POWER BI ARCHITECTURE

What is Power BI and how is Power BI desktop used in present solution…?

Power BI is a business suite that includes several technologies that work together to deliver business intelligence solutions for enterprises.

<u>In present solution,</u> Power BI has the get data feature using which we are connecting to data source in on-premises SQL Server. Data connections are established from this data source to authoring tool Power BI Desktop. Power BI Desktop tool is used in on-premises to develop various BI dashboards. This tool is installed on Monitoring server also called Utility DB server.

What are Key stages of development flow used to make BI dashboards available to client in current solution…?

There is primary 4 key stages of development to make BI dashboards available to client.
1. **Power BI desktop tool:** It is used for developing BI reports and dashboards on the premises.
2. **Publish report to power BI:** Reports and dashboard from Power BI desktop are published to cloud platform power BI service. Power BI Service is an online software service (SaaS, or Software as a Service) offering from Microsoft that lets you easily and quickly create self-service Business Intelligence dashboards, reports, datasets, and visualizations. The Power BI service is built on Azure, Microsoft's cloud computing platform.
3. **The Power BI Gateway:** It acts as a secure channel to transport data from on-premises data sources to on-cloud Power BI service. Therefore, in current architecture, it makes a connection between Power BI desktop and Power BI Service.
4. **User Authentication:** Client or business user uses web browser to access power BI service by authenticating through credentials stored in Azure AD. The visibility to reports is defined as per the permissions available to user given by PBI admin.

What is the architecture used by Microsoft for the seamless functioning of Power BI service…?

The architecture of Power BI Service is divided into two sections:
1. Web front-end cluster (WFE)
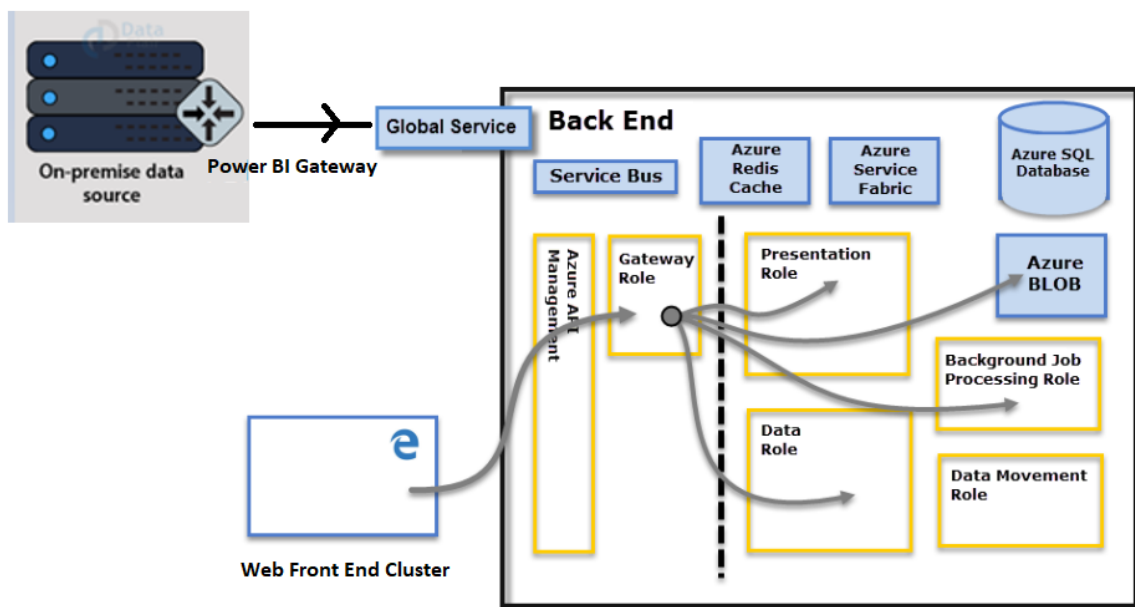2. Back-end cluster (BE)

1. Web front-end cluster (WFE)

a. WFE Cluster is first stage in Power BI Service when user/client makes initial connection and authenticates its credentials on Browser via Azure AD before making connection with PBI back-end cluster. WFE Cluster is the connection between client and power BI back-end cluster components like dashboard, data sets, Admin Portals, tenants, data connections etc.
b. A WFE cluster consists of an ASP.NET website running in the Azure App Service Environment on cloud.
c. **Azure CDN:** Azure Content Delivery Network is a globally distributed network of servers by Microsoft that delivers web content to web users.
d. **Azure Traffic Manager** is a traffic load balancer that allows you to distribute traffic coming to public facing applications across the global Azure regions.
e. **Azure AD** is cloud-based directory and identity management service that helps employees sign up to multiple services and access them anywhere over the cloud with a single set of login credentials.
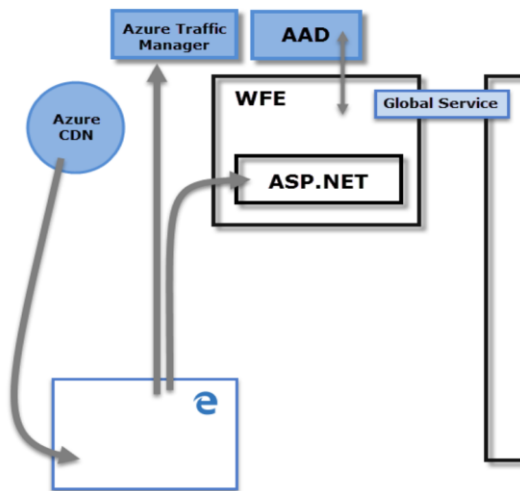
Web front-end cluster (WFE)

As shown in above diagram, when users attempt to connect to the Power BI service, the client's DNS service communicates with the Azure Traffic Manager to find the most appropriate initial HTML page contents on site stored on Azure CDN. It finally makes connection with PBI Back-end Cluster.

2. **Back-end cluster (BE)**

Power BI back-end cluster (BE)

The Power BI service at the back end take care of visualizations, datasets, storage, reports, data connections, data refreshing, and other interactions of user with Power BI.

As shown in above diagram, at the back end, web front end client has two direct points of interaction, Azure API Management, and Gateway Role. These two components are responsible for load balancing, authentication, authorization, routing, etc.

a. Power BI stores its data in two main repositories: Azure blob storage and Azure SQL database. Azure blob storage stores the datasets uploaded by users and all the metadata and system-related data is stored in the Azure SQL database.

b. After Azure API Management authenticates a user request, it is sent to the Gateway Role. The Gateway Role processes the requests and directs them to suitable components like Presentation Role, Background Job Processing Role, Data Role, and Data Movement Role.

c. For instance, the Presentation Role handles all the visualization related queries like for dashboards and reports.

d. For all the data related queries, the request is sent by the Gateway Role to the Data Role or Data Movement Role.

e. Power BI Service back end uses Azure Service Bus to connect on-premises data sources with the cloud via Power BI Gateway. Azure Service Bus receives all the requests to fetch data from the on-premises data source. Then it processes the request and executes the query on the on-premises data source to retrieve data from it to the cloud service.

f. The Azure Service Fabric manages all the microservices and components associated with running Power BI.

g. Azure Redis Cache helps in real-time reporting using the data stored in the in-memory of the Power BI system.