Architecture Design

Black Friday Sales Prediction

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Document Version	0.3
Last Revised Date	



DOCUMENT CONTROL

Change Record:

VERSION	DATE	AUTHOR	COMMENTS
0.1	19- SEP - 2021	Soumit Kar	Introduction and architecture defined
0.2	20 - SEP - 2021		Architecture & Architecture description appended and updated.



Reviews:

VERSION	DATE	REVIEWER	COMMENTS
0.2	21- SEP - 2021		Unit test cases to be added

Approval Status:

VE	ERSION	REVIE W DATE	REVIEWE D BY	APPROVED BY	COMMENTS

1. Introduction

1.1 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.

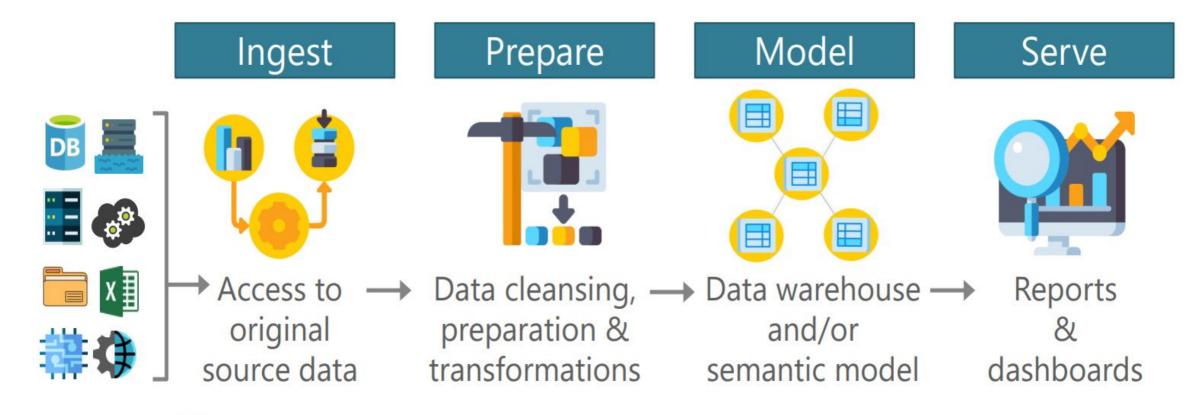
1.2 Scope

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.



Data Architecture Components





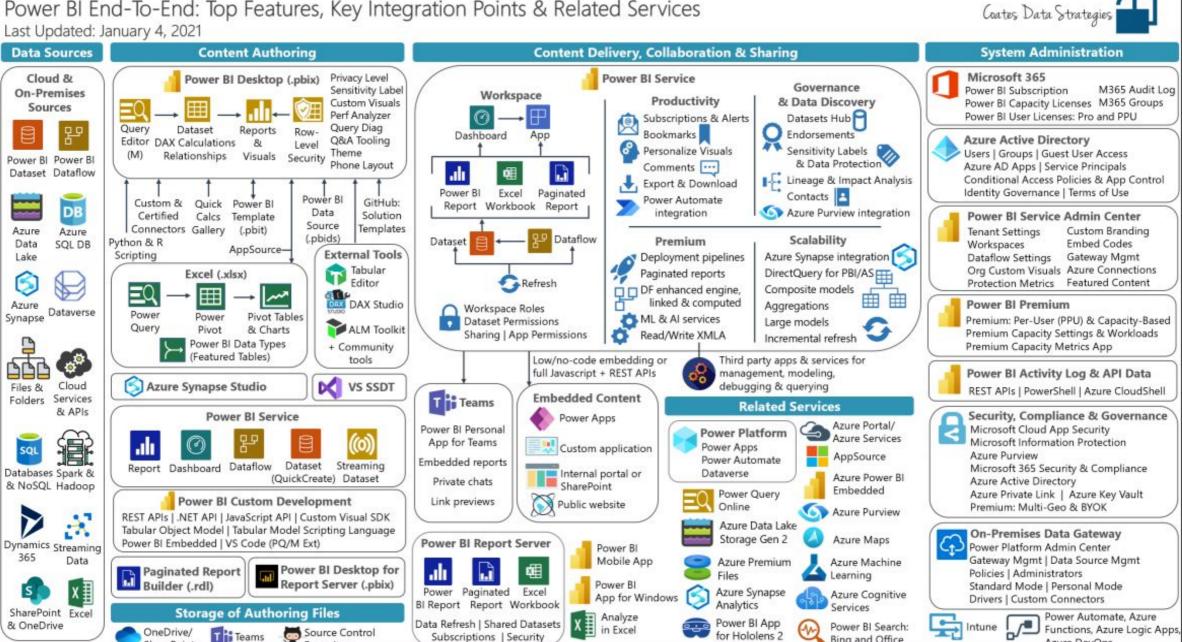


Power BI can be used for some or all of these components

Power BI End-To-End: Top Features, Key Integration Points & Related Services

Repository

SharePoint



Bing and Office

Azure DevOps

Power BI Authoring











Query Editor Data
Calculations
Relationships

Reports & Visuals

Skills: Data Data Data preparation modeling visualization

Languages: Power Query Data Analysis
Formula eXpressions
Language ("M") ("DAX")

Publishing to the Power BI Service





Power BI Desktop



Power BI Service

My Workspace



Excel

publish .xlsx file

Workspace App

Workspace



Paginated Report Builder publish .rdl file



Collaborate on content creation & validation

Power BI Report Server (PBIRS)





Excel

Paginated

Report Builder

X



Web Server

Report Server

Report Server TempDB



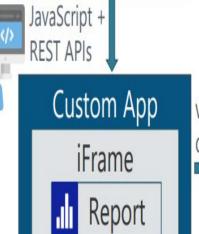
Embedding Content in a Custom App















publish

.rdl file

10

Options for Embedding Content



Internal Embedding

Embed for productivity (no-code)

Embed for your org (user owns data)

External Embedding

Embed for customers (app owns data)

Public



URL Embedding for internal websites and portals



Embedding in Teams



Embedding in SharePoint



REST APIs: Custom portals and custom apps



REST APIs: ISV apps and services



Publish to web: public portals, open data initiatives

Secured by organizational Azure AD

Secured by application authentication

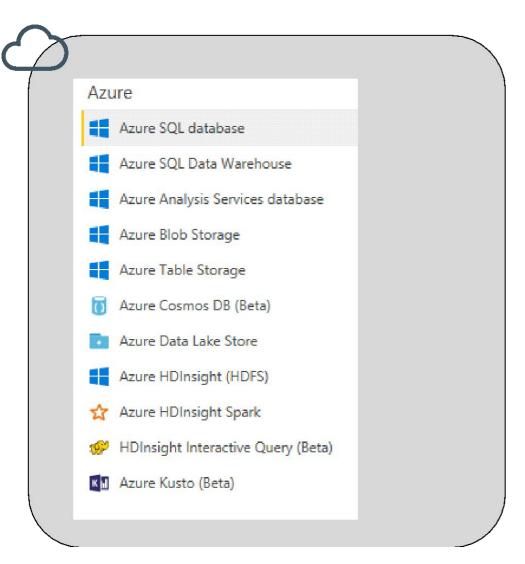
No user authentication

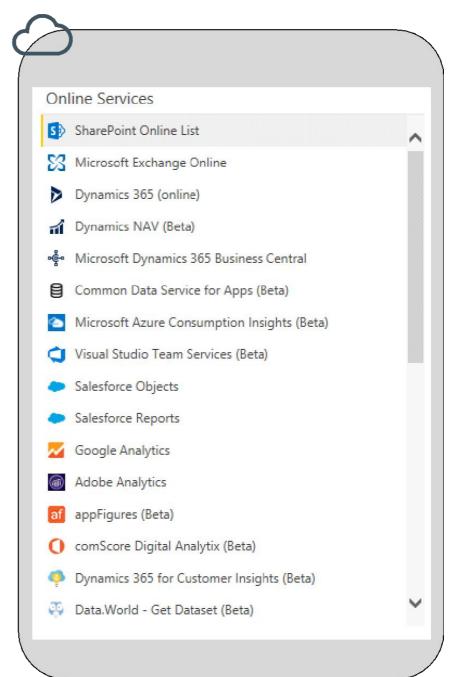
Agenda

- Gateway Architecture
- On premise gateway installation
- Cloud gateway configuration
- Identity / Security
- Deployment Topologies
- Troubleshooting
- Fun with Power Apps using the gateway
- Q+A

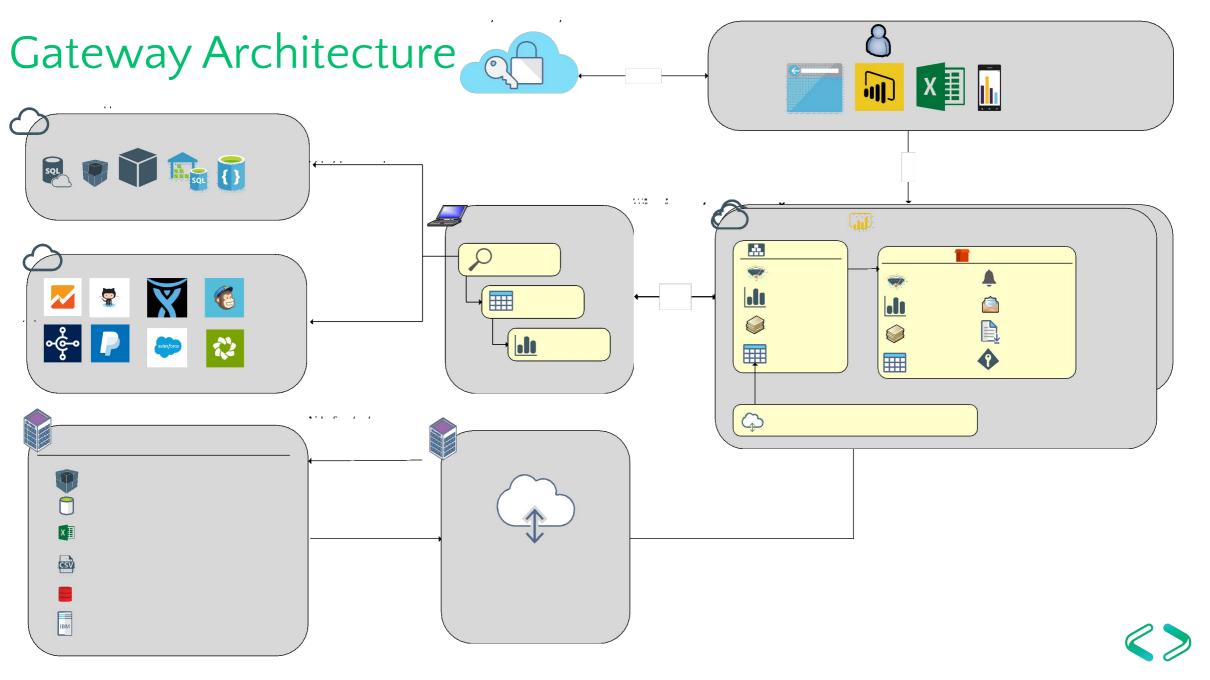


Cloud Data









Getting data into Power BI

Option	Where is Data	Role of Gateway
Import	Loaded into PBI Desktop	Refresh entire dataset
Live	Streamed from Model	Run query on model
Direct Query	Streamed from Source	Run query on Source



Get Data



How The Gateway Works













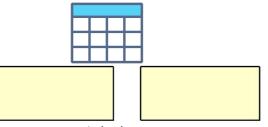


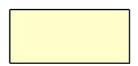


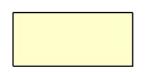














Installation and Configuration

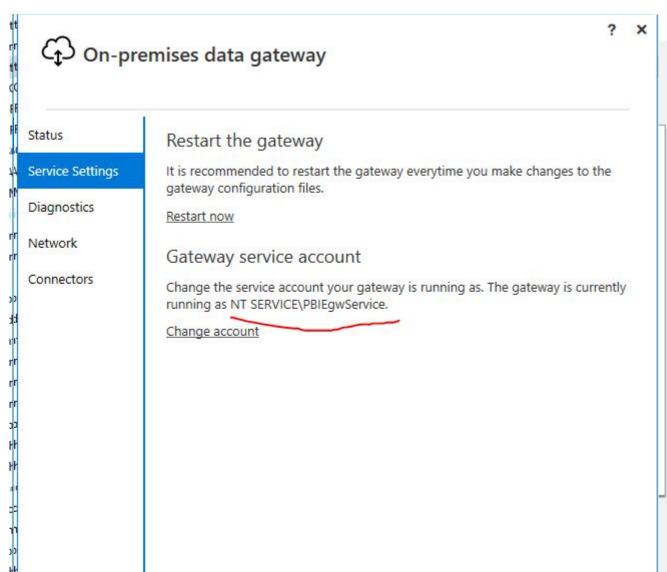
On-premises data gateway

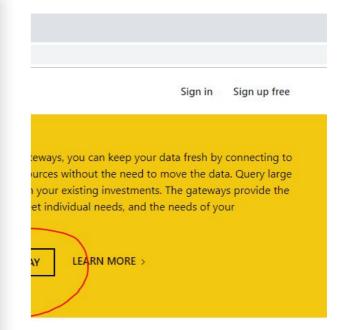
On-premises data gateway (personal mode)

Cloud services it works with	Power BI, PowerApps, Azure Logic Apps, Microsoft Flow	Power BI
Serves multiple users with access control per data source		
Runs as an app for users who aren't administrators on the computer		
Runs as a single user with your credentials		•
Import data and set up scheduled refresh	•	1.
Support for DirectQuery to SQL Server, Oracle, Teradata	•	
Support for a live connection to Analysis Services	•	
Monitoring and auditing for gateway and data sources	Coming soon	



Installation







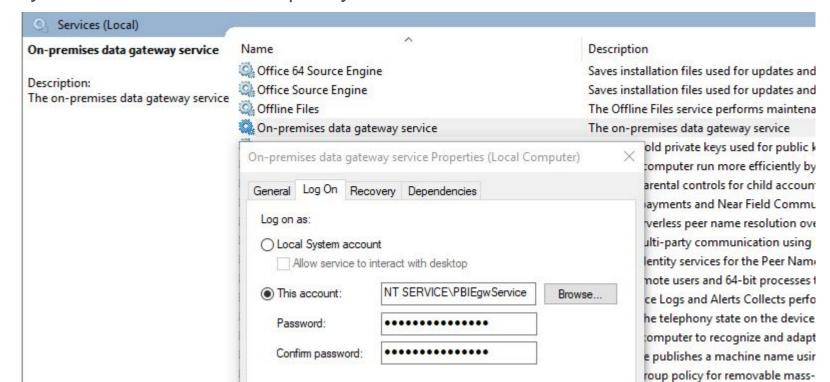
Secured access to data

Data transfer between Power BI and the gateway is secured through Azure Service Bus. Credentials provided by gateway administrators are encrypted to help protect your information in the cloud and only decrypted on the gateway machine.



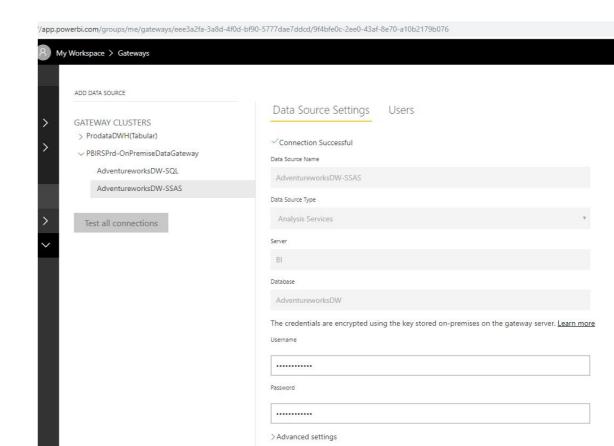
The On-premise Gateway Service Account

- Only handles connection to cloud and service bus (Does not need rights to any data sources)
- Connects to internet via computer account.
- Recommendation
 - Use default unless very locked down / strict proxy server



The Cloud Gateway Service

- Gateway Installation creates Cloud Gateway
- You have to add Data Sources
- Each Data Source has
 - Credentials are used to connect
 - Credentials must have query access



Cloud Gateway Demo



SSO Identity for Models

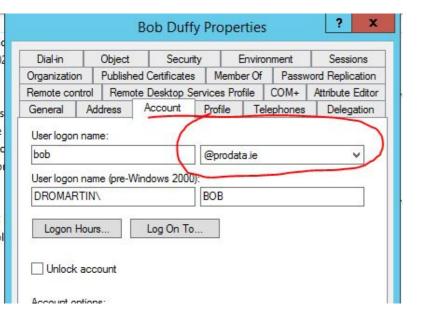
- Only supported on SSAS
- In Azure Identity is via UPN in Azure Active Directory
- Gateway uses impersonation to send UPN to data source
- Most common Error is below (UPN Mapping)

Audit Login	
Error	The following system error occurred: The user name or password is incorrect.
Audit Logout	



- C:\WINDOWS\system32>whoami /upn bob@prodata.ie
- C:\WINDOWS\system32>

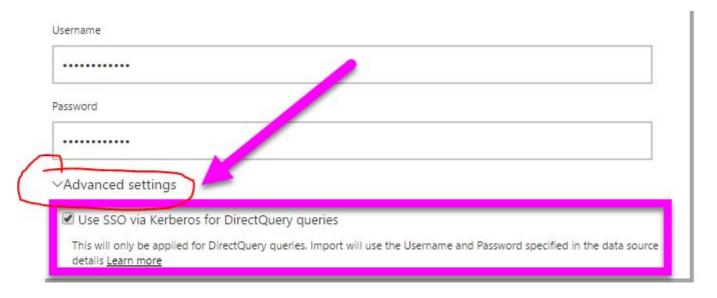
- Azure AAD UPN Must match On-premise UPN
- DirSync matches usernames and UPNs
- Eg <u>bob@prodata.ie</u>
- What if it doesn't?
 - UPN Mapping feature in cloud gateway settings
 - Change in Active Directory Controller



Create rules to map user names to Analysis Services server user names or associate custom data with user names. <u>Learn more</u>						
elect the type of rule for thi	is data source					
Effective user names CustomData						
Replace	With					
1 @prodata.ie	@prodata.local					
2 Original name	New name					
Add Delete						
nter user name to see ho	w the mapping rule will change it.					
Original name						
		Test rule				
bob@prodata.ie						
bob@prodata.ie						

SSO Identity for Other Sources

- Direct Query ONLY for SQL and SAP Hana
- Supports using Kerberos to flow identity to data source





Implementing RLS

- First get Identity Working
- Test by using USERPRINCIPLENAME() function in dax.
- Add roles in Model with membership to AD groups or users



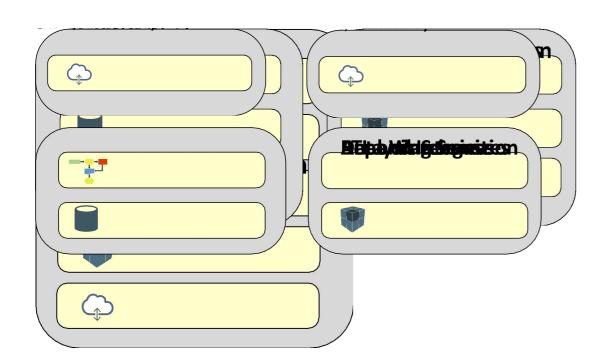


RLS and Data Security



Deployment Options

- Depends On
 - Capacity (Concurrency)
 - High Availability
 - Need for Isolation





Monitoring and Troubleshooting



Firewall and Network Considerations

- Azure service Bus Needs these outbound port ranges
 - 443, 5671, 5672, 9350–9354
- IP Range is as per Microsoft Datacenter IP List
- Recommendations
 - whitelist IP ranges
 - Recommendation: avoid proxy servers
 - Express Route may need routing configuration



Performance and Monitoring

Windows Performance Object On-Premise data gateway

Performance Counter	Usage
# of queries executed /sec	Monitor for high usage to baseline
# of queries failed / sec	If > 1 queries failing.
# of Mashup queries failed / sec	If > 1 refresh failing
# of items in the Service Bus pool	If high query back pressure
Process\Processor%\ Microsoft.PowerBI.EnterpriseGatway	If CPU% is high need consider dedicated box and more/better CPU. *New* Load balancing

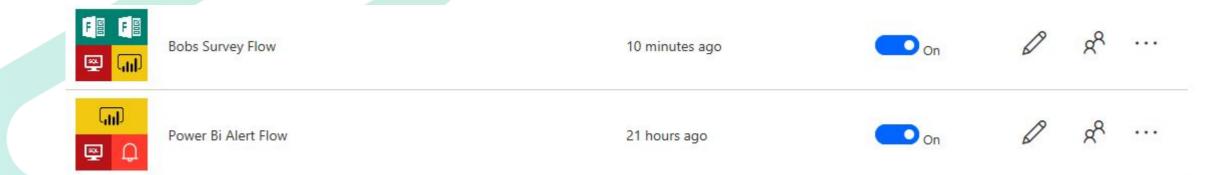


Troubleshooting

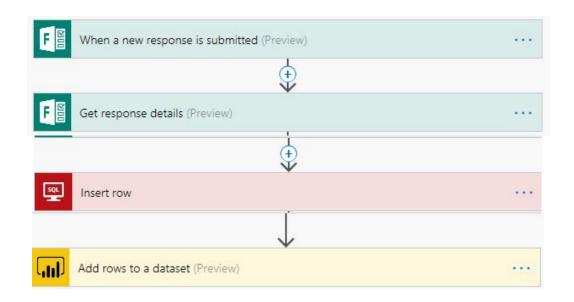
- Performance counters can show if error events
- On-premise gateway has diagnostics mode to generate logs
- SQL Profiler can trap errors with identity
- Fiddler can show network traffic
- Event Logs can show error messages
- Google and CSS Ticket are good options too ;-)



Fun with Power Apps and the Gateway



What's Your Favourite Laptop Survey?







Thank You

Any Q+ A

