TDD: Power BI Model Documenter

Table of Contents

- Table of Contents
- INTRODUCTION
  - Overview
  - Features Summary
- REPORT PAGES
  - Info
  - Tables
  - Columns
  - Measures
  - PQ Parameters
  - Relationships
  - Calculation groups
  - Partitions and policies
  - Field parameters
  - Security
- MODEL DOC - REFRESH SOLUTION STEPS
  - Process
  - Blank File Connection
  - Screenshots
- MODEL DOC - INSTALLATION
  - A) Run the installer
  - B) Update 2 files using VA HCDW customizations
- CUSTOMIZATION
  - Tables Source Connection
- APPENDIX
  - Links

Department of Veterans Affairs September 2024, Version 2.0

Human Capital Data Warehouse Office of Information Technology (OIT)

TITLE

Power BI Model Documenter

Version History

Date	Version	Description	Author
18 Oct 2023	1.0	Initial document	Brian Lofton
30 Sep 2024	2.0	Update screenshots to include new version updates.	Brian Lofton

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INTRODUCTION

The article describes the features of the Model Documentation Report, which is delivered for each HCDW PBI published report. Also included is how HCDW developers can install the plug-in and document the model in PBI Service.

Overview

Why create model documentation?

The Model Documenter report template produces essential information in very effective format. Creating model documentation is especially important if we want to share the dataset for reuse, or need to review or explain how the data is sourced and calculated in the report.

How to install Model Documenter?

To install the Power BI Model documenter, you can run an easy next-next-finish installer (Model documenter v2.0.0 and up). In the older version (v1.0) the installation required manually adding files to your program files directory. In order to install the tool, you must have local admin permissions on your device. Without these permissions, it is not possible to install or run the Model Documenter.

Features Summary

The Power BI Model Documenter is a plug-in to Power BI that quickly and effectively documents the report data model.

Deploying the report to PBI Service makes it easy to share and analyze the data model documentation for collaborating with developers and managers of the data.

Some HCDW Team customizations have been implemented.

- Identify all data sources and connection strings in the report (Redshift, Excel, CSV, manual data, etc.)
- Table row counts in the model tables
- Columns analysis (datatype, calculations, cardinality/unique rows)
- Measures and KPI's (calculation expressions, descriptions)
- Security roles are documented
- Table Relationships– from table, to table, type (1:M, 1:1, etc.)
- Shows comments/descriptions for– Measures, Tables, Columns, Security Roles (if the developer has added a comment)
- Copy code scripts to notepad, for review and analysis
- It takes about 5 minutes to Create, Save, and Deploy the report documentation

HCDW TDD - PBI Workspace

All reports for Model Documentation will be named with pre-fix, "**MODEL DOC -** ", and are deployed in the workspace "**HCDW TDD Models**".

Link	Resource	Description
HCDW TDD Models	Power BI workspace	The Model Documentation reports will be published & analyzed in this PBI Workspace, "HCDW TDD Models". This workspace contains other TDD report as well (such as "Column Cleaner" and "Field Finder"). All reports for Model Documentation will be named with pre-fix, "**MODEL DOC -** ".
MODEL DOC - VA Time to Hire Dashboard	Power BI report	Example documentation, MODEL DOC - VA Time to Hire Dashboard. This is one example of model documentation report created by this template plugin.

REPORT PAGES

Different Report Examples

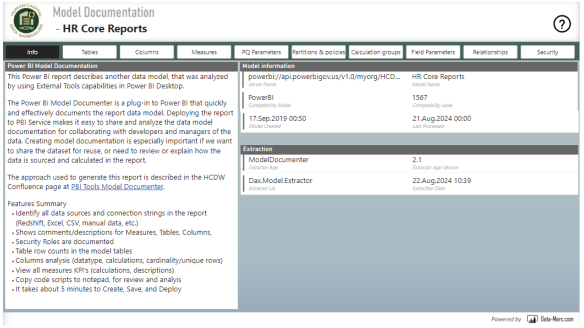
Please note:

- To demonstrate documentation capabilities, different report examples are used in the screenshots below
- HCDW Template examples are included, as well as the Default Template examples

Info

The info page includes all generic information about the data model, such as ***compatibility mode and level***, but also when the data model was created and when it was ***last processed***. From here, you can navigate through the report and find all other information about the data model. Also, on top it shows the ***name of the model*** and the ***API path***. NOTE: If the Model Documenter was run from Power BI Desktop files instead of PBI Service model, you will see a GUID shown, instead of the model name.

HCDW TEMPLATE



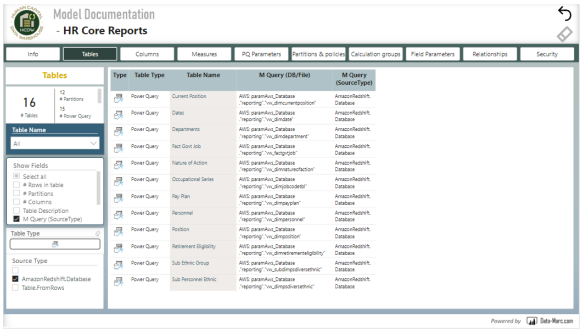
DEFAULT TEMPLATE

blocked URL

Tables

The Tables page includes information about all tables in the data model. Use the "Show Fields" options to customize the metrics fields to be displayed in the table-- ***# Rows, # Columns, Table Description, Query Source Type, Query DB/File***.

HCDW TEMPLATE



Source Type will tell if the data comes from CSV/ Excel/ SharePoint/ Databases sources. ***DB File*** says the name of the file pulled from the source. ***Table Description*** provides functional description of the table describing where it came from. You can also choose to see relevant information like the ***storage mode*** (Import / Direct Query / Dual), as well as the ***number of rows***.

Also the ***table type*** describes if the table is generated using Data Analysis Expression (DAX), M (Power Query), or using an Incremental Refresh policy. While hovering over a table, the tooltip will show up, containing information about the specific table-- Table state, La st refresh time, Last modified time. By selecting a single table name, you can active the following drill through options-- Measures (button 1), Partition (button 2), or Columns (button 3).

DEFAULT TEMPLATE

blocked URL

Columns

The columns page shows an overview of all columns in the data model, and to which table they belong. Additional information is shown such as the ***colum n cardinality*** (number of unique values in the column), ***sort order*** (if defined), ***f ormat string*** (if specified). Also there is an indicator when a column is generated using Data Analysis Expression (DAX).

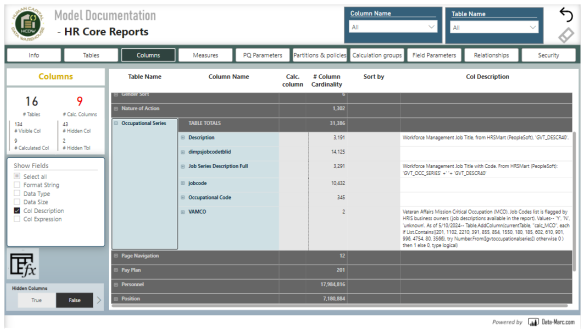
Use the "Show Fields" options to explore the information and customize the metrics fields to be displayed in the table-- ***Format String, Data Type, Data Size, Col Description, Col Expression***. The ***Col Description*** provides functional description of the column describing where it came from or how the data field is derived.

To export the full table dataset and furth er analyze the columns/values, we use DAX Studio (Read More). Simply copy /paste the name table from documentation, enter the sample script in DAX Studio, and run the script.

DAX Studio (export dataset)

`// All data in a table`
`EVALUATE <Table Name>`
 	
`// Filtered data in a table`
`EVALUATE`
`CALCULATETABLE ( Customer, Customer[City] = "Redmond" )`

HCDW TEMPLATE



DEFAULT TEMPLATE

blocked URL

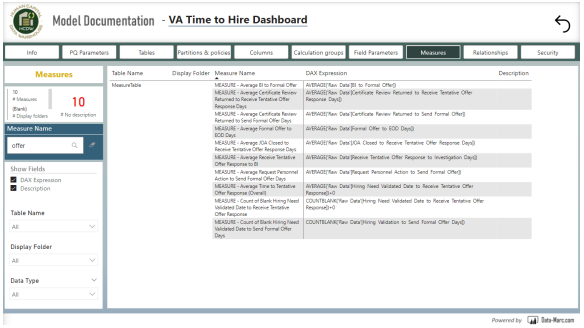
Measures

Measure page includes all details about the ***DAX measures*** in the data model. The overview directly shows the table where the measures are located, ***measure names*** and ***descriptions*** (if added by the developer).

The measure page allows you to show /hide fields such as ***DAX expression*** or ***Description***, allowing you to customize the page for the best viewing experience you need. There is also a "search option", simply type in a string and it will instantly filter to any matching measure names.

Adding functional descriptions are key to your elements created in Power BI, especially if you share the dataset for self-service purposes. Read more about the importance of descriptions in this blog post.

HCDW TEMPLATE



DEFAULT TEMPLATE

blocked URL

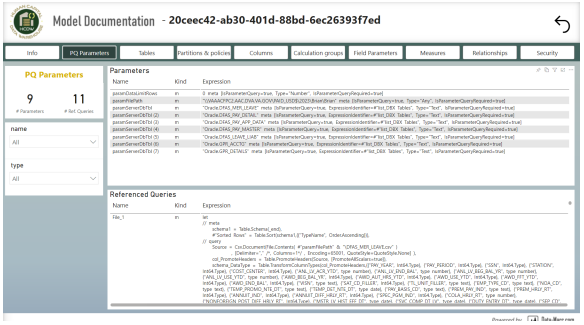
PQ Parameters

Introduced starting Model Documenter v2.1.0 On the parameter page, you will find two things, being Power Query parameters and referenced queries.

For Parameters, you will see the ***current value of these parameters*** and the expression which tells you whether the parameter is ***required*** and the ***value type***. In case you have a list of options provided in the parameter setting, these will not directly show.

For ***Referenced queries***, you will see all queries you build in Power Query, but did not load to your model. These queries are listed and show the M-query expression.

HCDW TEMPLATE



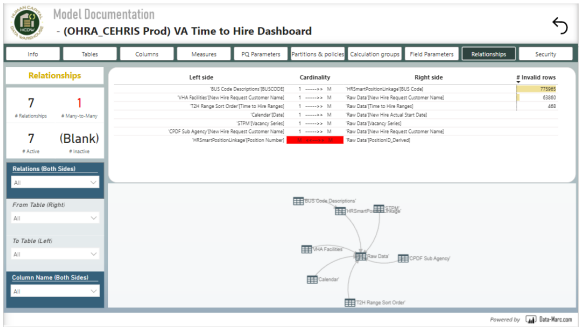
DEFAULT TEMPLATE

blocked URL

Relationships

The relationships view gives an overview of all data relationships in the semantic model (equivalent to SQL Join in relation database terms). Use the filters for ***Relations Both*** (table names on either side of the relationship), and ***Column Names Both*** (see where a particular column is used in the model relations). There are two main visuals on the page: 1) On Top, a list of all relationships with the cardinality, 2) On Bottom, a visual overview of all relationships in the model.

HCDW TEMPLATE



DEFAULT TEMPLATE

blocked URL

There is a reported metrics for ***invalid rows count***; This indicator shows is no matching value for rows in relationships. ***In-active relationships*** will be displayed in a grey font, where all other relationships are displayed like all other information. In case you have relationships with ***cross filter direction set to both***, or ***many-to-many*** relationships, these relationships are highlighted in red, as these types of relationships can lead to ambiguous data models and/or limited relationships.

If you want to learn semantic model relationships concept, refer to this video: [DAX Tools VertiPaq Analyzer 7 - The Relationships page | SQLBI]().

Calculation groups

Introduced with Model Documenter v2.1.0 All calculation groups in the model, will show in a dedicated page to calculation groups. They will no longer show up in the tables overview, as no details were shown there. In this new dedicated page, you will see all calculation groups including the calculation items, descriptions and item expressions.

By selecting a calculation item, the expression will show on the right-hand side.

HCDW TEMPLATE

<No examples yet>

DEFAULT TEMPLATE

blocked URL

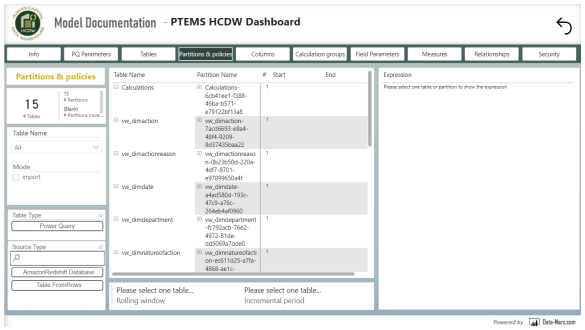
Partitions and policies

Introduced starting Model Documenter v2.1.0 On the partitions page, you will find more information about the partitions associated to the tables in the model. You can access this page via drill through from the table page, or directly via the page navigation. All tables by default have one partition, which will show as the table name concatenated with a GUID. In case you specified Incremental Refresh, your model will show all the different partitions generated.

Please know that the ***partitions from Incremental Refresh*** are only generated in the Power BI Service. In order to visualize the partition information, you must connect using the Analysis Services connector to the XMLA endpoint of your Power BI dataset hosted in any type of Power BI Premium. Once connnected, you can run the Model Documenter from Power BI desktop to get the results out.

By selecting an individual partition, the expression of this partition will show on the right-hand side of the screen. In case of incremental refresh, the bottom of the page shows the rolling window (period of data in the model) and the incremental period (active section that is refreshed).

HCDW TEMPLATE



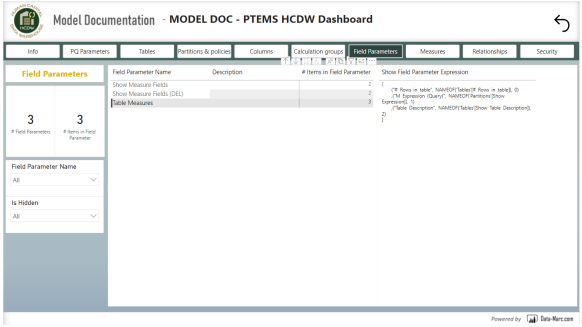
DEFAULT TEMPLATE

blocked URL

Field parameters

HCDW TEMPLATE

Introduced starting Model Documenter v2.1.0 In case you were using Field Parameters in versions of the Model Documenter prior to v2.1.0, running the tool might have caused you issues. Introducing v2.1.0 and onwards, these issues are resolved. In case you are using field parameters, they will now show up in this dedicated page including the descriptions and number of items listed in the field parameter. By selecting a field parameter, the expression will show on the right-hand side.



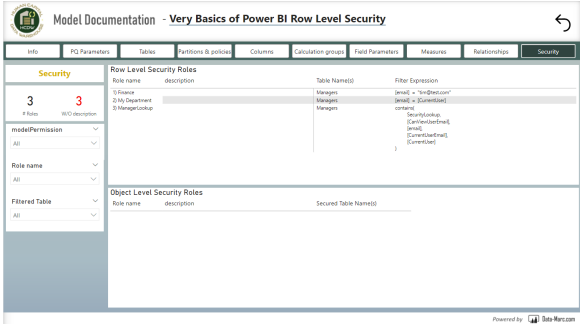
DEFAULT TEMPLATE

blocked URL

HCDW TEMPLATE

Security

The security page shows all security roles applied to the data model. You will see the DAX expression used to filter the table, as well as which table is affected by this. Also, the description of the role is shown. Power BI Desktop does not have a native way of adding descriptions to roles. However, with Tabular Editor you can add descriptions to roles. Please read this blog post to learn how to do this.



DEFAULT TEMPLATE

blocked URL

MODEL DOC - REFRESH SOLUTION STEPS

> **Solution Steps**
>
> The MODEL DOC report solution is created/refreshed by HCDW Developer staff.

Model Documentation cannot be updated directly in the PBI Service, by refreshing the dataset.

PBI Service dataset refresh does not work, because the model documentation is performed on the local computer, by extracting files to local computer during run-time ("C:\Power BI Model Documenter").

To refresh the documentation, use the below instructions on your local developer station

Process

1. Start with new empty PBIX file
2. Create Analysis Services live connection with XMLA endpoint (PBI workspace)
3. Run the Model Documenter (external tools)
4. Save the file (upload first time only)

Blank File Connection

Creating the documentation is just a few clicks

Use a direct connection to existing data model is preferred method for creating documentation.

Using a local file connection information shows local host information, and is not as useful as the model name and workspace information.

Start with new empty PBIX file

- Open a blank PBIX

Create Analysis Services Live connection with XMLA endpoint (PBI workspace)

- PBI Desktop: PBI Ribbon | Get Data | Analysis Services
  - You may see two options and they work the exact same-- "SQL Server Analysis Services" and "Azure Analysis Services"
- Enter the "Server" connection detail prompts:
  - Use the XMLA endpoint for the PBI Workspace that contains the data model.
  - Example: **`powerbi://api.powerbigov.us/v1.0/myorg/HCDW%20Team`**
- Expand the database you wish to document | Choose the "Model" | then "OK"
- In the "Data" pane on the right, you will notice there are now some tables listed from the model

Run the Model Documenter (external tools)

- PBI Desktop: PBI Ribbon | External Tools | Model Documenter
- Some automation will execute
  - A new PBIX file is opened
  - A prompt will appear to enter your credentials
  - Refresh window will appear and will run for 1-2 minutes
  - The model documentation report is created in a file named "Untitled"

Save the file (upload first time only)

- Save the "Untitled" documentation report
  - PBI VC library: All reports will be published & analyzed in this PBI Workspace, "**HCDW TDD Models**"
  - PBI Report name: All reports for Model Documentation will be named with pre-fix, "**MODEL DOC -** ".
  - Example: **MODEL DOC - VA Time to Hire Dashboard**
- Deploy the new documentation report
  - PBI workspace: All reports will be published & analyzed in this PBI Workspace, "**HCDW TDD Models**"

Screenshots

Fig1: Running the Model Documenter plugin

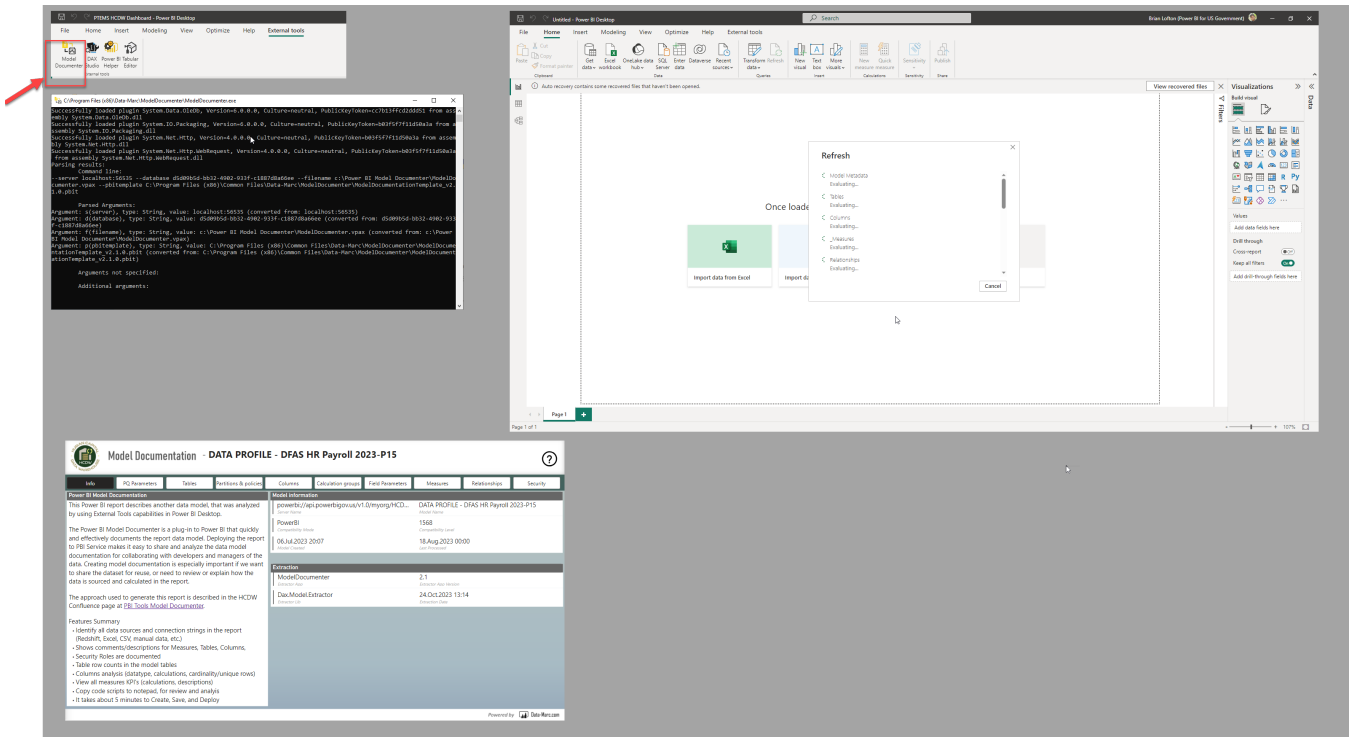


Fig.2: Analysis Services live connection to existing data model

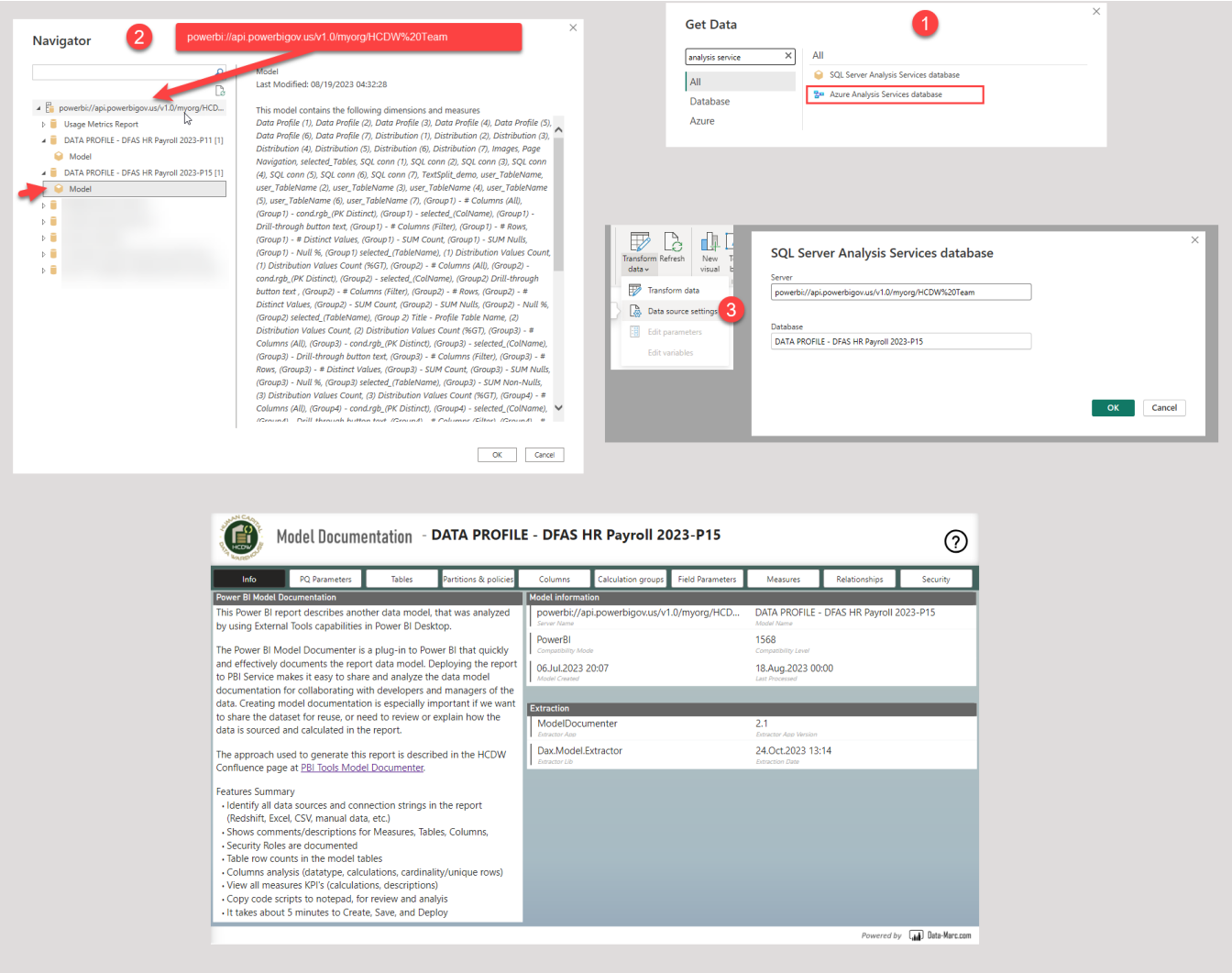
PBI XMLA endpoints

```
        - HCDW Team
powerbi://api.powerbigov.us/v1.0/myorg/HCDW%20Team

- HCDW TDD Models
powerbi://api.powerbigov.us/v1.0/myorg/HCDW%20TDD%20Models

- HCDW Sandbox
powerbi://api.powerbigov.us/v1.0/myorg/HCDW%20Sandbox

- HCDW Payroll [TEST]
powerbi://api.powerbigov.us/v1.0/myorg/HCDW%20Payroll%20%5BTEST%5D
```



MODEL DOC - INSTALLATION

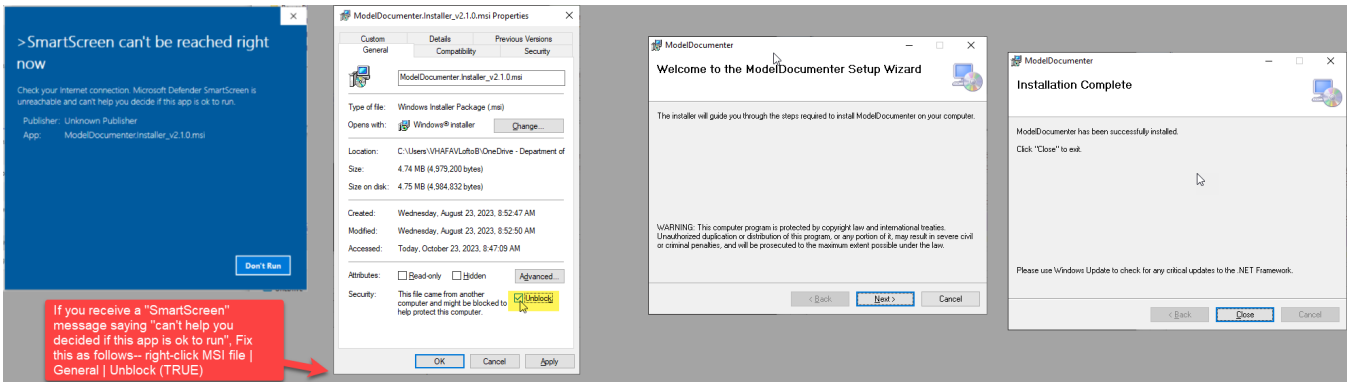
Installation is very simple.

1. Run the installer
2. Updates 2 files using VA HCDW customizations

A) Run the installer

Below is the installer link, and are screenshots for running the MSI.

Link	Source	Description
ModelDocumenter.Installer_v2.1.0	[Doc Library] SharePoint: HCDW PBI Reports | HCDW PBI Tools - Installs	HCDW Team installs folder, installers for approved tools.



B) Update 2 files using VA HCDW customizations

Both files to copy are located in PBI VC document library. To update the files you must enter EP account credentials.

Source Files Directory:
`C:\Users\%username%\Department of Veterans Affairs\Power BI Reports Site - VC HCDW TDD Models\Published Reports`

Copy File:

ModelDocumentationTemplate_v2.1.0_(VAHCDW).pbit

- The changes made give us custom visuals and insights created for our team

Target Directory
`C:\Program Files (x86)\Common Files\Data-Marc\ModelDocumenter`

Copy File:

Data-Marc_ModelDocumenter_v2.1.0.pbitool.json

- The changes made tells the PBI plugin to use the "VAHCDW" template file, instead of the default template file

Target Directory
`C:\Program Files (x86)\Common Files\microsoft shared\Power BI Desktop\External Tools`

CUSTOMIZATION

Tables Source Connection

Two calculations are added, for extracting the "DB/File" and the "Source Connection" information from the query expression. Examples included below.

- DB/File:
  - hcd-dev-redshiftcluster.czcd1vi5pnl6.us-gov-west-1.redshift.amazonaws.com:5439
  - https://dvagov.sharepoint.com/sites/oithcdwpbireports
- Source Connection:
  - AWS: "hcd-dev-db"."datawarehouse"."dimgpracctg"
  - SPxlsx: PBI Data Upload/HCDW Team/DFAS Type Codes.xlsx""

M expression: DF/File and Source Connection

```
            fnDBFile = Table.AddColumn(Source, "DB/File",
        each
        let M_expression = () => [Column1] in
        // AWS REDSHIFT
        let AwsRed_Conn = () => Text.BetweenDelimiters( M_expression(), "AmazonRedshift.Database(", ")" ) in
        let AwsRed_Db = () => Text.AfterDelimiter(AwsRed_Conn(), ",") in
        let AwsRed_Schema = () => Text.BetweenDelimiters( M_expression(), "Source{[Name=", "]" ) in
        let AwsRed_Table = () => Text.BetweenDelimiters( M_expression(), "mySchema{[Name=", "]" ) in
        let calc_AwsRed = () => Text.Combine( List.Select({AwsRed_Db(), AwsRed_Schema(), AwsRed_Table()},
each _<> "" and _ <> null),  ".") in
        let print_AwsRed = () => if (calc_AwsRed() = "") then null else "AWS: "& calc_AwsRed() in
        // SHAREPOINT FILES
        let SharePoint_Conn = () => Text.BetweenDelimiters( M_expression(), "Web.Contents(", ")" ) in
        let SP_filename = () => Text.Replace(Text.AfterDelimiter(SharePoint_Conn(), "/", {2,
RelativePosition.FromEnd}), "%20", " ") in
        let SP_type = () => Text.Select(Text.AfterDelimiter(SharePoint_Conn(), ".", {0, RelativePosition.
FromEnd}), {"a".."z","A".."Z"}) in
        let print_SharePoint = () => if (SP_filename() = "") then null else "SP"& SP_type() & ": "&
SP_filename() in
        //// Final
        print_AwsRed() ?? print_SharePoint()
        //print_AwsRed()
        //SP_type()
        ),
    fn_SourceConn = Table.AddColumn(fnDBFile, "Source Connection",
        each
        let M_expression = () => [Column1] in
        // AWS REDSHIFT
        let AwsRed_Conn = () => Text.BetweenDelimiters( M_expression(), "AmazonRedshift.Database(", ")" ) in
        let AwsRed_Conn2 = () => Text.BeforeDelimiter( AwsRed_Conn(), "," ) in
        let AwsRed_Conn3 = () => Text.Select( AwsRed_Conn2(), {"1".."9","a".."z","A".."Z",":","/",".","-"})
in
        let print_AwsRed = () => if (AwsRed_Conn() = "") then null else AwsRed_Conn3() in
        // SHAREPOINT FILES
        let SharePoint_Conn = () => Text.BetweenDelimiters( M_expression(), "Web.Contents(", ")" ) in
        let SharePoint_Conn2 = () => Text.BeforeDelimiter( SharePoint_Conn(), "/", 4 ) in
        let SharePoint_Conn3 = () => Text.Select( SharePoint_Conn2(), {"a".."z","A".."Z",":","/",".","-"}) in
        let print_SharePoint = () => if (SharePoint_Conn2() = "") then null else SharePoint_Conn3() in
        //// Final
        print_AwsRed() ?? print_SharePoint()
        //print_AwsRed()
        //SP_type()
        ),
```

APPENDIX

Links

Link	Source	Description
TRM Entry: 16445	TRM Approval	PBI Model Documenter is an approved technology in the TRM. Current Version: 2.x
HCDW PBI Tools - Installs	[Doc Library] SharePoint: HCDW PBI Reports	HCDW Team installs folder, installers for approved tools.
marclelijveld / External-Tools-Model-Documentation (Public)	Github Repo	The Github repo includes documentation to learn more about the tool, what an external tool is and a page-by-page explanation of the Model Documenter output. Some HCDW Team customizations have been implemented.