HR Analytics

Architecture Design

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03/06/2023	1.0	Abstract, Introduction, General Description	Y.C.MUDLIAR
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Contents:

Introduction:

What is Architecture design document?

Any software needs the architectural design to represents the design of software. IEEE defines architectural design as "the process of defining a collection of hardware and software components and their interfaces to establish the framework for the development of a computer system." The software that is built for computer-based systems can exhibit one of these many architectures.

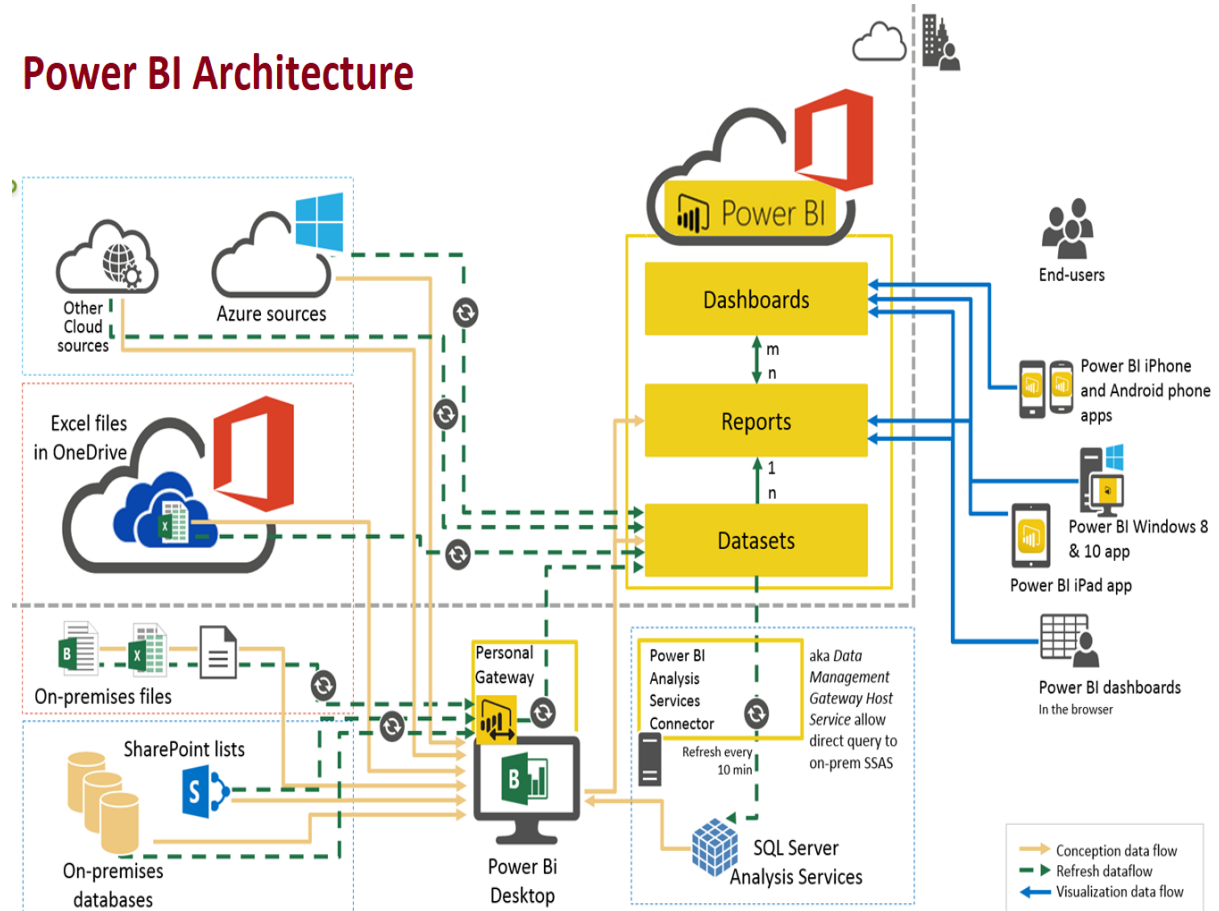**Each style will describe a system category that consists of:**

• A set of components (eg: a database, computational modules) that will perform a function required by the system.

• The set of connectors will help in coordination, communication, and cooperation between the components.

• Conditions that how components can be integrated to form the system.

• Semantic models that help the designer to understand the overall properties of the system.

Scope

Architecture Design Document (ADD) is an architecture design process that follows a step-by-step refinement process. The process can be used for designing data structures, required software architecture, source code and ultimately, performance algorithms. Overall, the design principles may be defined during requirement analysis and then refined during architectural design work.
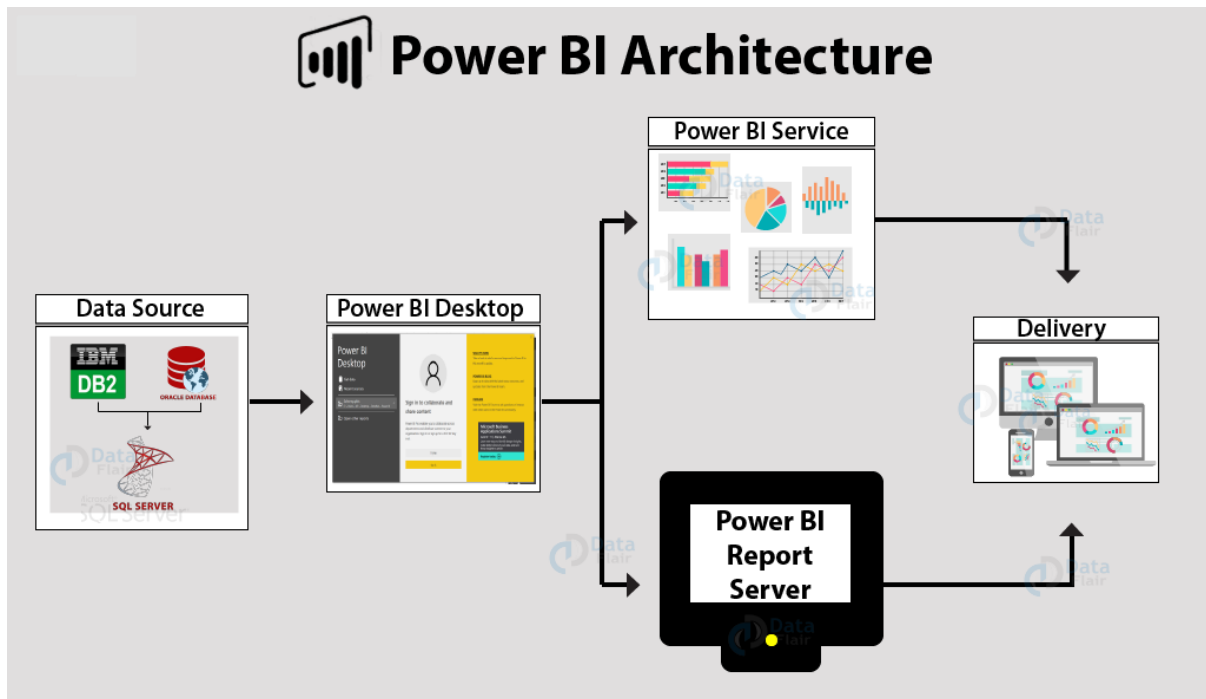
Architecture:

Power BI Architecture

Power BI

Dashboards

Reports

Datasets

Other Cloud sources

Azure sources

Excel files in OneDrive

On-premises files

SharePoint lists

On-premises databases

Personal Gateway

Power Bi Desktop

Power BI Analysis Services Connector

Refresh every 10 min

aka *Data Management Gateway Host Service* allow direct query to on-prem SSAS

SQL Server Analysis Services

End-users

Power BI iPhone and Android phone apps

Power BI Windows 8 & 10 app

Power BI iPad app

Power BI dashboards
In the browser

Conception data flow
Refresh dataflow
Visualization data flow

Power BI Service Architecture:

Power BI is a business suite that includes several technologies that work together. To deliver outstanding business intelligence solutions, Microsoft Power BI technology consists of a group of components such as:

- Power Query (for data mash-up and transformation)
- Power BI Desktop (a companion development tool)
- Power BI Mobile (for Android, iOS, Windows phones)
- Power Pivot (for in-memory tabular data modelling)
- Power View (for viewing data visualizations)
- Power Map (for visualizing 3D geo-spatial data)
- Power Q&A (for natural language Q&A)

Components of Power BI Architecture:

Let us learn about the components of Power BI architecture in detail.

1. **Data Sources**

An important component of Power BI is its vast range of data sources. You can import data from files in your system, cloud-based online data sources or connect directly to live connections. If you import from data on-premise or online services there is a limit of 1 GB. Some commonly used data sources in Power BI are:

- Excel
- Text/CSV
- XML
- JSON
- Oracle Database
- IBM DB2 Database
- MySQL Database
- PostgreSQL Database
- Sybase Database
- Teradata Database
- SAP HANA Database
- SAP Business Warehouse server
- Amazon Redshift
- Impala
- Google BigQuery (Beta)
- Azure SQL Database
- Salesforce Reports
- Google Analytics
- Facebook
- GitHub

2. **Power BI Desktop**

Power BI Desktop is a client-side tool known as a companion development and authoring tool.

This desktop-based software is loaded with tools and functionalities to connect to data sources, transform data, data modelling and creating reports.
You can download and install Power BI Desktop in your system for free. Using Power BI Desktop features, one can do data cleansing, create business metrics and data models, define the relationship between data, define hierarchies, create visuals and publish reports.

3. **Power BI Service**

Power BI Service is a web-based platform from where you can share reports made on Power BI Desktop, collaborate with other users, and create dashboards.
It is available in three versions:

- Free version
- Pro version
- Premium version

Power BI Service is also known as, **"Power BI.com"**, **"Power BI Workspace"**, **"Power BI Site"** and **"Power BI Web Portal"**. This component also offers advanced features like natural language Q&A and alerts.

4. Power BI Report Server

The Power BI Report Server is similar to the Power BI Service. The only difference between these two is that Power BI Report Server is an on-premise platform. It is used by organizations who do not want to publish their reports on the cloud and are concerned about the security of their data.

Power BI Report Server enables you to create dashboards and share your reports with other users following proper security protocols. To use this service, you need to have a Power BI Premium license.

5. Power BI Gateway

This component is used to connect and access on-premise data in secured networks. Power BI Gateways are generally used in organizations where data is kept in security and watch. Gateways help to extract out such data through secure channels to Power BI platforms for analysis and reporting.

6. Power BI Mobile

Power BI Mobile is a native Power BI application that runs on iOS, Android, and Windows mobile devices. For viewing reports and dashboards, these applications are used.

7. Power BI Embedded

Power BI Embedded offers APIs which are used to embed visuals into custom applications.

Power BI Service:

As we have learned in the earlier sections, all the reports that you create in Power BI Desktop are published on a cloud platform known as Power BI Service.

Users can access the reports and dashboards from Power BI Service using client platforms like websites, mobile devices, etc. This means that every client who wants to access content created on Power BI needs to interact with Power BI Service. And so, we must take a look under the hood and learn how Power BI Service works.

Power BI Service's architecture consists of two parts:

- A front end
- A back end

Front End cluster

The front end also called the web front-end cluster acts as an intermediary between clients and the back end. The front end services are used for establishing an initial connection and authenticating clients using Azure Active Directory. The Azure Active Directory stores user identities.

Along with this, Azure Traffic Manager is used to direct user requests to the nearest data center after authentication. Once a client/user is authenticated, the **Azure Content Delivery Network (CDN)** distributes static Power BI content/files to users.
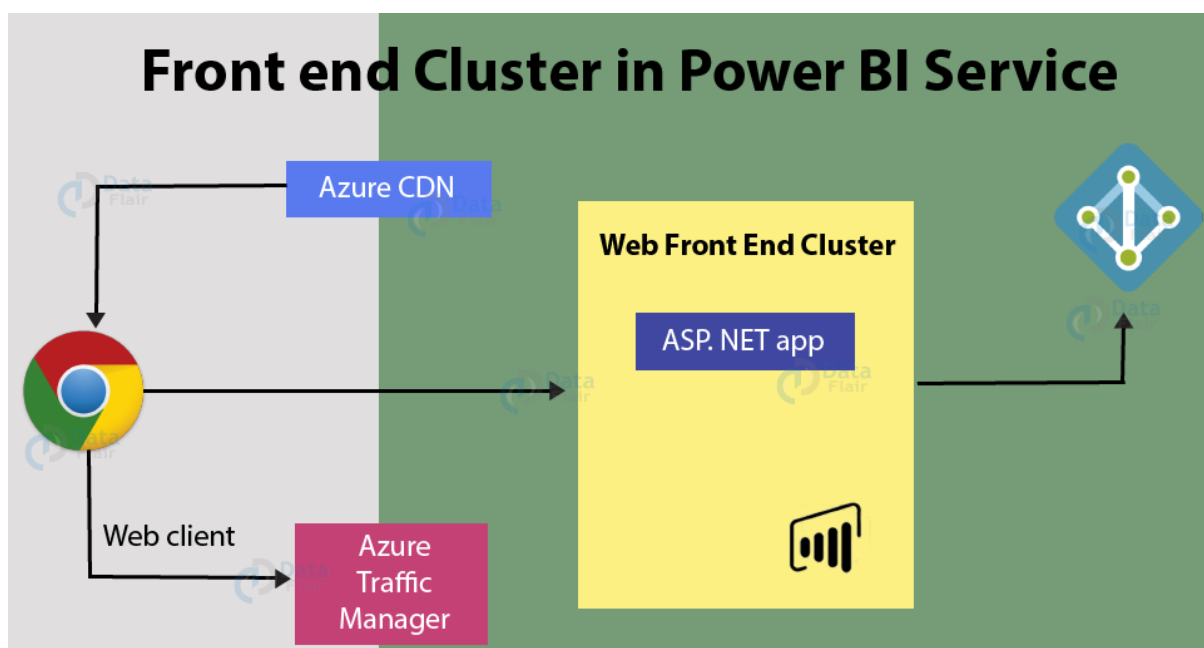
Back End Cluster:

The Power BI services at the back end take care of visualizations, datasets, storage, reports, data connections, data refreshing, and other interactions with Power BI. At the back-end, a web client has only two direct points of interaction, Azure API Management, and Gateway Role. These two components are responsible for load balancing, authentication, authorization, routing, etc.
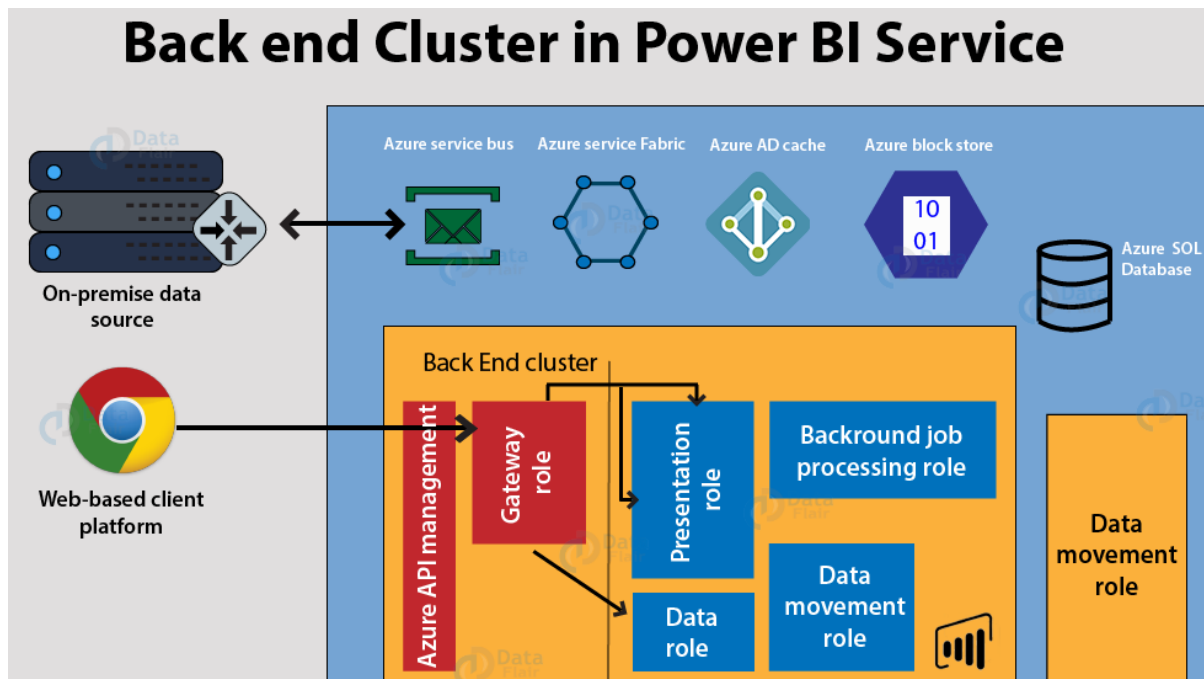
Working of Power BI Service:

- Power BI stores its data in two main repositories; Azure block storage and Azure SQL database. Azure block storage stores the datasets uploaded by users and all the metadata and system-related data is stored in the Azure SQL database.
- 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.
- For instance, the Presentation Role handles all the visualization related queries like for dashboards and reports.
- For all the data related queries, the request is sent by the Gateway Role to the Data Role or Data Movement Role.
- Power BI Service back end uses Azure Service Bus to connect on-premise datasource with the cloud. Azure Service Bus receives all the requests to fetch data from the on-premise data source. Then it processes the request and executes the query on the on-premise data source to retrieve data from it to the cloud service.
- The Azure Service Fabric manages all the microservices and components associated with running Power BI.
- Azure AD Cache helps in real-time reporting using the data stored in the in-memory of the Power BI system.

Deployment:

- The first step in the deployment process is to develop and test your Power BI content. This includes creating reports, dashboards, and data models using Power BI Desktop. You can connect to data sources, transform and model the data, and design visualizations to meet your analysis requirements. During the development phase, it's important to thoroughly test your content to ensure accuracy and functionality.

- Once your Power BI content is ready, you can publish it to the Power BI Service. The Power BI Service is a cloud-based platform where you can store and share your reports, dashboards, and datasets. To publish your content, you can save your Power BI Desktop files (.pbix) and upload them to the Power BI Service.

- In the Power BI Service, you can configure security settings and define access permissions for your content. You can control who can view, edit, or share your reports and dashboards. Power BI provides options to share content with specific individuals, groups, or the entire organization. You can also set up row-level security to restrict data access based on user roles or attributes.