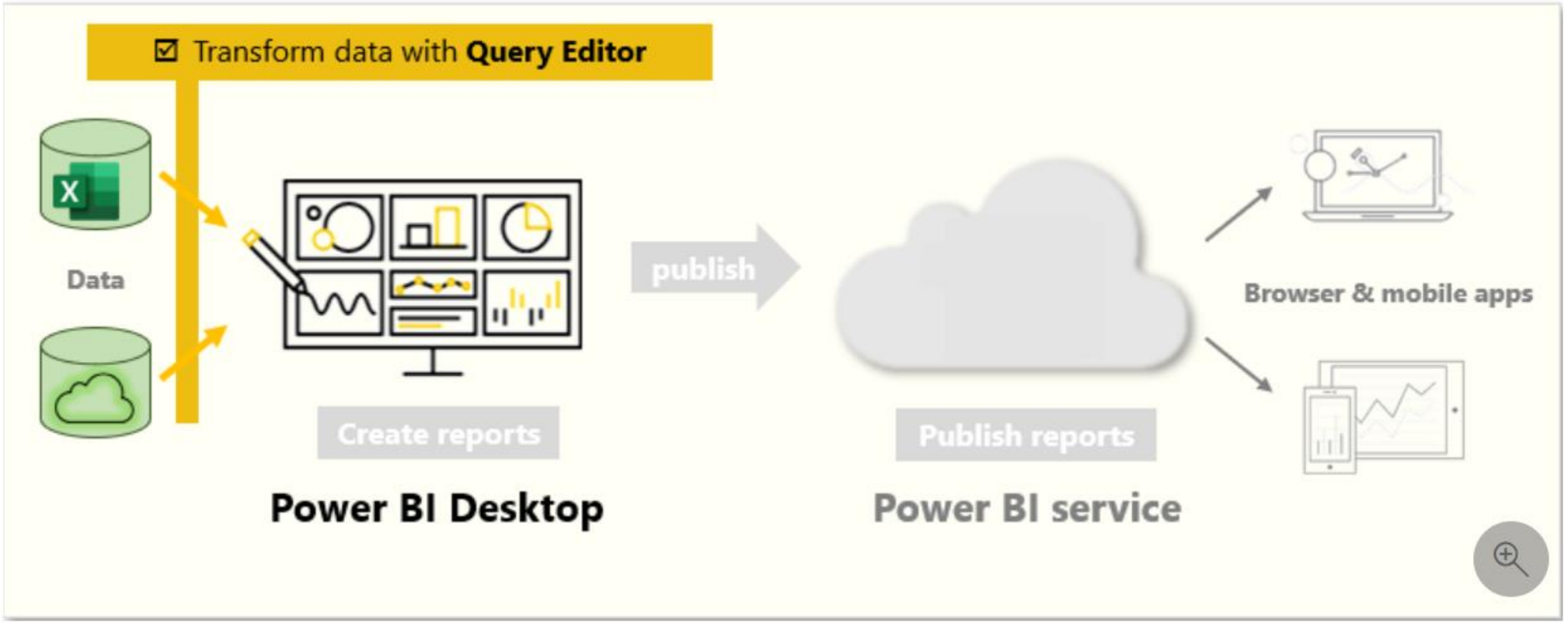
Logic Apps is the perfect tool for critical technical integrations between systems or databases at very large scale. Even more powerful when coupled with event hub, and azure functions.

Power Automate

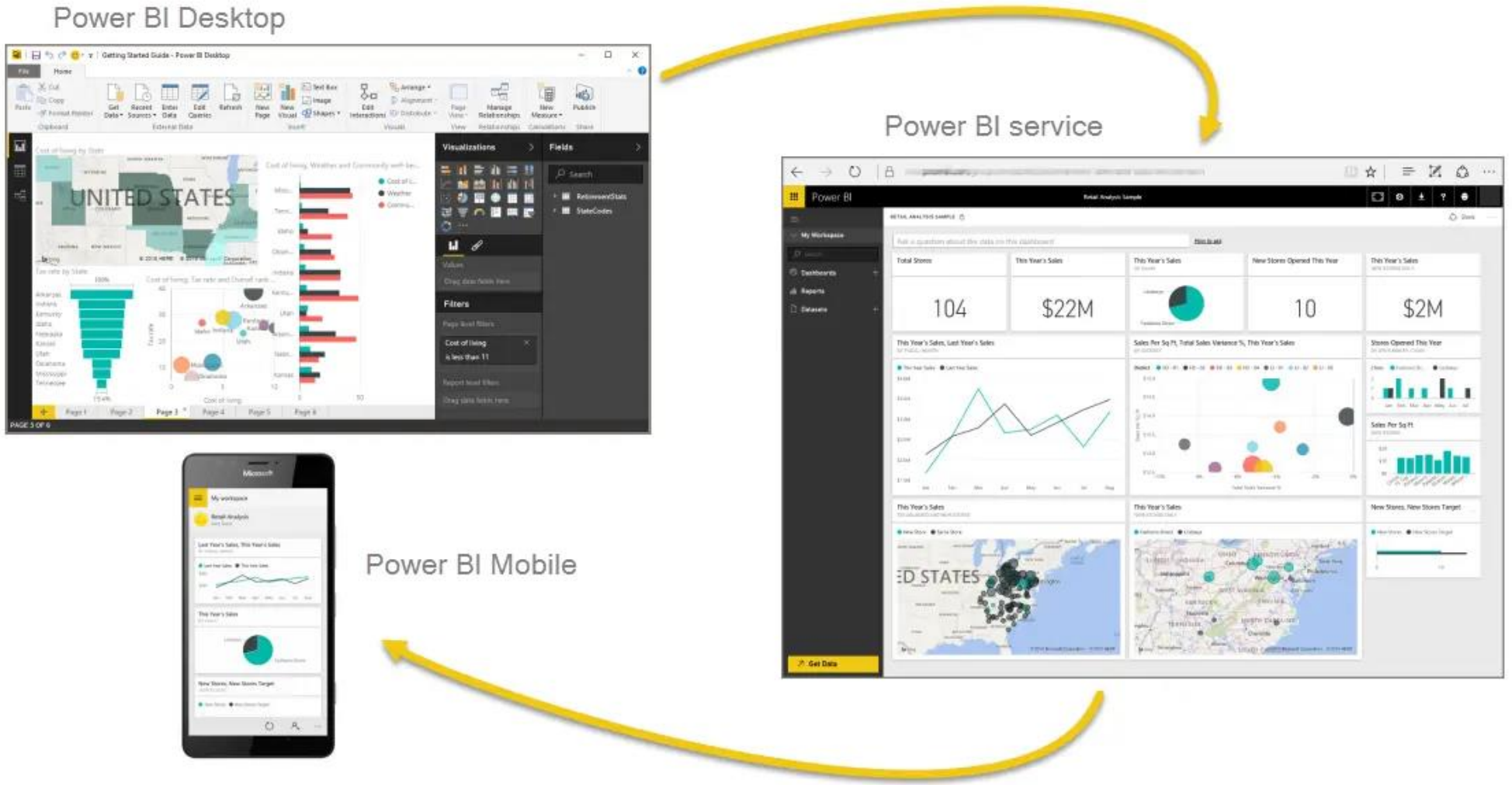
Built for:	Citizen Developers
Managed by:	IT / Super Users
Support model:	SaaS
Business Model:	SaaS / PaaS
Best for:	Automation

Power Automate is a great tool for automating business processes and productivity tasks between multiple applications and web services. It leverages over300 connectors and Robotic Process Automation. It is even more powerful when natively coupled with Power Apps and AI Builder.

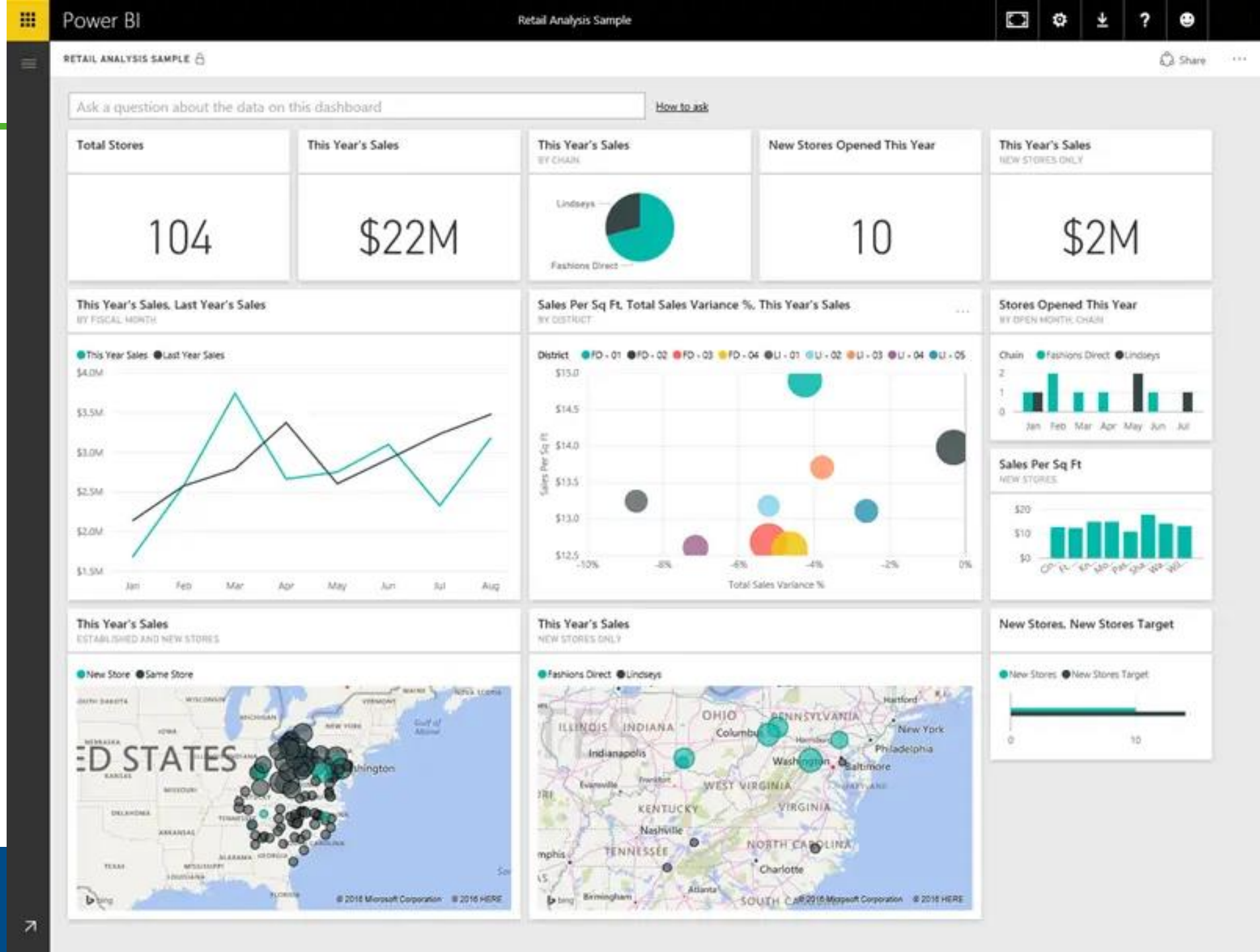
> Power BI | Desktop | Service | Mobile



> Power BI


Power BI Desktop
Power BI service
Power BI Mobile
UNITED STATES
Power BI
104
$22M
10
$2M

> Power BI



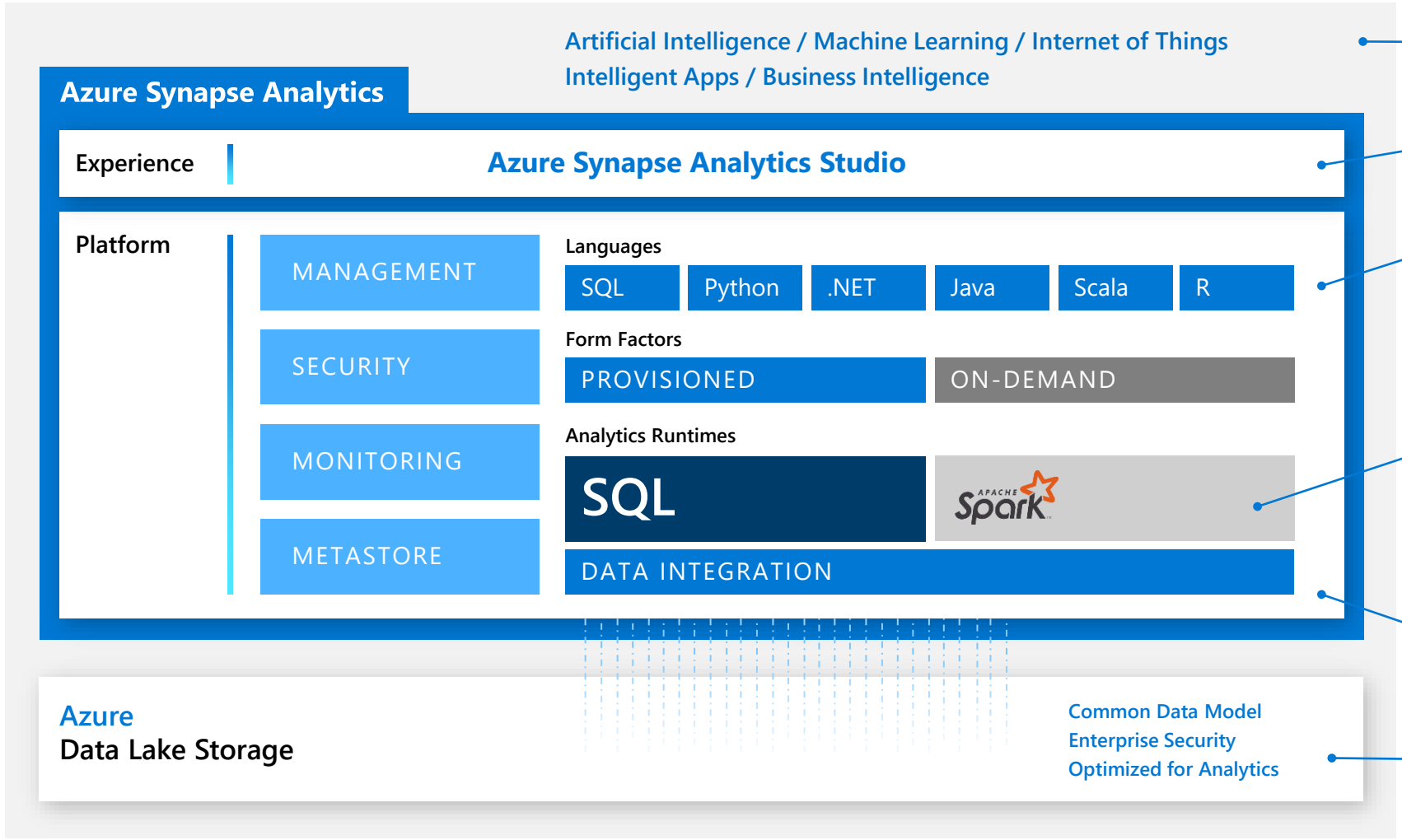
Georgian

Azure Synapse Analytics

Microsoft

Azure Synapse Analytics

Integrated data platform for BI, AI and continuous intelligence



Designed for analytics **workloads at any scale**

SaaS **developer experiences** for code free and code first

Multiple **languages** suited to different analytics workloads

Integrated analytics runtimes available provisioned and serverless on-demand

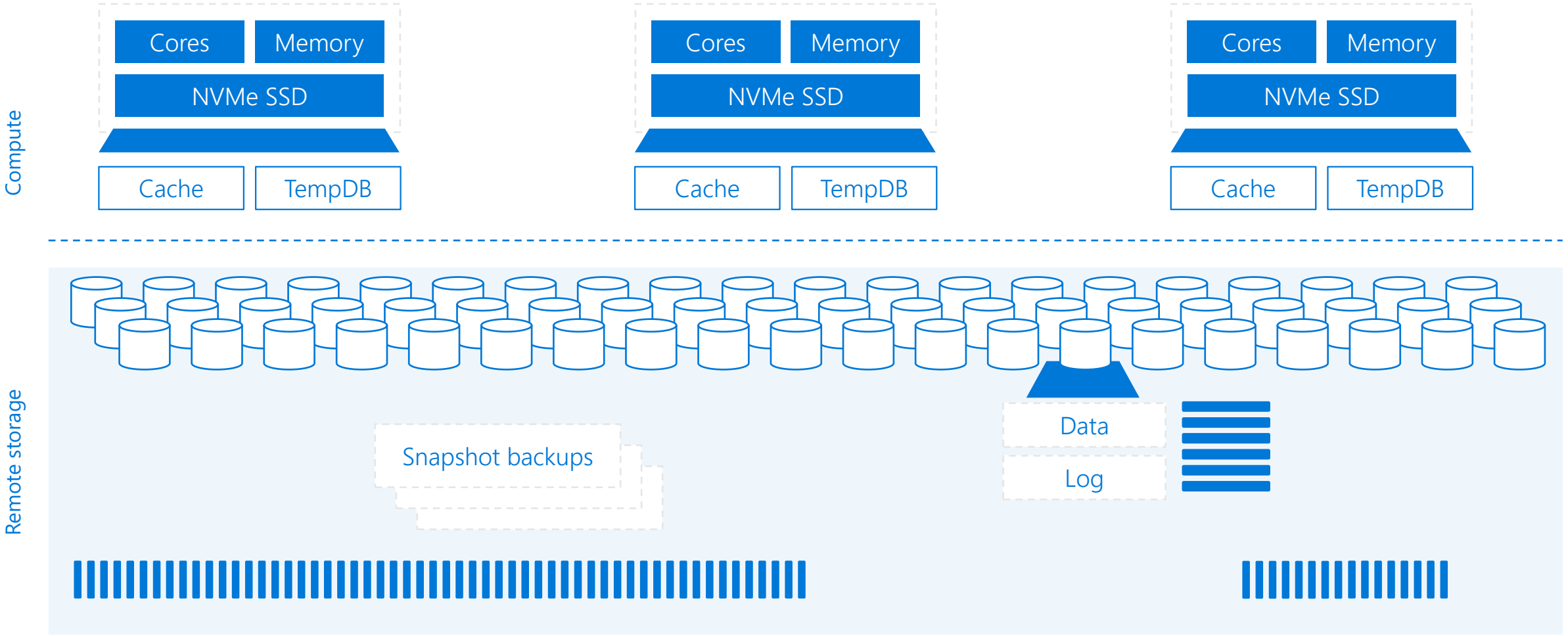
SQL Analytics offering T-SQL for batch, streaming and interactive processing

Spark for big data processing with Python, Scala, R and .NET

Integrated **platform services** for, management, security, monitoring, and metastore

Data **lake integrated** and Common Data Model aware

Azure Synapse Analytics MPP Architecture



References

> References

- Big Data Analytics Program, 2019/2020 – Georgian College, Barrie, Ontario
- Microsoft, Azure data platform, https://docs.microsoft.com/en-us/azure/architecture/example-scenario/dataplate2e/data-platform-end-to-end
- Microsoft, Data warehousing and analytics, https://docs.microsoft.com/en-us/azure/architecture/example-scenario/data/data-warehouse
- Microsoft, Advanced Analytics Architecture, https://docs.microsoft.com/en-us/azure/architecture/solution-ideas/articles/advanced-analytics-on-big-data
- Microsoft, Azure Synapse Analytics - dedicated SQL pool Videos, https://docs.microsoft.com/en-us/azure/synapse-analytics/sql-data-warehouse/sql-data-warehouse-videos
- Microsoft, Success by Design Implementation Guide, First Edition, 2021
- Monkey Learn, Sentiment Analysis, https://monkeylearn.com/sentiment-analysis/
- Cloud Geeks, Jerry Hargrove, website, https://www.lucidchart.com/blog/what-are-cloud-regions
- Microsoft, Authentication, Microsoft Docs, https://docs.microsoft.com/en-us/learn/modules/recognize-dynamics-365-security/4-authentication
- Microsoft, Dataverse, Microsoft Docs, https://docs.microsoft.com/en-us/learn/modules/connect-analyze-dynamics-365-data/3-benefits-dataverse
- Microsoft, Azure Data Platform End-to-End, Implement a Modern Data Platform Architecture, Official Material

END OF DAY 6