



801: Develop for Data Repository with Microsoft Power BI

Presented by: Ian Proffer and Dan Deatricks
Sunday, May 15, 1:00-3:30

2022 MUSE Inspire Conference

May 15-18 Gaylord Texan Resort & Convention Center | Dallas, TX



Welcome back! Come see our education sessions:

Day	Date	Time	Room	Session
Monday	May 16	2:30-3:25	Grapevine 6	1007 - Power BI and DR
Tuesday	May 17	10:00-10:55	Austin 4	1062 - Improve Quality Performance
Wednesday	May 18	10:00-10:55	Austin 4	1057 - Microsoft's Power Platform (Northeastern VT)
		11:00-11:55	Grapevine 6	1097 - OR Utilization Analysis (Northwestern Medical Center)



Our Agenda

- > Power BI considerations for Data Repository
- > Data model concepts and options
- > Using SQL Server data sources
- > Hands-on: build a report
- > Power BI service reports and apps
- > Discussion and wrap-up



Power BI tools for today

Power BI Home

Search

Good morning, Ian

Find and share actionable insights to make data-driven decisions

+ New report

Favorites + frequents

COVID New Cases

ED Patient Volume

Lab Tests

Recent My apps [See all](#)

Name	Type	Opened	Location	Endorsement
Lab Demo 1	Report	now	My workspace	—
My workspace	Workspace	23 hours ago	Workspaces	—
Lab Tests	Report	23 hours ago	My workspace	—
Executive Team	Workspace	4 days ago	Workspaces	—



Then and now



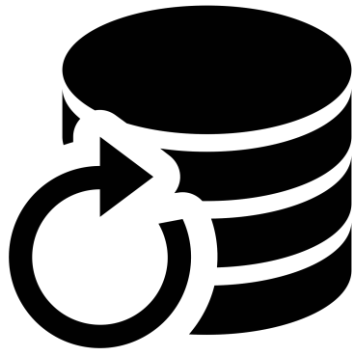
1. Write TSQL stored procedures in Management Studio
2. Develop .rdl (report template) in SSDT/Visual Studio
3. Deploy report from SSDT to Report Server
4. Users view reports from web portal (Report Manager)



1. Import and transform data, develop visualizations and reports with PBI Desktop (or PBI Report Builder for paginated reports)
2. Publish and share reports to the PBI service (cloud) OR to PBI Report Server (local/on-premises)
3. Users view reports from PBI service, mobile device, or on-premise PBI Server

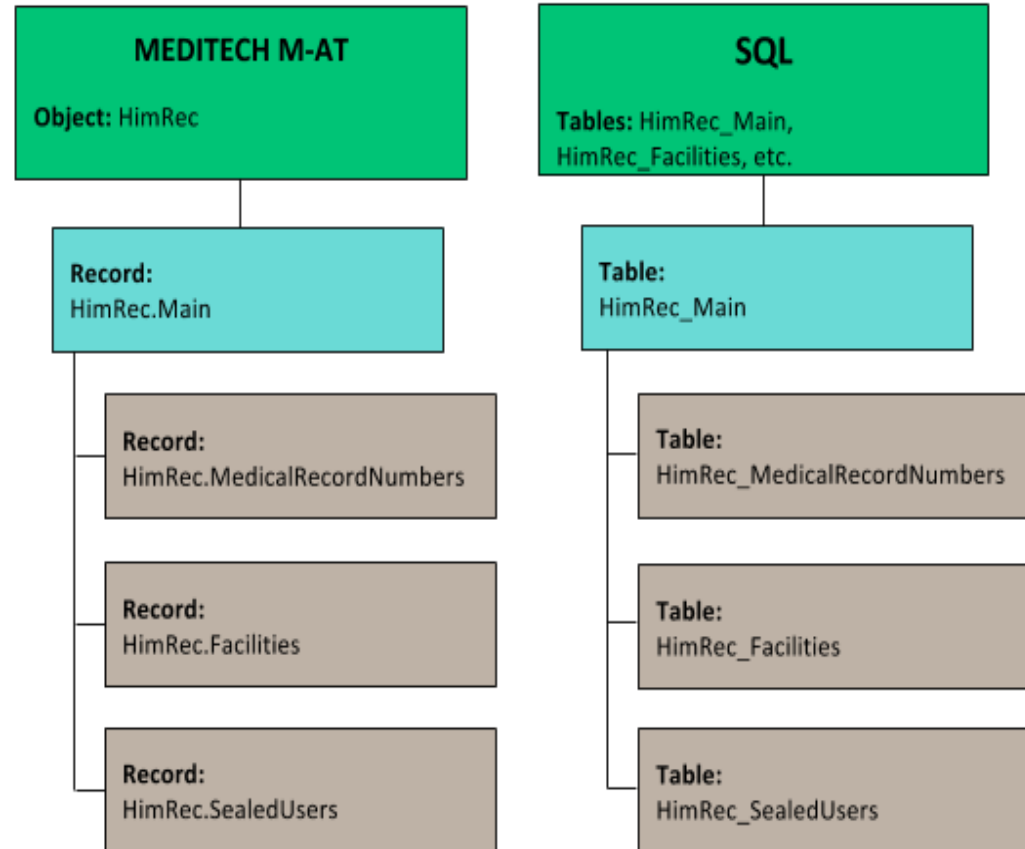


Using Power BI with DR



Review of DR design

- > Power BI expects relational data sources to be normalized - the DR is not.
- > The DR table schema is hierarchical like MT and lacks foreign keys, making it challenging for report development and data model design.
- > The sheer number of tables is also a problem.





Data
Repository
101

Primary & foreign keys

- > Every table has a single **primary key**, also known as the clustered index. Primary keys are a physical part of the table structure and should never be modified. In DR primary keys are always two or more columns.
- > **PatientID** defines patient-level data in HIM (or MRI). This internal ID is the equivalent of EMR Number (or Unit Number in NPR).
- > **VisitID** is likely the most important field in the DR. This internal ID defines visit-level data and is represented by the Account Number.
- > VisitID is a foreign key in many clinical modules (ITS, LAB, PHA and OM) and allows clinical activity (tests, orders, etc.) to be joined to the patient account.
- > Foreign keys are only identified in DR by column naming conventions:
 - > PatientID, VisitID, etc.
 - > Location_MisLocID, Facility_MisFacID, etc.



A typical example

SELECT

```
HRM.Name AS PatientName,  
HRMRN.PrefixMedicalRecordNumber AS MRN,  
RAM.AccountNumber,  
PR.RxNumber,  
PR.Prescription,  
PRA.AdministrationSeqID,  
PRA.AdministrationDateTime
```

FROM

```
trainfdb.dbo.RegAcct_Main RAM  
INNER JOIN trainfdb.dbo.HimRec_Main HRM  
ON RAM.SourceID = HRM.SourceID  
AND RAM.PatientID = HRM.PatientID  
INNER JOIN trainfdb.dbo.HimRec_MedicalRecordNumbers HRMRN  
ON HRM.SourceID = HRMRN.SourceID  
AND HRM.PatientID = HRMRN.PatientID  
INNER JOIN trainndb.dbo.PhaRx PR  
ON RAM.SourceID = PR.SourceID  
AND RAM.VisitID = PR.VisitID  
INNER JOIN trainndb.dbo.PhaRxAdministrations PRA  
ON PR.SourceID = PRA.SourceID  
AND PR.PrescriptionID = PRA.PrescriptionID
```

PatientName	MRN	AccountNumber	RxNumber	Prescription	AdministrationSeqID	AdministrationDateTime
Test,Abbie M	M000000015	V00000005272	0000264	ACETAMINOPHEN 325 MG TAB	1	2018-05-02 08:09:00.000
Test,Abbie M	M000000015	V00000005272	0000264	ACETAMINOPHEN 325 MG TAB	2	2018-05-02 08:13:00.000
MINTTEST,MEREDITH A	M000000025	V00000005314	0000265	MORPHINE 5 MG/ML VIAL	1	2018-05-02 08:09:00.000
MINTTEST,MEREDITH A	M000000025	V00000005322	0000266	SODIUM CHL 0.9% 1,000 ML	1	2018-05-02 08:05:00.000
Testing,Meg O	M000000002	V00000005330	0000267	TETANUS/DIPHThERIA TOXOID 0.5 ML VIAL	1	2018-05-02 08:10:00.000
TEST,SUSAN L	M000000074	V00000006197	0000280	ERYTHROMYCIN OPHTH OINT NEON	1	2018-05-03 14:51:00.000
STest,Hayley	M000000014	V00000006213	0000281	HEPATITIS B PEDI VACCINE 0.5 ML VIAL	1	2018-05-03 14:53:00.000
FRIED,CHICKEN	M000000156	V00000006247	0000282	PHYTONADIONE neonatal 1 MG/0.5 ML AMP	1	2018-05-03 14:51:00.000
FRIED,CHICKEN	M000000156	V00000006254	0000283	TETANUS-DIPH-ACELL PERTUSS AD 0.5 ML SYR	1	2018-05-03 14:52:00.000
FRIED,CHICKEN	M000000156	V00000006288	0000284	INFLUENZA VIRUS VACCIN 0.5 ML INJECT	1	2018-05-03 15:10:00.000
FRIED,CHICKEN	M000000156	V00000006312	0000285	GABAPENTIN 300 MG CAP	1	2018-05-04 09:28:00.000
test,meghan	M000000201	V00000006320	0000286	ceFAZolin Piggyback 1 GM/50 ML PIGGYBACK	1	2018-05-04 09:29:00.000
TEST,Snowkitty T	M000000200	V00000006338	0000287	CELECOXIB 200 MG CAP	1	2018-05-04 09:27:00.000

Considerations for DR & PBI

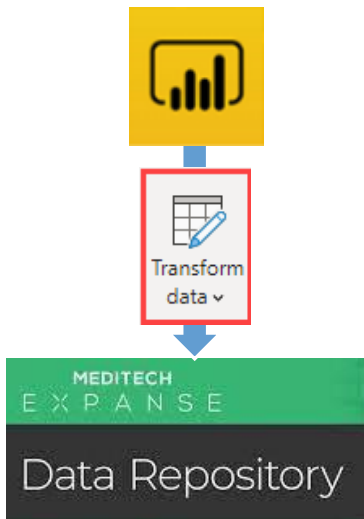


- > Connectivity:
 - > Import or DirectQuery?
- > Data model:
 - > star schema or...something else?
- > SQL coding:
 - > views, stored procedures, or embedded expressions?
- > Back-end stuff:
 - > Will need on-premises data gateway to connect to DR server
 - > How often will data sources need to be refreshed?

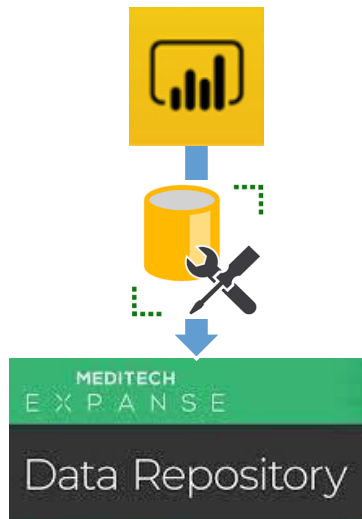
Accessing DR data with Power BI

How you use Power BI with DR depends on the developer's experience with DR and SQL Server.

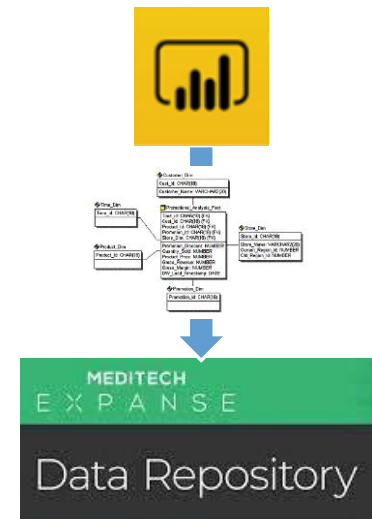
Direct to DR tables
(**Not recommended**)



Via SQL object (**Yes**)



Via data model (**Yes**)



Getting data from SQL Server

Import



- > Data cached on desktop and in Power BI service
- > 1 GB limit for non-premium
- > Data is compressed for efficiency
- > Full use of DAX (data access expressions) function library
- > Data sources require periodic refresh

DirectQuery



- > Always uses current data
- > Scalable, no 1GB limitation
- > Significantly slower than data import mode
- > Cannot combine data in Power Query
- > Many DAX functions unavailable

Using SQL programming objects



> Views (i.e., virtual tables)

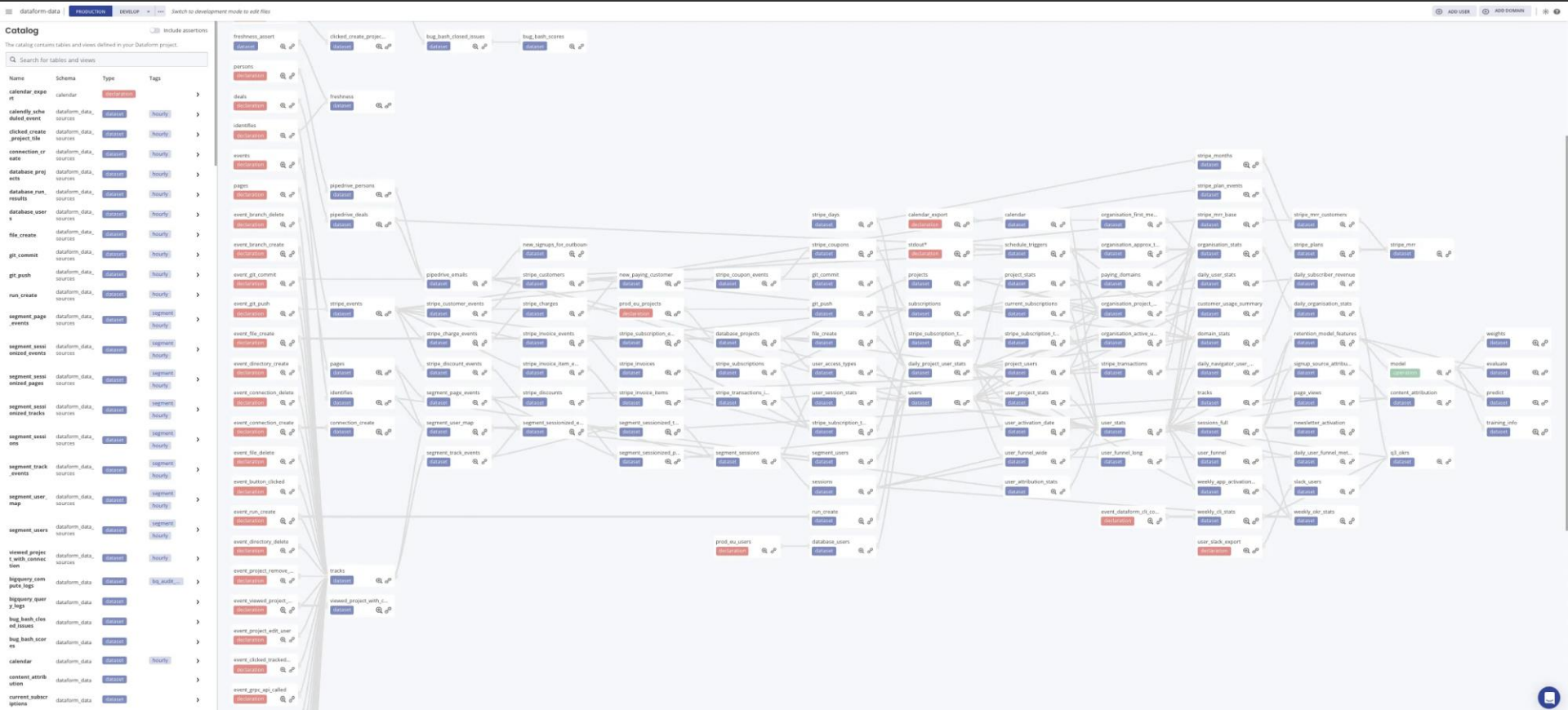


> Stored procedures

```
SELECT
    Name,
    AccountNumber,
    Facility,
    Location,
FROM AdmVisits|
```

> Embedded queries

Data models



Easy, right?




Build your “model” with SQL code

```
SELECT
    RAM.AccountNumber
    ,HRM.Name
    ,HRA.City
    ,HRM.Sex
    ,HRM.Birthdate
    ,MLM.Name AS Location
    ,RAM.AdmitDateTime
    ,RAM.RegistrationStatus
    ,RAM.ArrivalDateTime
    ,RAM.ServiceDateTime
    ,AAD.DiagnosisUrnID
    ,AAD.DiagnosisCode_MisDxID
    ,AAD.DiagnosisName
    ,AAD.DiagnosisSource
FROM
    trainfdb.dbo.RegAcct_Main RAM
INNER JOIN trainfdb.dbo.HimRec_Main HRM
    ON RAM.SourceID = HRM.SourceID
    AND RAM.PatientID = HRM.PatientID
INNER JOIN trainfdb.dbo.HimRec_Address HRA
    ON HRM.SourceID = HRA.SourceID
    AND HRM.PatientID = HRA.PatientID
INNER JOIN trainfdb.dbo.AbsAcct_Diagnoses AAD
    ON RAM.SourceID = AAD.SourceID
    AND RAM.VisitID = AAD.VisitID
INNER JOIN trainfdb.dbo.MisLoc_Main MLM
    ON RAM.SourceID = MLM.SourceID
    AND RAM.Location_MisLocID = MLM.MisLocID
WHERE
    RAM.RegistrationType_MisRegTypeID = 'IN'

ORDER BY
    RAM.VisitID,
    AAD.DiagnosisUrnID
```



A blurred office desk with a laptop, a mug, and glasses. The background is out of focus, showing a person working at a desk. The foreground shows a laptop, a white mug, and a pair of glasses resting on a document.

Demo: Connecting to SQL Server

Questions and discussion



- > About data models, Data Repository, etc?

Let's build a report

Hands-on with Power BI Desktop
Build a [BAR Balance Report](#)

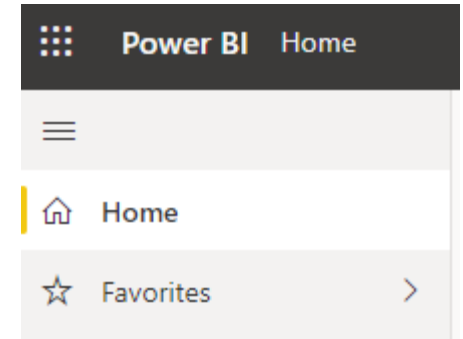


Time check



Power BI online - user experience

- > Workspaces
 - > share the ownership and management of dashboards, reports, and datasets
 - > Use roles to determine permissions (manage, edit, view)
- > Apps
 - > Package related workspace content (dashboards, reports, and datasets)
 - > Can use workspace permissions or be different
- > Dashboards
 - > Single-page canvas of tiles used to “tell the story”



Power BI Workspace

The screenshot displays the Power BI workspace interface. At the top, the header shows "Power BI" and "Power BI Demo" on the left, and a search bar on the right. A left-hand navigation pane contains icons for Home, Favorites, Recent, Create, Datasets, Goals, Apps, Shared with me, Deployment pipelines, Learn, Workspaces, and the current workspace "Power BI Demo". The main content area shows the workspace name "Power BI Demo" with a description "For demo reports and training." Below this are options to "New" or "Create a pipeline", and a secondary navigation bar with "View", "Filters", "Settings", "Access", and another search bar. The main content area is divided into tabs: "All", "Content" (which is selected and underlined), and "Datasets + dataflows". A table lists the reports in the workspace:

	Name	Type	Owner	Refreshed
	Anesthesia Procedures	Report	Power BI Demo	12/22/21, 3:44:47 PM
	COVID New Cases	Report	Power BI Demo	12/22/21, 9:02:24 AM
	ED Patient Volume	Report	Power BI Demo	12/22/21, 9:08:23 AM
	Lab Tests	Report	Power BI Demo	1/27/22, 3:30:35 PM



Power BI Apps

- Power BI Apps
- Home
- Favorites
- Recent
- Create
- Datasets
- Goals
- Apps**
- Shared with me
- Deployment pipelines
- Learn
- Workspaces
- My workspace
- Get data


Search

Apps

Apps are collections of dashboards and reports in one easy-to-find place.


View Sort

Glen D'Abate ☆
10/4/21, 3:35:47 PM




Financial
Financial Dashboards & Reports

Glen D'Abate ☆
10/4/21, 10:55:41 AM




Clinical
Clinical Dashboards & Reports

Glen D'Abate ☆
9/17/21, 1:52:38 PM












Acmeware [Production]
Acmeware [Production]

Glen D'Abate ☆
9/17/21, 2:09:48 PM

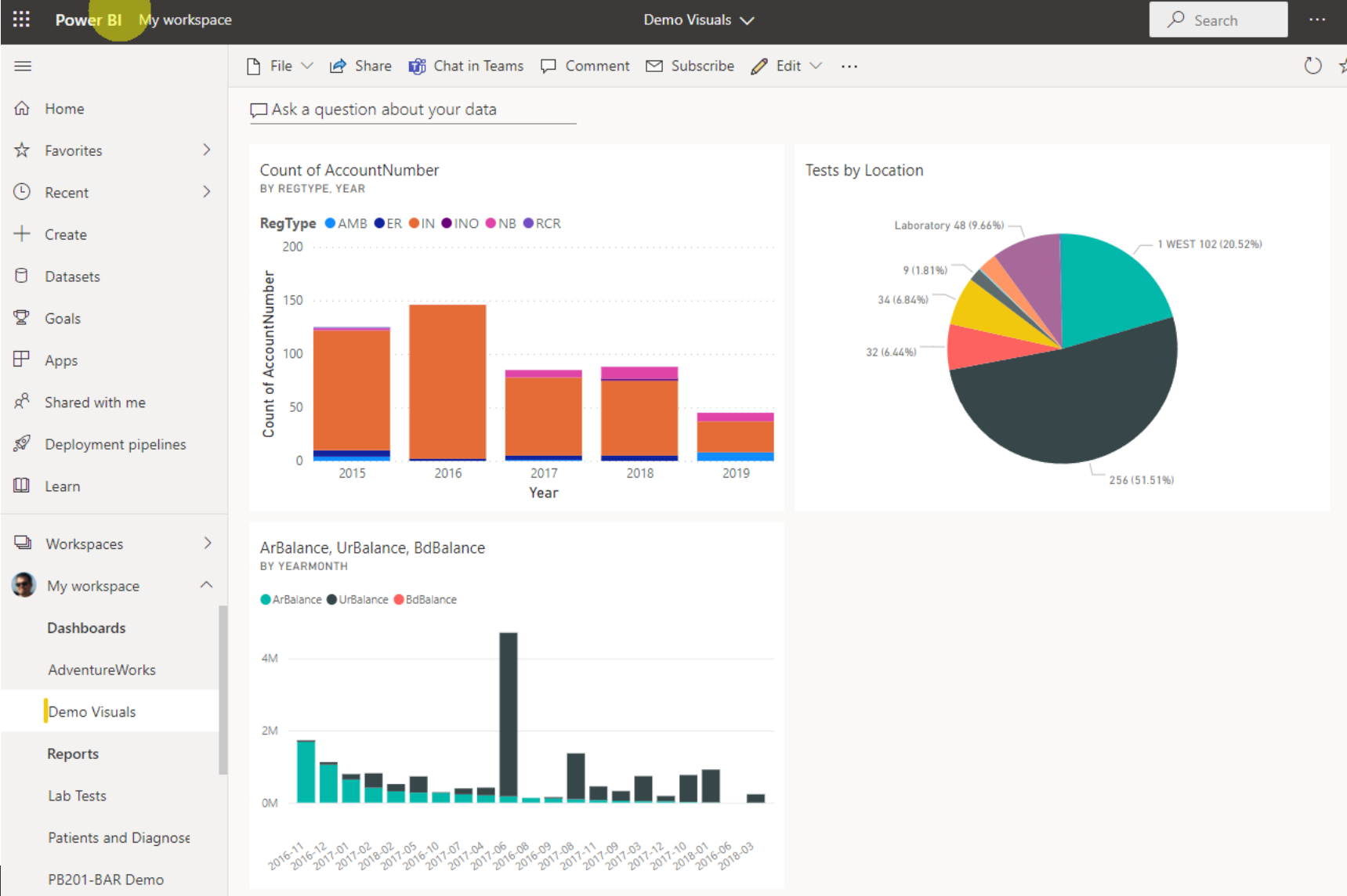


Acmeware [Test]
Acmeware [Test]

Glen D'Abate ☆

-  **Save**
Save this report
-  **Save as**
Save a copy of this report
-  **Print**
Print current page
-  **Embed**
Securely embed this report in a website or portal
-  **Embed in SharePoint Online**
Get a link to securely embed this report in a SharePoint page
-  **Publish to web**
Embed this report for public access by anyone on the Internet
-  **Export to PowerPoint**
Export this report as a PowerPoint presentation
-  **Export to PDF**
Export this report to a PDF file
-  **Download report (Preview)**
Download a .pbix copy

Power BI Dashboard



Power BI online – admin notes

- > Refreshing datasets
- > Gateways
- > The deployment pipeline



Refreshing datasets

General Alerts Subscriptions Dashboards **Datasets** Workbooks

- ▶ Gateway connection
- ▶ Data source credentials
- ▶ Parameters
- ▶ Scheduled refresh

Keep your data up to date

On

Refresh frequency

Daily

Time zone

(UTC-05:00) Eastern Time (US and C...

Time

8 00 AM

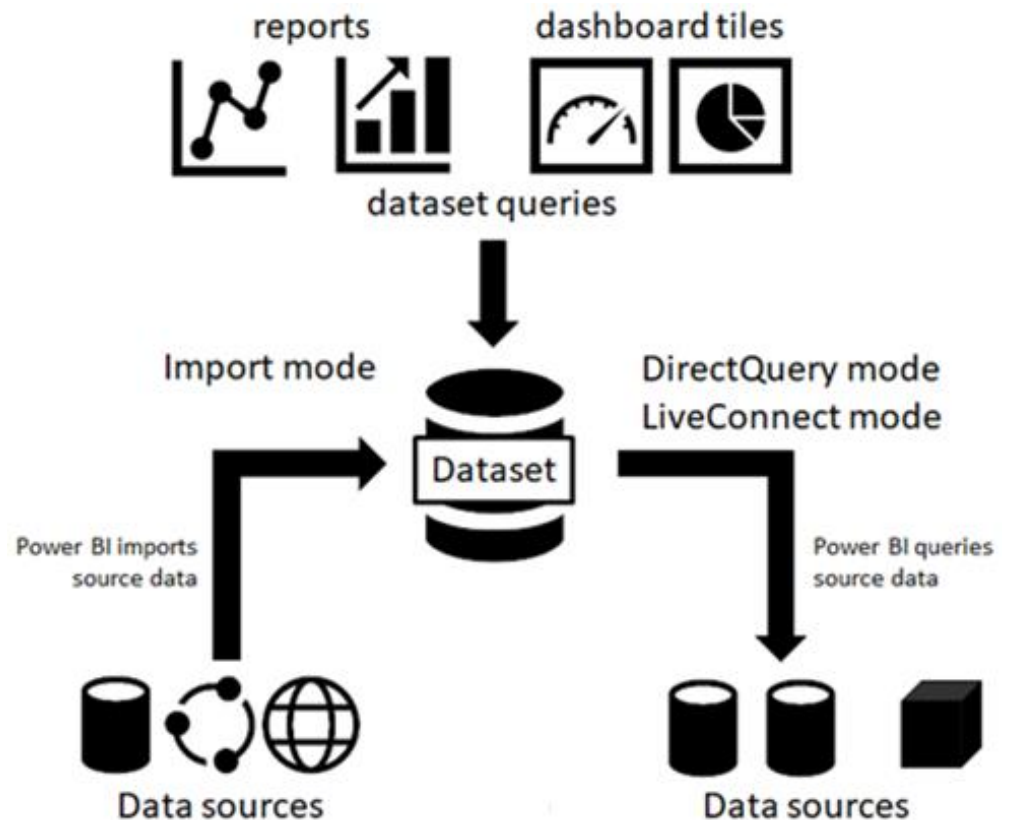
[Add another time](#)

Send refresh failure notifications to

Dataset owner

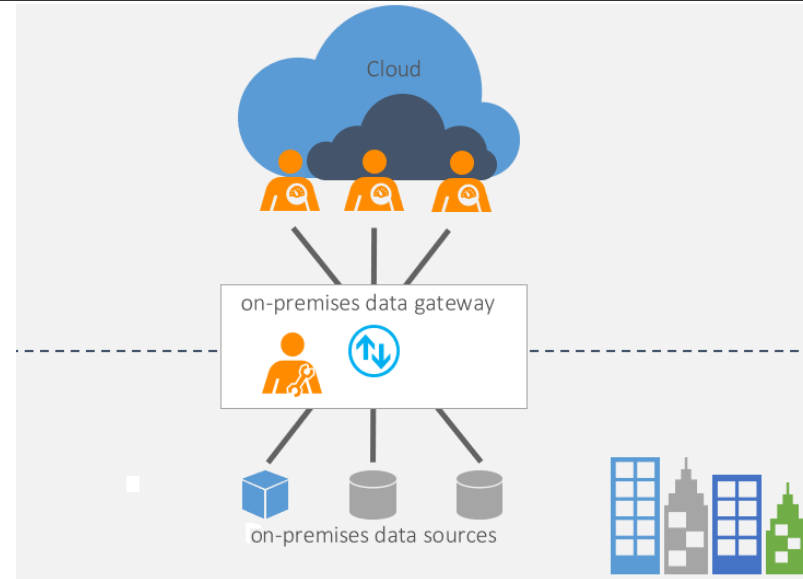
These contacts:

Enter email addresses



Power BI Service access to the DR

- > Power BI can connect to many local and cloud-based databases and online services, from SQL Server to Google Analytics and Salesforce
- > Access to DR on-premises or in a private cloud (e.g. CloudWave) requires Power BI Gateway
- > Power BI Gateway is installed on your network allowing access to the DR



Gateway connection

To use a data gateway, make sure the computer is online and the data source is added in [Manage Gateways](#). If you're using an On-premises data gateway (standard mode), please select the corresponding data sources and then click apply.

Use an On-premises or VNet data gateway

On

Gateway	Department	Contact information	Status	Actions
<input checked="" type="radio"/> Personal Gateway			✔ Running on GDABATE-DT2	
<input type="radio"/> GDABATE-DT Gate...		gdabate@acmeware.c...	✔ Running on GDABATE-DT, select all datasources to use	



Using the deployment pipeline

The screenshot displays the Microsoft Power BI Deployment Pipelines interface. The top navigation bar includes the Power BI logo, the text "Power BI Deployment pipelines", a search bar, and a user profile icon. A left-hand navigation pane lists various options: Home, Favorites, Recent, Create, Datasets, Goals, Apps, Shared with me, Deployment pipelines (highlighted), Learn, Workspaces, and My workspace. The main content area shows a deployment pipeline for "AcmeWareDemo". The pipeline consists of three stages: Development, Test, and Production. Each stage contains a card for the "AcmeWare" dataset. The Development stage has a "Deploy" button, while the Test and Production stages have "Update app" buttons. The pipeline is shown as a sequence of steps connected by arrows, with green checkmarks indicating successful transitions between stages. The Production stage shows a deployment date of 03/09/2021. The interface also includes an "Access" and "Settings" menu in the top right corner.

Power BI Deployment pipelines

AcmeWareDemo AcmeWareDemo

Search Access Settings

Development Test Production

AcmeWare [Development] AcmeWare AcmeWare

Deployed: 03/09/2021 Deployed: 03/09/2021

StaffHoursBy... StaffHoursBy... StaffHoursByCategory StaffHoursByCategory

Deploy Update app



Open discussion

- > What questions do you have?



Microsoft Power BI



Keep in touch!

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Our website: <https://acmeware.com>