



Microsoft Azure Fundamentals Training (AZ-900)

Module 3



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Database

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Azure Services – Database



SQL Database



CosmosDB



Data Factory



Synapse Analytics

Azure Services - Database



SQL Database

It's basically a SQL server but on cloud. It works to create, scale and extend applications into the cloud using MS SQL Server technology.



Data Factory

Cosmos DB is a NoSQL database service that implements a subset of the SQL SELECT statement on JSON documents.



CosmosDB

This service is a fully managed service for composing data storage, processing, and movement services into streamlined, scalable, and reliable data production pipelines.



Synapse Analytics

Azure Synapse is a limitless analytics service that brings together enterprise data warehousing and Big Data analytics.

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Azure SQL Database

Azure SQL Database



Azure SQL Database is a general-purpose relational database, provided as a managed service. With it, you can create a highly available and high-performance data storage layer for the applications and solutions in Azure.



Azure SQL Database Managed Instance

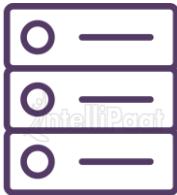
Azure SQL Database



It's based on the latest stable version of the **Microsoft SQL Server database engine.**



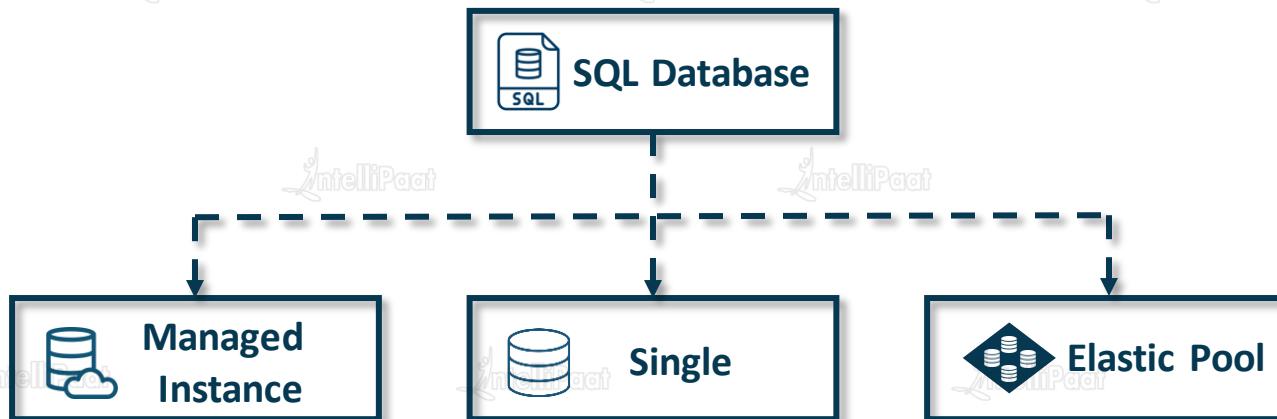
You can use advanced query processing features, such as high-performance in-memory technologies and intelligent query processing.



In fact, the newest capabilities of SQL Server are released first to SQL Database, and then to SQL Server itself.

Azure SQL Database

Azure SQL Database provides the following deployment options for an Azure SQL database:



Azure SQL Database



Single Database



Managed Instance



Elastic Pool

Single database represents a fully managed, isolated database.

A single database is similar to a contained database in Microsoft SQL Server Database Engine.

You might use this option if you have modern cloud applications and microservices that need a single reliable data source.

Azure SQL Database



Single Database



Managed Instance



Elastic Pool

Managed instance is a fully managed instance of the Microsoft SQL Server Database Engine.

Use this option for easy migration of on-premises SQL Server databases to the Azure cloud

It contains a set of databases that can be used together.



Single Database



Managed Instance



Elastic Pool

Elastic pool is a collection of single databases with a shared set of resources, such as CPU or memory.

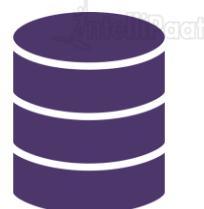
Single databases can be moved into and out of an elastic pool

Azure SQL Database

Azure SQL Database offers three service tiers that are designed for different types of applications:



General Purpose/Standard service tier is designed for common workloads. It offers budget-oriented balanced compute and storage options.



Hyperscale service tier designed for very large OLTP database and the ability to auto-scale storage and scale compute fluidly.



Business Critical/Premium service tier designed for OLTP applications with high transaction rate and lowest-latency I/O.



Why Azure SQL Database?

Why Azure SQL Database?

Why should we use Azure SQL?

Frictionless migration



Built-in machine learning



Unmatched scale and high availability



Accelerate your on-premises SQL Server migrations without changing the application code with Managed Instance.

Get peak database performance and durability with safe, reliable and proven AI technology. Maximize the performance of your application.

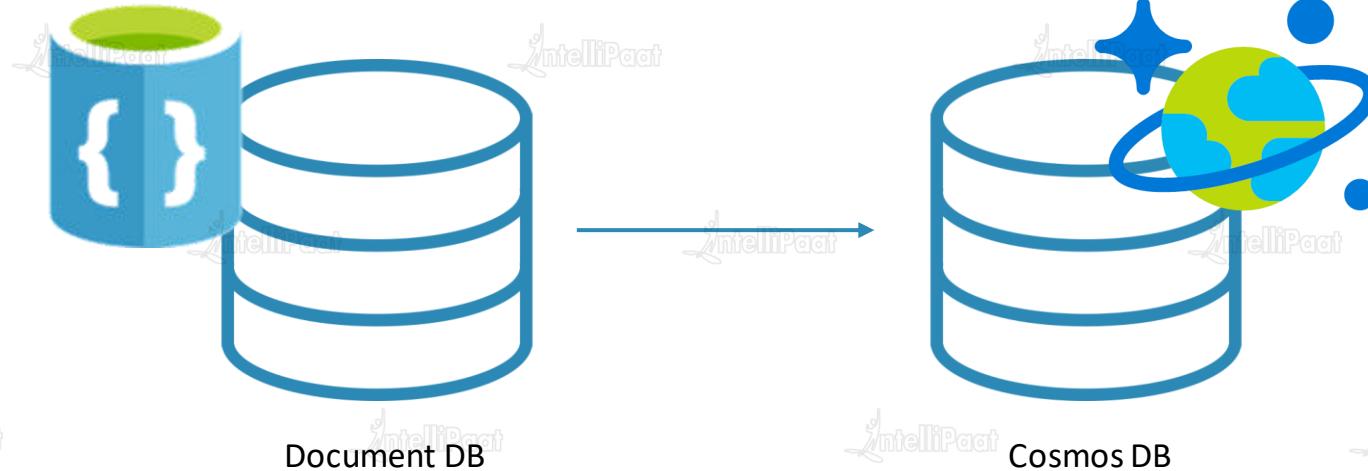
Scale compute and storage resources independently for maximum flexibility and lower your costs with discounted readable replicas



Hands-on: Create a Single Database Using Azure Portal



Azure Cosmos DB



Document DB

Cosmos DB

Azure Cosmos DB is an improvised version of document DB

Azure Cosmos DB



Today's applications are required to be highly responsive and always online. To achieve low latency and high availability, instances of these applications need to be deployed in datacenters that are close to their users.



- Azure Cosmos DB is Microsoft's globally distributed, multi-model database service.
- With a click of a button, Cosmos DB enables you to elastically and independently scale throughput and storage across any number of Azure regions worldwide.

Cosmos DB can be scaled across the world and it supports JSON DB, NoSQL and Multi-APIs.

Cosmos DB



→ Planet Scale



→ JSON DB



→ Multi-API

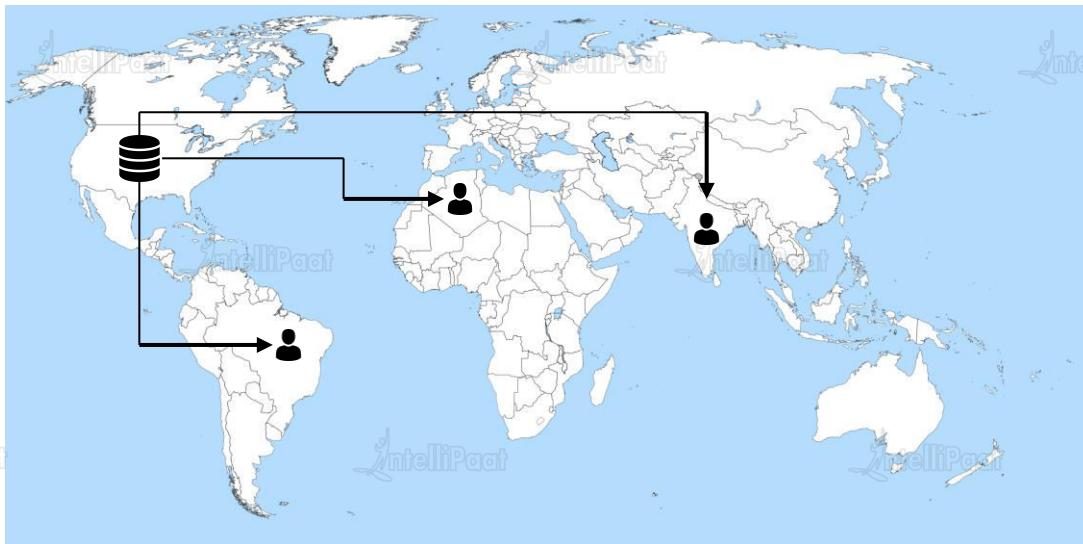


→ No SQL



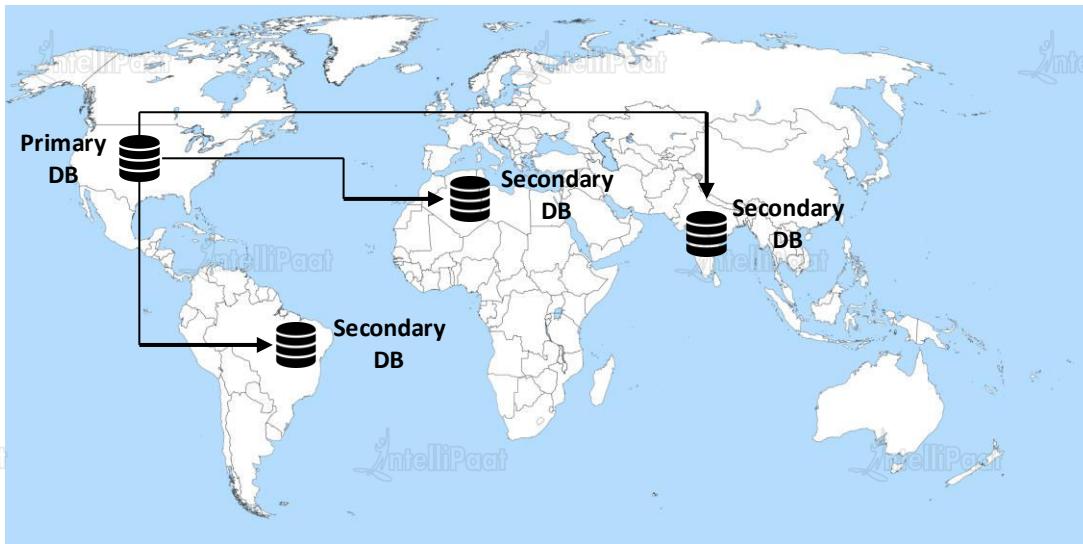
Azure Cosmos DB

Let's check out this example. Let us assume, we have a Cosmos DB in US but our customer base is worldwide. US customers will experience faster access than users from other regions.



Azure Cosmos DB

To solve this issue, we can implement the architecture in the below map. Have a Primary DB in US to read and write, and all other Secondary DBs in various regions are only readable.





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Why Azure Cosmos DB?

Why Azure Cosmos DB?



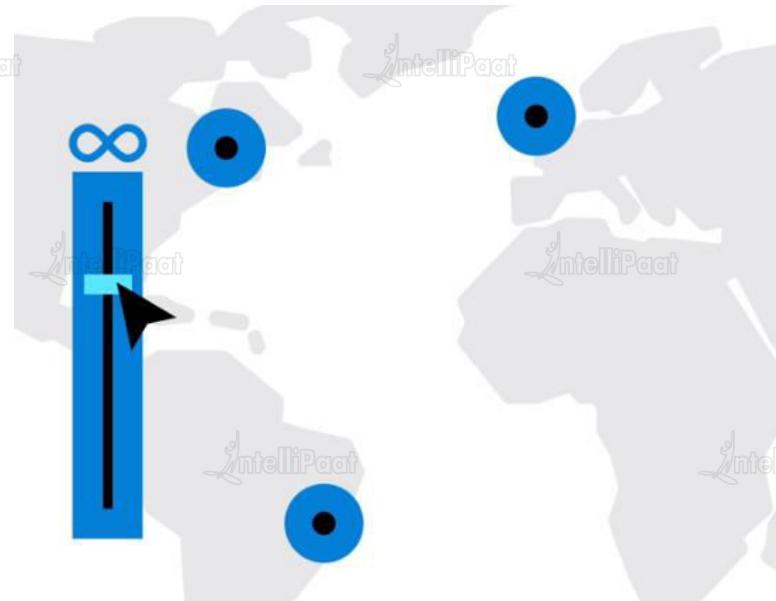
Easily add or remove any number of regions world wide at any time



Why Azure Cosmos DB?

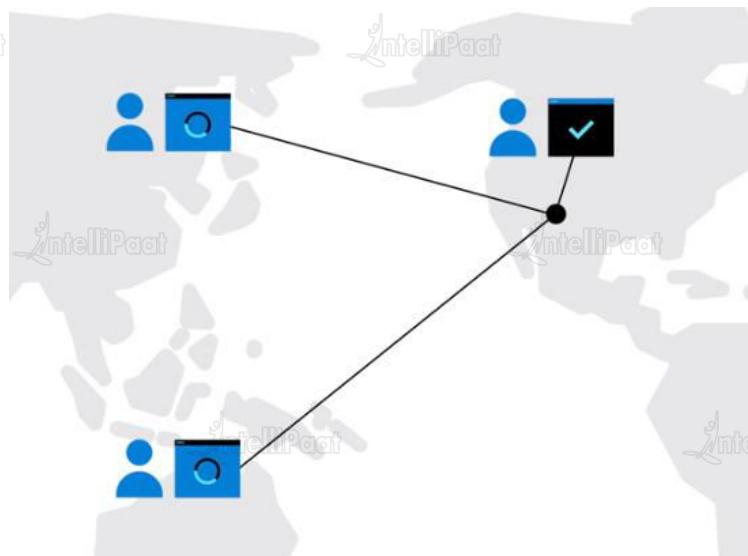


Elastically scale throughput and storage across all regions at any time



Why Azure Cosmos DB?

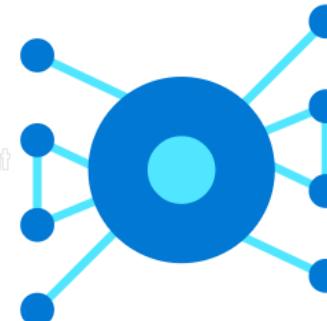
Avoid the speed of light penalty for your globally distributed apps



Why Azure Cosmos DB?

Enterprise-grade security by default

Multi-model with wire protocol-compatible API endpoints for Cassandra, MongoDB, SQL, Gremlin, etc



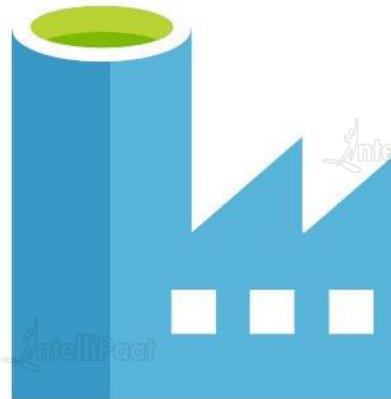


Azure Data Factory

Azure Data Factory

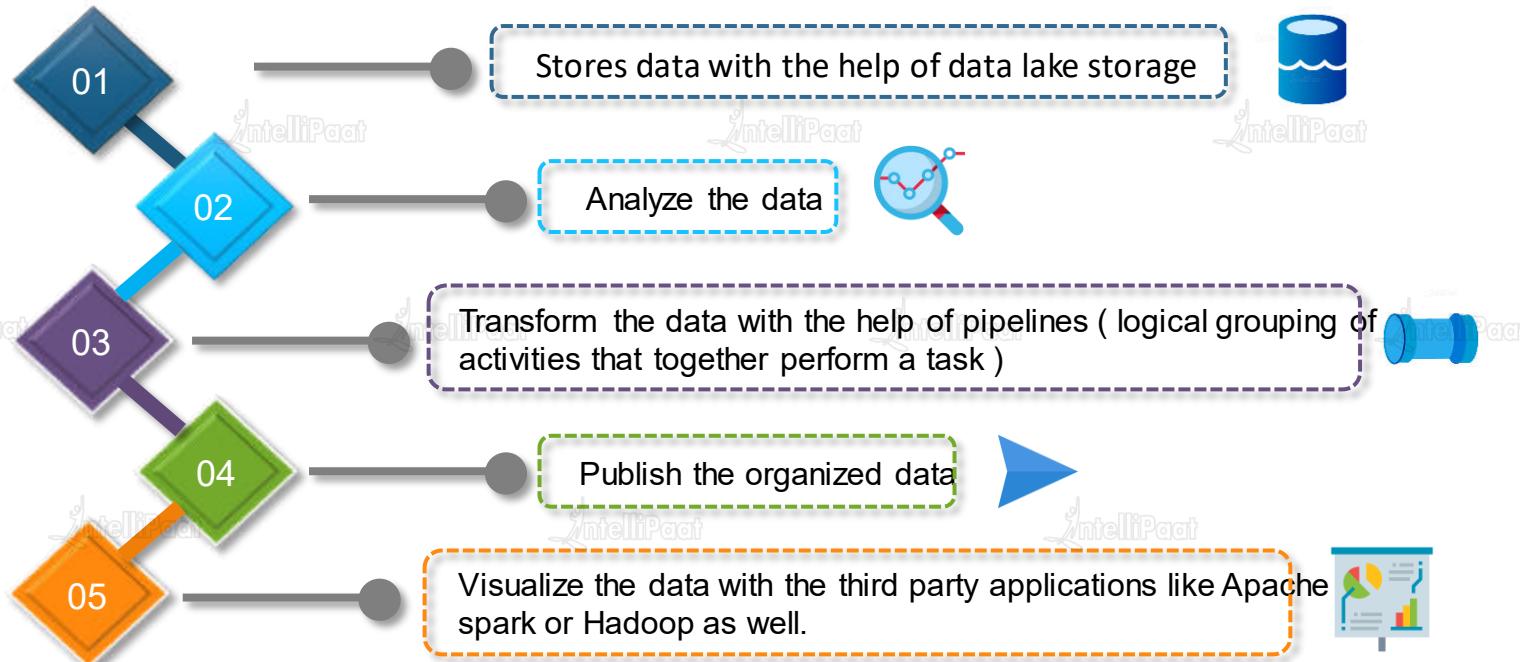


This service is a fully managed service for composing data storage, processing, and movement services into streamlined, scalable, and reliable data production pipelines. Azure Data Factory does not store data itself.



Azure Data Factory

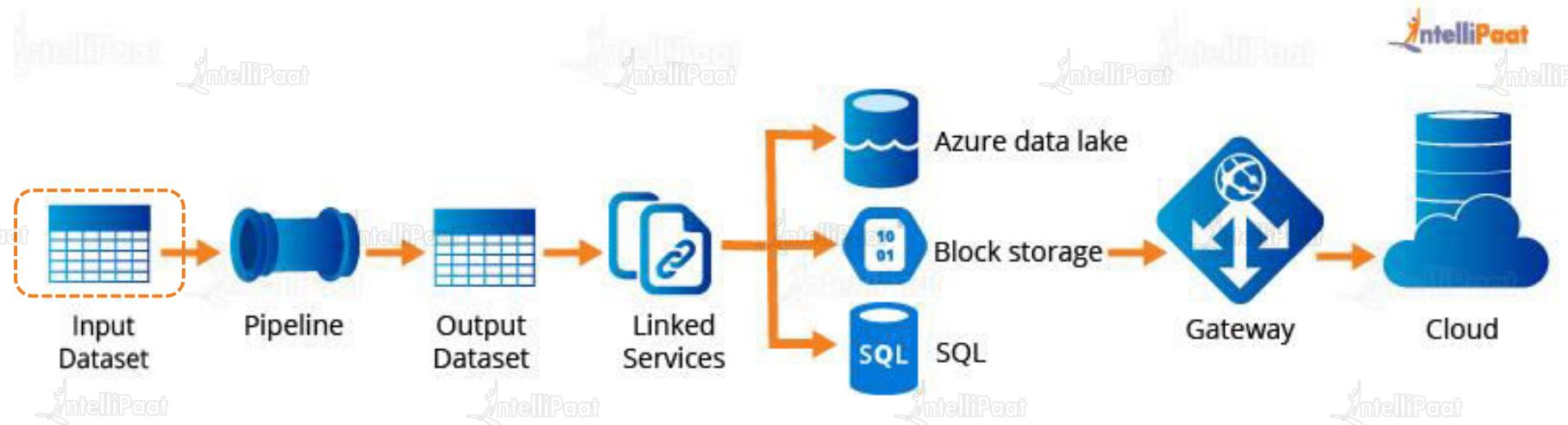
As the data is coming from number of different products, to analyze and store all this data we can use data factory which:





Flow Process of Data Factory

Flow process of Data factory

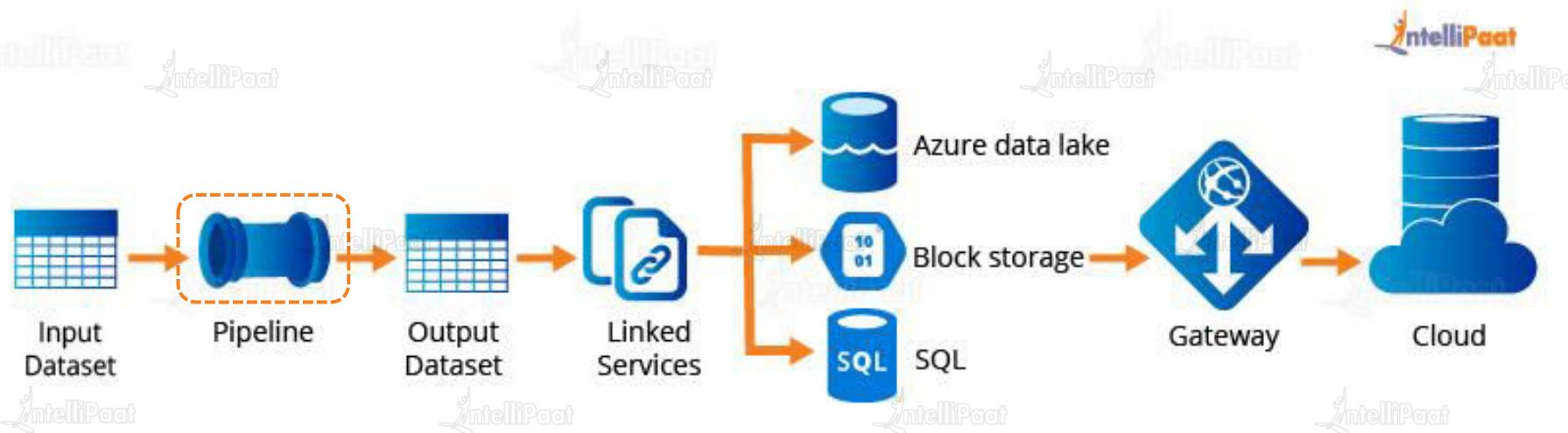


01

Input dataset: Data that you have within your data store. The one that you need to be processed then you pass this data through a pipeline



Flow process of Data factory

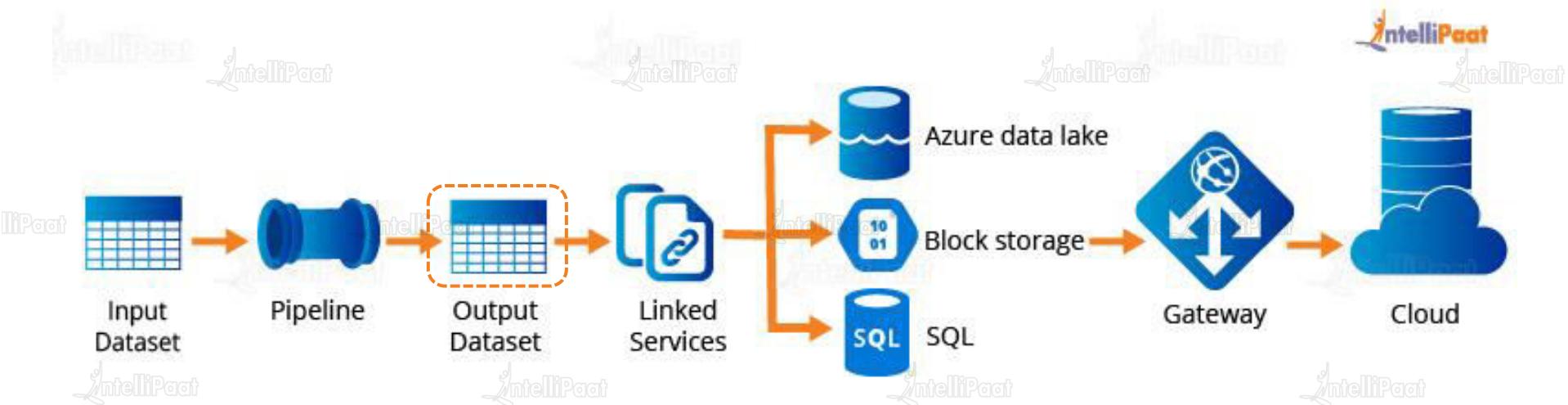


02

Pipeline: It basically performs an operation on the data that transforms which could be anything from just data movement or some data transformation.



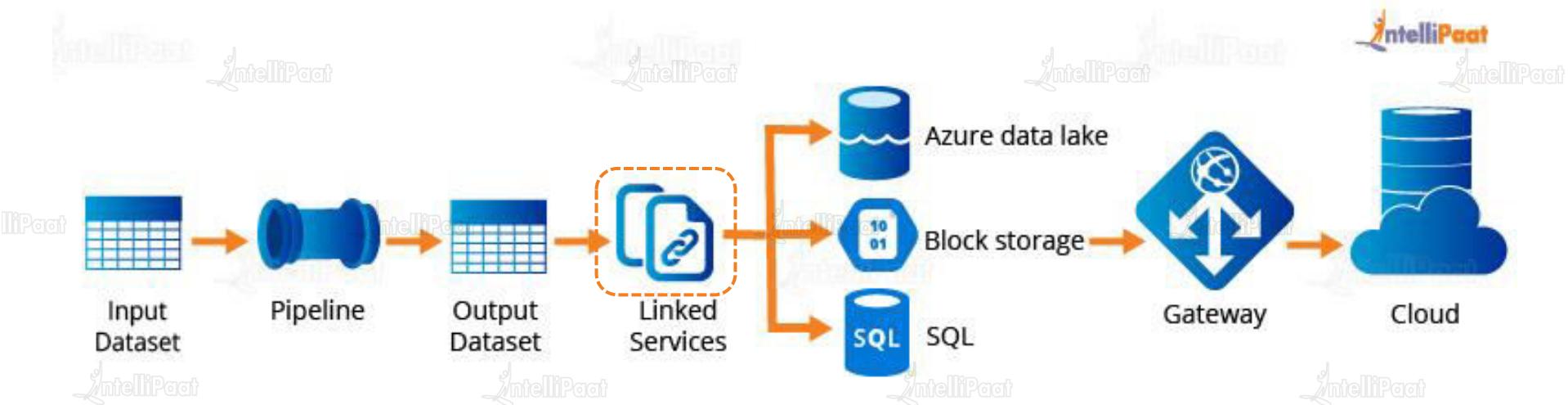
Flow process of Data factory



03 **Output data set:** It contains the data that is in a structured form as it is already been transformed and made structured in the pipeline storage then it is given to linked services like azure data lake, blob storage or SQL.



Flow process of Data factory

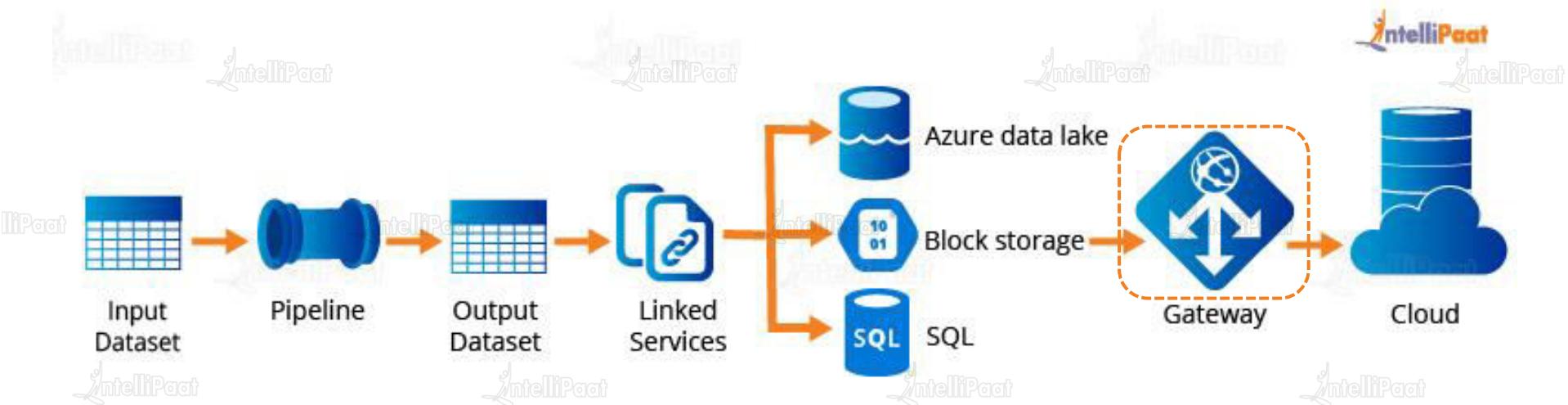


04

Linked services: These store information that is very important when it comes to connecting an external source.



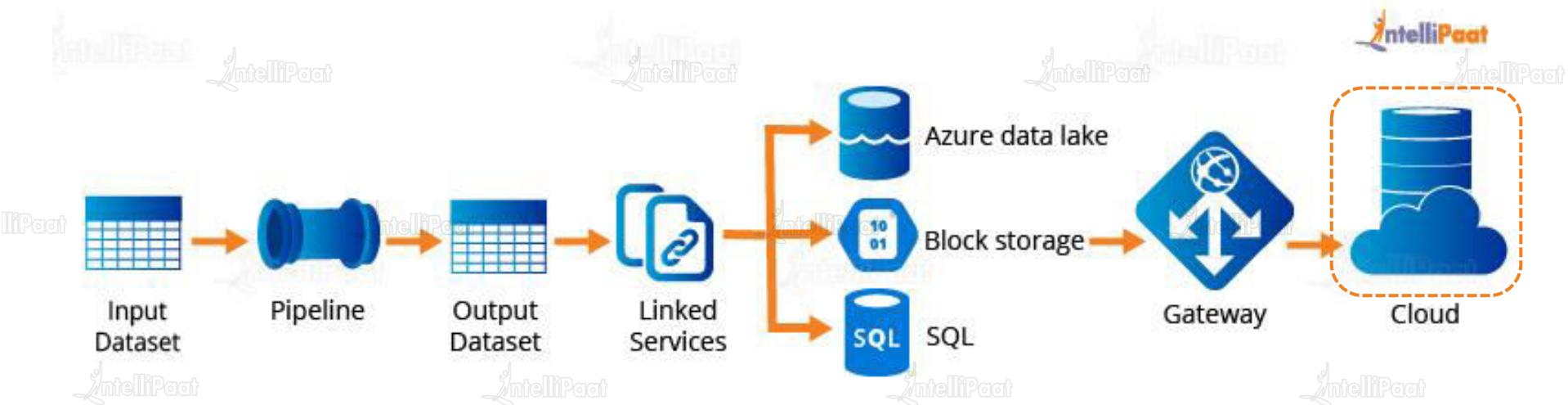
Flow process of Data factory



05 **Gateway:** It connects your on-premises data to the cloud. So you do need a client installed on your on-premises system so that you can connect to the azure cloud.

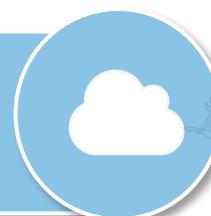


Flow process of Data factory



06

Cloud: Your data can be analyzed, visualized with a number of different analytical software's like apache spark, R, Hadoop and so on.





Why Azure Data Factory?

Why Azure Data Factory?



Improve productivity with shorter time to market

Reduce overhead costs

Transfer data using prebuilt connectors

Integrate data cost-effectively

Work the way you want

Get continuous integration and delivery (CI/CD)

Why Azure Data Factory?



Transfer data using prebuilt connectors

Access to ever-expanding portfolio of more than 90+ prebuilt connectors including Azure data services, on-premises data sources, Amazon S3 and Redshift and Google BigQuery at no additional cost.





Azure Synapse Analytics

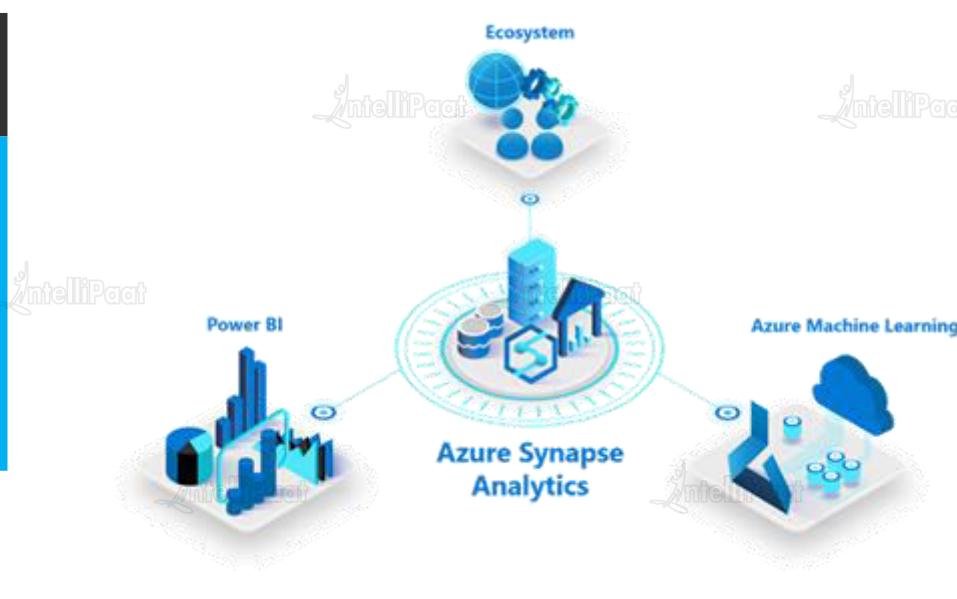
Azure Synapse Analytics

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01

Azure Synapse is a limitless analytics service that brings together enterprise data warehousing and Big Data analytics.



Azure Synapse brings these two worlds together with a unified experience to ingest, prepare, manage, and serve data for immediate BI & ML needs

02

It gives you the freedom to query data on your terms, using either serverless on-demand or provisioned resources at scale.



Features of Azure Synapse Analytics:



Limitless scale

Deliver insights from all your data, across data warehouses and big data analytics systems, with blazing speed



Powerful Insights

Expand discovery of insights from all your data and apply machine learning models to all your intelligent apps

Features of Azure Synapse Analytics:



Unified Experience

Significantly reduce project development time with a unified experience for developing end-to-end analytics solutions



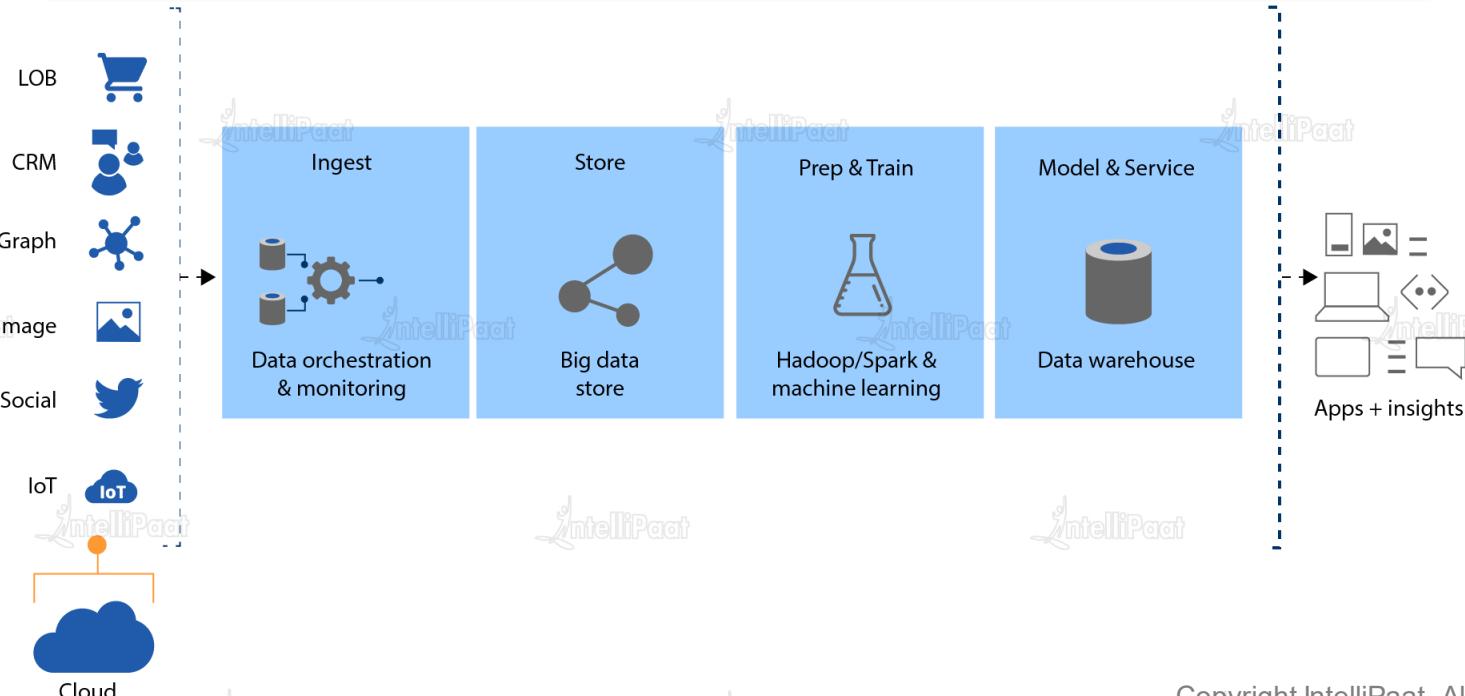
Unmatched Security

Secure data with the most advanced security and privacy features in the market, such as column- and row-level security and dynamic data masking

Azure Synapse Analytics



The analysis results can go to worldwide reporting databases or applications. Business analysts can then gain insights to make well-informed business decisions

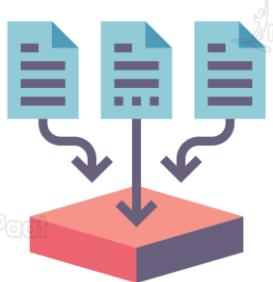




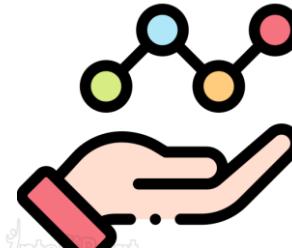
Azure Monitor

What is Azure Monitor?

Azure monitor is a service to maximize the productivity of your azure services and applications by providing a solution for **collecting, analysing, and acting on telemetry** from your cloud and on-premises environments.



Collecting



Analyzing



Generating Alerts

Why do we need Azure Monitor?



These are some of the use cases where Azure monitor is used:

To detect and diagnose issues across applications and dependencies with Application Insights

To correlate infrastructure issues with Azure Monitor for VMs and Containers

To be able to drill into troubleshooting and deep diagnostics

Support operations at scale with Alerts and Automated actions

Create visualizations with Azure dashboard and workbooks

What is Azure Monitor?

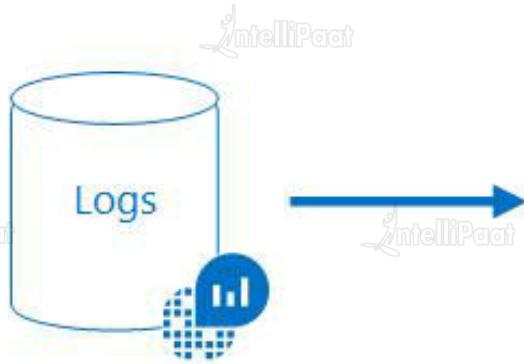
Azure monitor is made up of two data types - **Metrics and Logs**



Metrics Explorer

What is Azure Monitor?

Azure monitor is made up of two data types - **Metrics and Logs**



The screenshot shows a Log Analytics search interface with the following details:

- Search query: Event | where EventLevelName == "Error" | project TimeGenerated, Computer, EventLevelName, Source, EventID
- Results: 4K Results
- View: List
- Table Headers: TimeGenerated, Computer, EventLevelName, Source, EventID
- Data Rows (partial):

TimeGenerated	Computer	EventLevelName	Source	EventID
7/17/2017 11:39:02 AM	srv01.contoso.com	Error	Microsoft-Windows-L...	5873
7/17/2017 11:39:12 AM	srv01.contoso.com	Error	HealthService	4502
7/17/2017 11:39:12 AM	srv02.contoso.com	Error	HealthService	4502
7/17/2017 11:39:12 AM	srv01.contoso.com	Error	HealthService	4502
7/17/2017 11:39:12 AM	srv03.contoso.com	Error	HealthService	4502
7/17/2017 11:39:26 AM	srv03.contoso.com	Error	NPM Agent	100
7/17/2017 11:39:26 AM	srv03.contoso.com	Error	NPM Agent	100

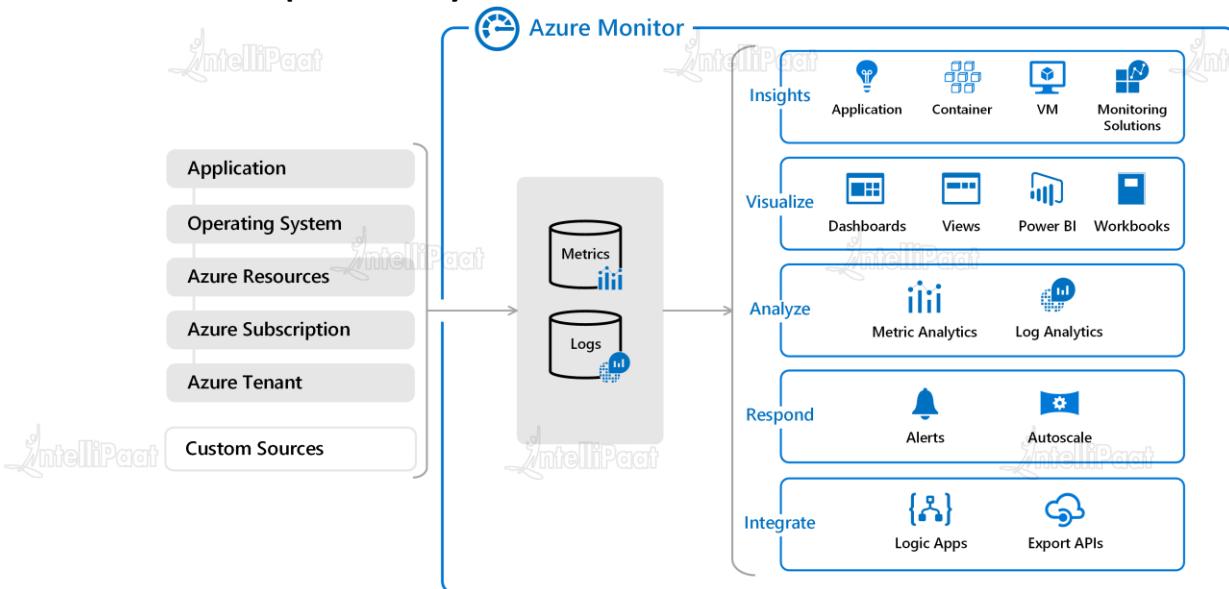
Log Analytics

What is Azure Monitor?

This is an overview of the working of Azure Monitor.

In the center, we have the two data stores that is Metrics and Logs.

The left side of the chart we have the sources of monitoring data and the right side is a list of services provided by Azure monitor based on the data collected.





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Azure Metrics

What are Metrics?

Metrics are introduced in Azure monitoring particularly for **alerting** and **fast detection of issues**.

These values are used to describe one aspect of a system at a time.

In Azure monitor, they are lightweight and capable of supporting near real time scenarios.



Structure of data – Azure Metrics

The data collected by azure metrics is a **time-series database**.



Each set of metric values is a time series with the following properties:

- The time the value was collected
- The resource the value is associated with
- A namespace that acts like a category for the metric
- A metric name
- The value itself



Hands-on: Azure Metrics and Alerts



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Azure Log Analytics

What are Logs?

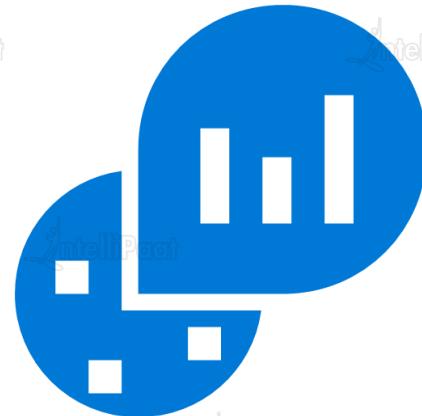


Logs are essentially used to describe events, collected sporadically. They are numerical data combined with text in the form of detailed descriptions.

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Telemetry such as events and traces are stored Azure Monitor Logs in addition to performance data so that it can all be combined for analysis.

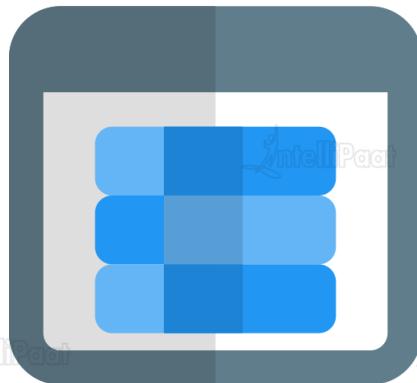


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Structure of data – Azure Log

All the logs in Azure monitor are stored in the Log analytics workshop.
They are stored in the form of multiple tables.



➤ All tables share some common properties, each has a **unique set of properties** depending on the kind of data it stores.

➤ A new workspace will have standard set of tables, and more tables will be added by different monitoring solutions and other services that write to the workspace.



Alerts and Actions

What are alerts?



In Microsoft Azure, alerts are used to **notify important conditions**. They are a result of the continuous monitoring of data and reach out to the owner of the system before the users do so as to be able to address them.

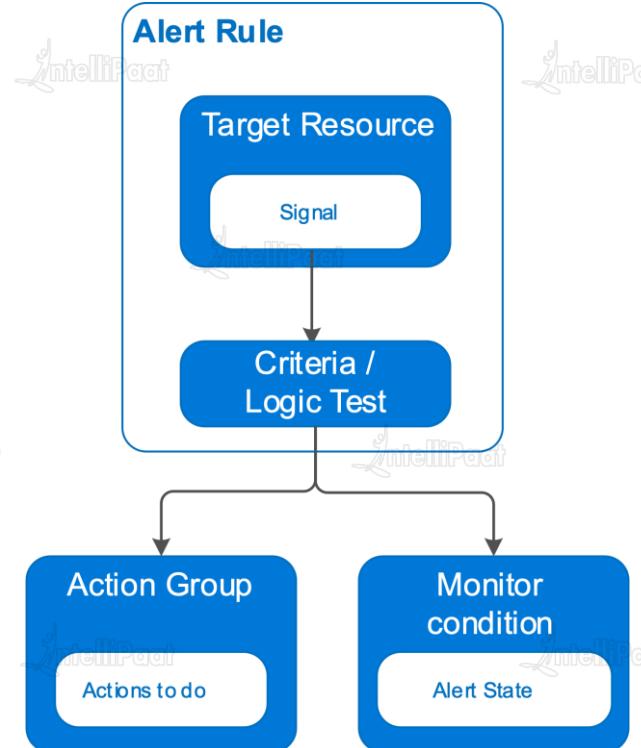
The previous alert experience and alert types are called *classic alerts*.



Workflow of Alert Rule

The following are the key attributes of an alert rule:

01	02	03	04
Target Resource Scope and signals available for alerting	Criteria Combination of signal and logic applied on a target resource	Severity Defining the severity of the alert once the criteria is matched	Action Specific action taken when an alert is fired





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Azure Application Insights



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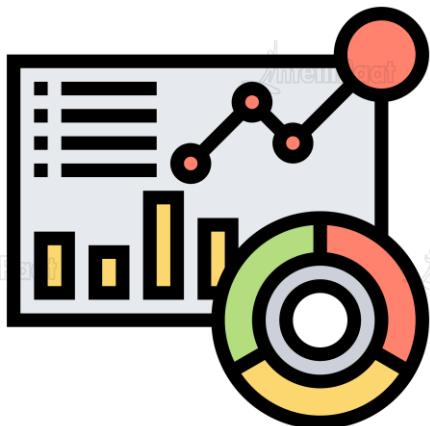
What are Application Insights?



Application insights is a service provided by Microsoft azure to monitor your applications that are live. It automatically deals with performance anomalies and uses powerful analytical tools to understand how the users are working with the application.



How does Application Insights work?

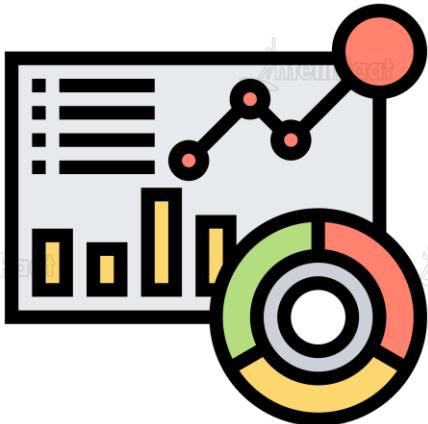


- Install a small instrumentation package in your application

- Set up an Application Insights resource in the Microsoft Azure portal

- The instrumentation monitors your app and sends telemetry data to Azure Monitor

How does Application Insights work?

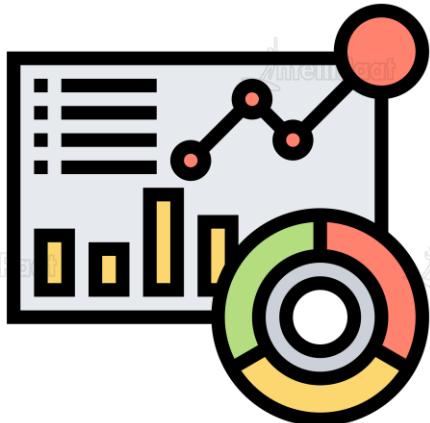


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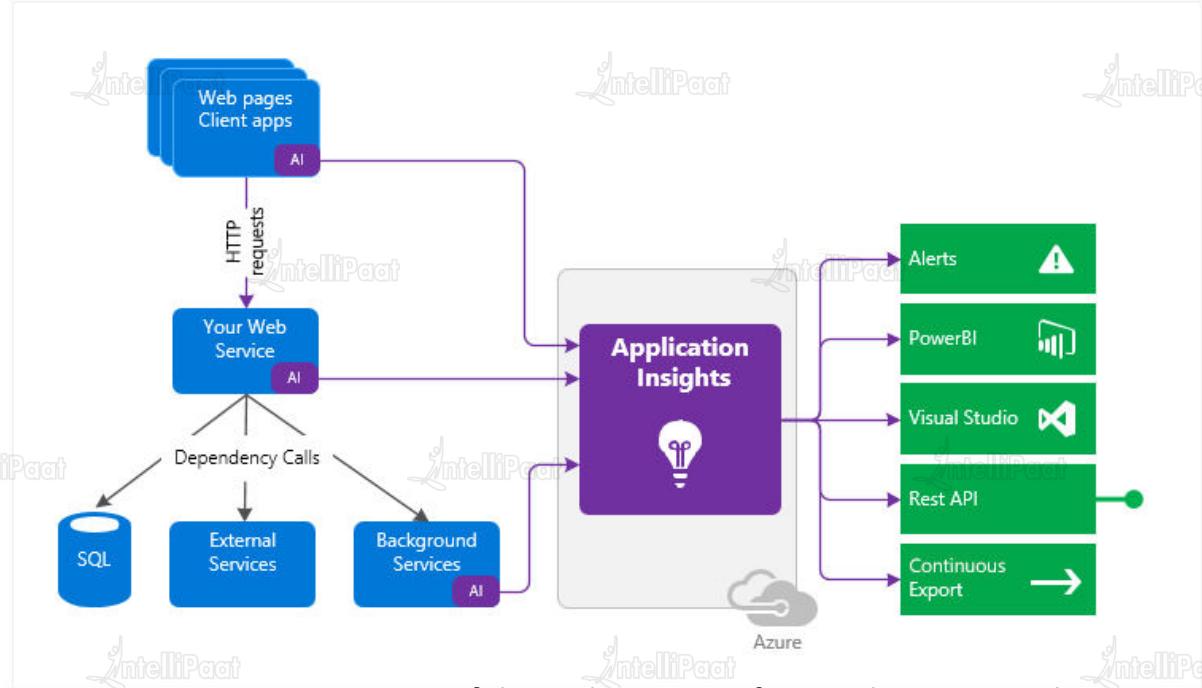
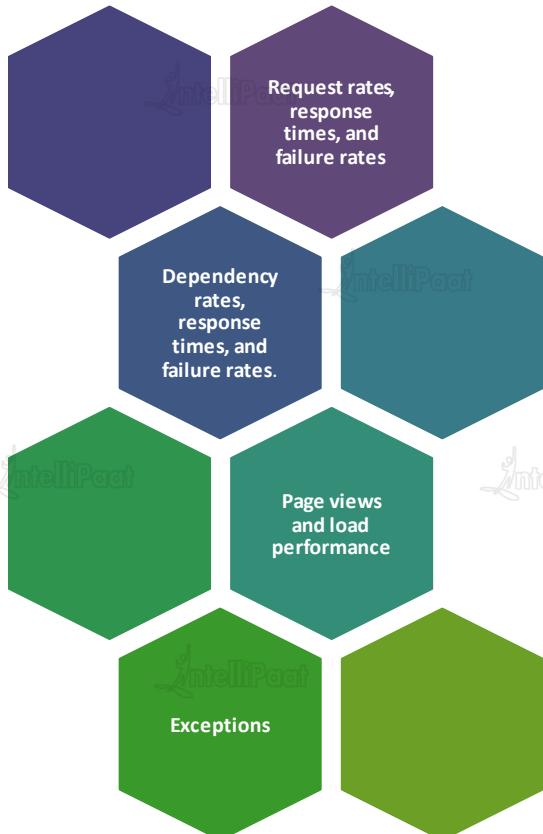


- Install a small instrumentation package in your application

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What all does Application Insights monitor?





Backup Reports

Why do we need Backup Reports?

Azure backup is a service provided by azure to help get rich and deep insights on the backup reports. This includes allocating and forecasting of cloud storage consumed, auditing of backup and restore and identifying key trends.





Recovery Service Vaults



What are Recovery Service Vaults?



Recovery service vaults are a storage entity provided by Microsoft Azure to store different types of data. This may be copies of other data, configuration information for VMs, workloads, servers or workstations.

What are the specific uses of Recovery service vaults?

- Hold backup data for various Azure services
- Supporting System Center DPM, Windows Server, Azure Backup Server, and more.
- Making it easier to organize your backup data, while minimizing management overhead.

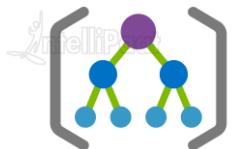


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Azure Governance

What is Azure Governance?

Azure enables your organization's development and IT departments to be agile by making it easy to create, read, update, and delete resources as needed. Azure provides various Governance tools.



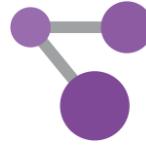
Azure Management Groups



Azure Policy



Azure Blueprints



Azure Resource Graph



Cost Management



Azure Management Groups

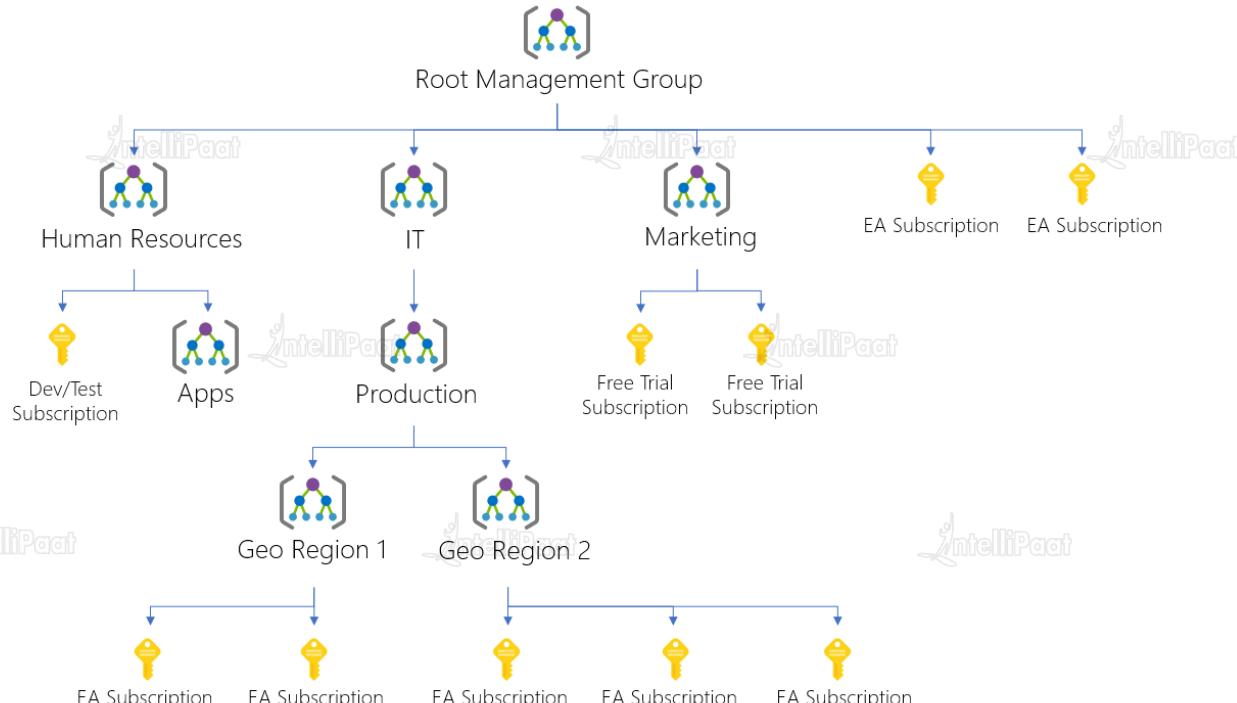
Important facts about management group

- 10,000 management groups can be supported in a single directory
- A management group tree can support up to six levels of depth
- This limit doesn't include the Root level or the subscription level
- Each management group and subscription can only support one parent
- Each management group can have many children
- All subscriptions and management groups are within a single hierarchy in each directory

Azure Governance – Management Groups



Hierarchy of Management Groups and Azure Subscriptions



Azure Governance – Policy



Azure Policy

Azure Policy is a service in Azure that you use to create, assign, and manage policies. These policies enforce different rules and effects over your resources, so those resources stay compliant with your corporate standards and service level agreements.

How is Azure policy different from RBAC?

Azure Policy focuses on resource properties during deployment and for already existing resources. Azure Policy controls properties such as the types or locations of resources. Unlike RBAC, Azure Policy is a default allow and explicit deny system.

Azure Governance – Blueprints



Azure Blueprints

Azure Blueprints enables cloud architects and central information technology groups to define a repeatable set of Azure resources that implements and adheres to an organization's standards, patterns, and requirements.

A Blueprint is made up of various **Artifacts**. Currently Azure Blueprint supports all these Artifacts – **Resource Groups, Azure Resource Manager Template, Policy Assignment and Role Assignment**.

Azure Governance- Blueprints



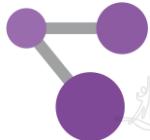
Azure Blueprints



CAF Foundation Blueprint Sample

Core infrastructure services

Azure Governance – Resource Group



Azure Resource Graph

Azure Resource Graph is a service in Azure that is designed to extend Azure Resource Management by providing efficient and performant resource exploration with the ability to query at scale across a given set of subscriptions so that you can effectively govern your environment.

Features of Azure Resource Graph:

- Ability to query resources with complex filtering, grouping, and sorting by resource properties.
- Ability to iteratively explore resources based on governance requirements.
- Ability to assess the impact of applying policies in a vast cloud environment.

Azure Governance – Cost Management



Cost Management

You use Azure Cost Management and Billing features to conduct billing administrative tasks and manage billing access to costs. You can also use its features to monitor and control Azure spending and to optimize Azure resource use.



When you create an Azure Account an Billing account is automatically created. Cost management is the process of effectively planning and controlling costs involved in your business. You can use the Billing account to do cost planning and administration.



What is Azure Compliance?

Azure provides 90+ compliance offerings. Microsoft offers a comprehensive set of compliance offerings to help your organization comply with national, regional, and industry-specific requirements governing the collection and use of data.



Global

CIS Benchmark

CSA-STAR attestation

CSA-STAR certification

CSA-STAR self assessment

ISO 20000-1:2011



US Government

CJIS

CNSSI 1253

DFARS

DoD DISA L2, L4, L5

DoE 10 CFR Part 810



Industry

23 NYCRR Part 500

AFM + DNB (Netherlands)

APRA (Australia)

AMF and ACPR (France)

CDSA



Regional

BIR 2012 (Netherlands)

C5 (Germany)

CCPA (US-California)

IRAP / CCSL (Australia)

CS Mark Gold (Japan)



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Azure Privacy

What is Azure Privacy?

Azure provides data privacy and protection services. Azure's data centers are secured heavily and that adds another layer of privacy.





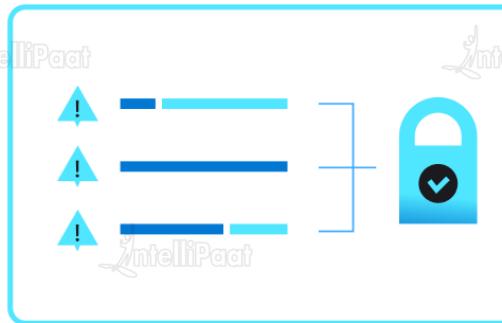
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Azure Trust

Azure Trust



1B+ USD investment in security R&D and 3500 cyber security experts



Azure Trust



90+ compliance offerings provided by Microsoft Azure



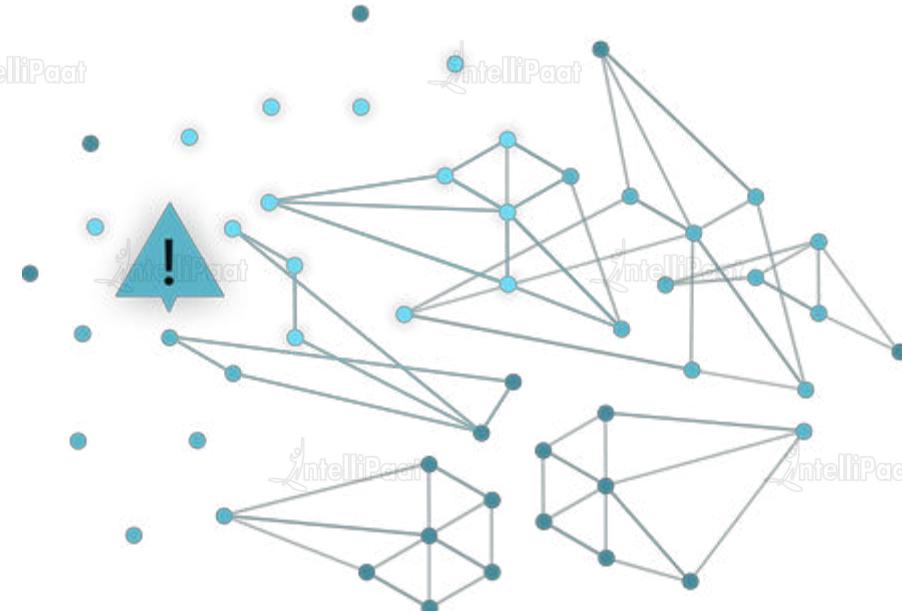
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