



**Cloud Pak for Data**

**Tutorial – Mortgage**

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Cloud Pak for Data is a single end to end platform for data management, governance and data science analytics. It provides a one stop shop for data scientists, data engineer and data stewards to collaborate on the platform to acquire, govern and extract best insights from the data in the least amount of time.

In this demo, user will use a set of a fictitious mortgage data that available in Db2 database on IBM Bluemix Cloud. User will perform following tasks to predict if a prospective customer may default on their mortgage.

- Create connection from Cloud Pak for Data to Db2 database on cloud
- Discover Db2 assets from Cloud Pak for Data
- Transform the Db2 data on Cloud Pak for Data
- Use analytics dashboard to build visualizations
- Build a simple machine learning model from prediction

## 1. Prerequisites

- Access to an operational Cloud Pak for Data Instance
- Install Git on the machine that you will use for the tutorial.

## 2. Setting up database and sample data

Log in to the cluster where Cloud Pak for Data is deployed or log in to a Linux-based system (RedHat or Ubuntu) that can access the cluster over your network.

From your home directory, clone the tutorial sample files:

```
git clone git@github.com:IBM-ICP4D/ICP4DTutorial.git
```

Change to the tutorials directory:

```
cd ICP4XTutorial/tutorials/
```

The sample data-loading utility, `load_samples.sh`, provides an easy way to host a Db2 server and load it with sample data.

Run the following command to view the list of sample data that is provided in the `load_samples.sh` utility:

```
./load_samples.sh -l
```

Run the following command to load the sample data into a Db2 database:

```
./load_samples.sh -t mortgage-002
```

After the loading process completes, an instance of Db2 is hosted on your cluster as a Docker container.

### 3. Access Credentials

To work through the tutorial, you need access a Db2 database.

#### 3.1. Access credential for Db2 database

For this tutorial you need JDBC connection to access to a Db2 database that hosted locally on Cloud Pak for Data. Following are JDBC connection credential for Db2:

JDBC Host name	<Same IP address as your web console>
Port number	50000
Database name	MORTGAGE
User ID	db2inst1
Password	password
Db2	Version 11.1
JDBC connection string	jdbc:db2://<same IP as Web Console>:50000/MORTGAGE

#### 3.2. Sign in to Cloud Pak for Data web console as Administrator

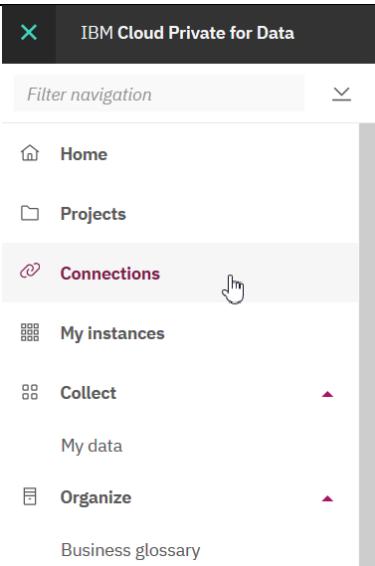
You should have an operational Cloud Pak for Data Instance. Use latest version of Firefox or Google Chrome browser to access the Cloud Pak for Data web console. Starting from here all instruction need to execute on Cloud Pak for Data web console only. You need to login as admin who has administrator privileges.

<a href="#">Sign in</a>  Username <input type="text" value="admin"/> PASSWORD <input type="password" value="*****"/> <input type="button" value="Sign In"/>	<p>Sigh in to the Cloud Pak for Data web console as user 'admin' and password is 'password'.</p>
--	--

## 4. Create Connection

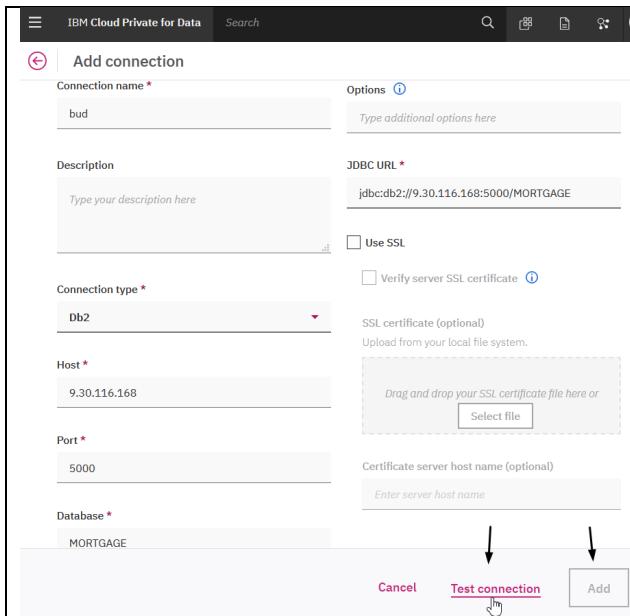
Create a connection to the data source for Db2 database.

### 4.2. Navigate to Connections



On the left pane choose **Connections**. Next, on the **Data Connections** window click on the  icon.

### 4.3. Add connection



Fill out the **Add Connection** information according to the information provided in step ‘2.1. Access credential for DB2. Credential used in following step is just an example.

1. For **Choose connection** use the drop-down menu and select ‘Db2’.
2. Use ‘Bud’ as the **Name**
3. **JDBC URL** is  
‘`jdbc:db2://172.16.171.29:50000/MORTGAGE`’
4. **Username** is ‘`db2inst1`’ and **Password** is ‘`password`’.

Next click on **Test Connection**, once it successful click on **Save Connection**.

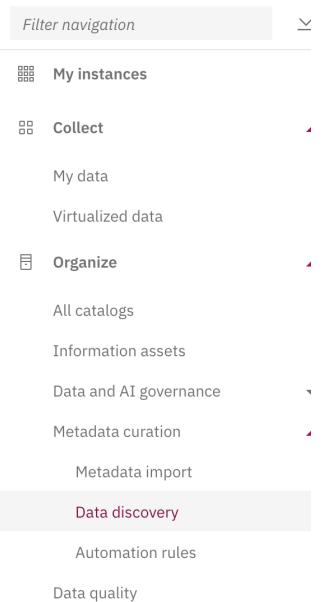


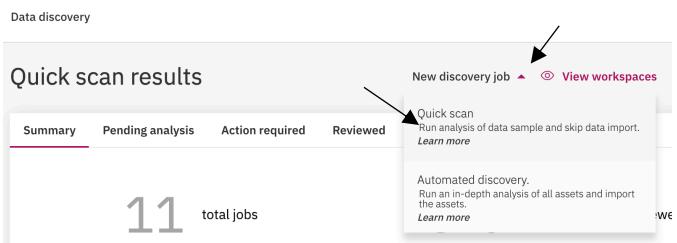
**Success** The test connection was successful. Click Add to save the connection information.

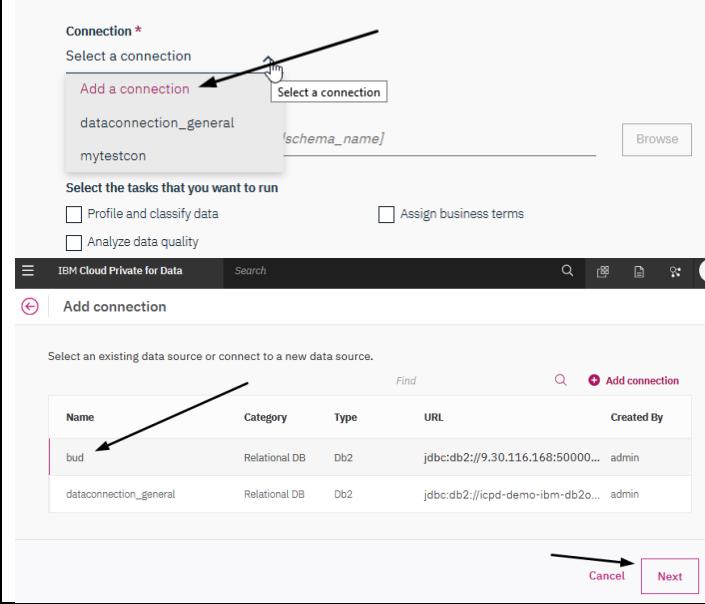
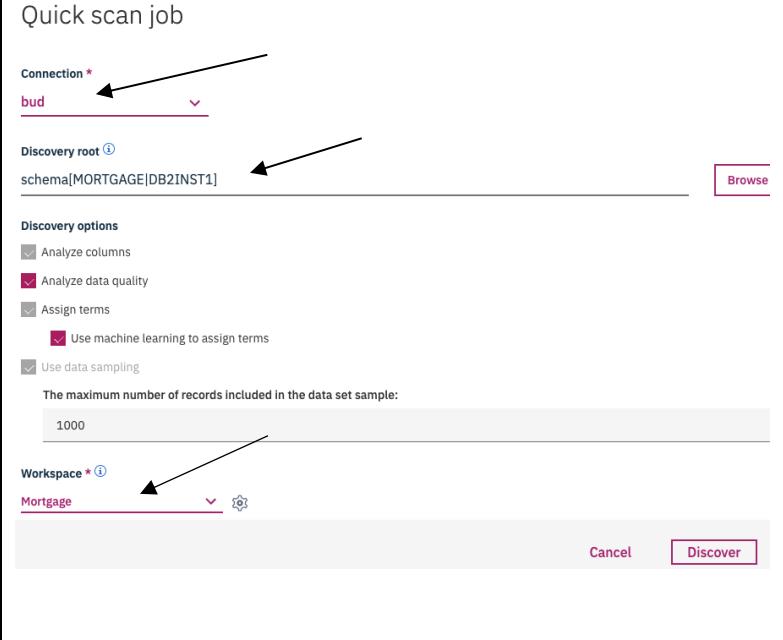
## 5. Discover Assets

Use the data source created above discover all data assets from Db2 database.

### 5.1. Navigate to discover assets

 <b>6.</b>	<p>From <b>Organize</b> option on the left pane, choose <b>Metadata Curation &gt; Discover assets</b>.</p>
---	--

 <b>11</b> total jobs	<p>To select discover job</p> <p>Navigate to <b>New discover job &gt; Quick scan</b></p>
---	--

	<p>To discover assets</p> <ol style="list-style-type: none"> <li>Click on <b>Add a connection</b></li> <li>Choose the connection named <b>bud</b> that you created previously, click <b>Next</b></li> </ol>
	<ol style="list-style-type: none"> <li>Choose the connection named <b>bud</b> that you created previously.</li> <li>Select <b>Discover root</b> as <b>MORTGAGE &gt; DB2INST1</b></li> <li>Check necessary <b>Discover options</b></li> <li>Click on <b>Add a workspace</b> under Workspace and named it as <b>Mortgage</b>. Click <b>Create</b>.</li> <li>Click on <b>Discover</b> It may take few minutes to complete.</li> </ol>

<p>Click on <b>View results</b> or <b>View workspaces</b> to explore the discover assets.</p>																																	
<p><b>Quick scan results</b>      New discovery job ▾     </p>																																	
<table border="1"> <thead> <tr> <th>Summary</th> <th>Pending analysis</th> <th>Action required</th> <th>Reviewed</th> </tr> </thead> <tbody> <tr> <td><b>Status</b></td> <td colspan="3"> <input checked="" type="radio"/> All jobs pending analysis  <input type="radio"/> Analyzing  <input type="radio"/> In queue for analysis         </td> </tr> </tbody> </table>	Summary	Pending analysis	Action required	Reviewed	<b>Status</b>	<input checked="" type="radio"/> All jobs pending analysis <input type="radio"/> Analyzing <input type="radio"/> In queue for analysis			<table border="1"> <thead> <tr> <th colspan="2">Pending analysis</th> <th colspan="2">Action required</th> <th colspan="2">Reviewed</th> </tr> </thead> <tbody> <tr> <td colspan="2"> <input type="checkbox"/> Pause    <input type="button" value="View results"/> </td> <td colspan="2"></td> <td colspan="2">1 item selected (select up to 15) <input type="button" value="Cancel"/></td> </tr> <tr> <th>Job ID</th> <th>Data assets</th> <th>Connection</th> <th>Started by</th> <th>Processing time</th> <th>Status</th> </tr> <tr> <td>qs_1571071613091</td> <td>-</td> <td>bud</td> <td>admin</td> <td>2 minutes 15 seconds</td> <td>Analyzing</td> </tr> </tbody> </table>	Pending analysis		Action required		Reviewed		<input type="checkbox"/> Pause <input type="button" value="View results"/>				1 item selected (select up to 15) <input type="button" value="Cancel"/>		Job ID	Data assets	Connection	Started by	Processing time	Status	qs_1571071613091	-	bud	admin	2 minutes 15 seconds	Analyzing
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## 6. Add users

Create users with different roles.

From **Administer** option on the left pane, choose **Manage users**.

Switch tab to 'Users' and click on 'Add user'

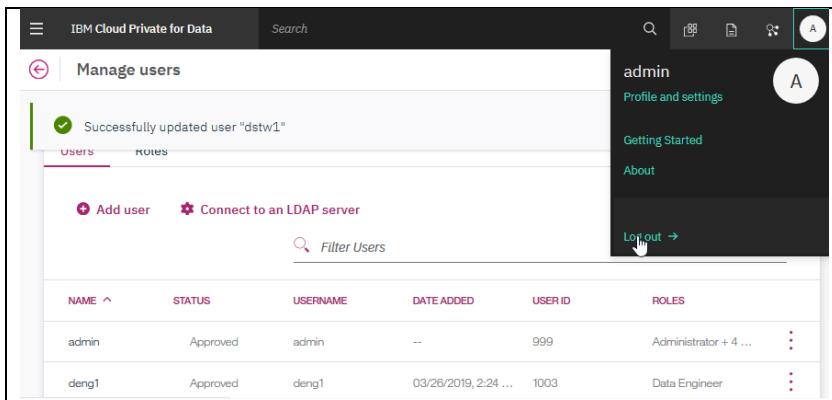
Fill out Add User information for a data scientist

1. Name as **dst1**
2. Username is **dst1**
3. Use a valid email address
4. Set Password as **dst1**
5. Choose the user roles as Data Scientist

Click on **Add** to confirm the add user

Follow same steps in Add User section (above) and two more account. Create **deng1** for Data Engineer and **dstw1** a data steward.

User	Role	Password
• deng1	Data Engineer	deng1
• dstw1	Data Stewards	dstw1



The screenshot shows the 'Manage users' page of the IBM Cloud Private for Data interface. A success message 'Successfully updated user "dstw1"' is displayed. The user list table includes columns: NAME, STATUS, USERNAME, DATE ADDED, USER ID, and ROLES. Two users are listed: 'admin' (Approved, admin, --, 999, Administrator + 4 roles) and 'deng1' (Approved, deng1, 03/26/2019, 2:24 ..., 1003, Data Engineer). A sidebar on the right contains links for Profile and settings, Getting Started, About, and Logout.

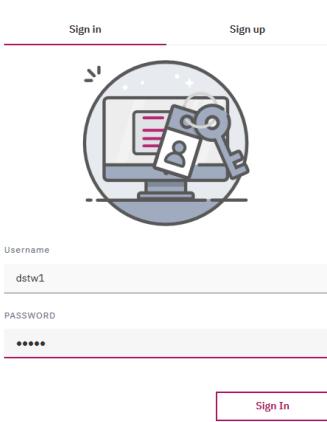
NAME	STATUS	USERNAME	DATE ADDED	USER ID	ROLES
admin	Approved	admin	--	999	Administrator + 4 ...
deng1	Approved	deng1	03/26/2019, 2:24 ...	1003	Data Engineer

Logout →

Log out from user **admin**

## 7. Implement Policies and Rules

Create governance policies and rules for the entire organization to ensure clarity and compatibility among departments, projects, or products.

	Sigh in to the Cloud Pak for Data web console as user 'dstw1' and password is 'dstw1' that you created earlier.
---	---

### 7.1. Import Governance Assets

Cloud Pak for Data enables you to structure your enterprise information in a logical way, discover relationships between assets, and keep your data always up-to-date. You can import existing glossary with terms, categories, information governance policies and rules.

Choose **Organize > Metadata curation > Metadata import** from the left pane.

### 7.2. Create a policy

Choose **Organize > Data and AI governance > Policy** from the left pane

Select **Published** tab and click on **Create Policy**

On the **New policy** window create a policy with following information and click on **Save as draft**:

**Name:** Data Validation  
**Description:** Check for appropriate data

It will take few minutes to appear under list of available policies.

### 7.3. Create a rule

Choose **Organize > Data and AI governance > Rule** from the left pane

Select **Published** tab and click on **Create Rule**

Choose **Governance rule**

On the **New governance rule** window create a rule with following information and click on **Save as draft**:

**Name:** Income cannot be null  
**Referencing policies:** Data Validation  
**Short Description:** Income column must have a valid value

It will take few minutes to appear under list of available rules.

Click on **Add policy** under **Parent policies** to assign the rule to it.

#### a. Add rule to metadata

Click on the enterprise search, Search for 'mortgage\_customer' and hit enter  
From the search results select table 'mortgage\_customer'

Click on **Details** tab at the top

On Database Table Details window choose **Database Columns** from left

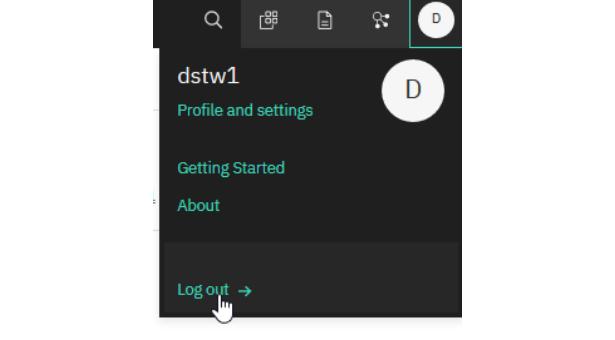
Select INCOME column

Next click on icon (right top corner) and choose **Edit**

Scroll down to **Implement Rules** section

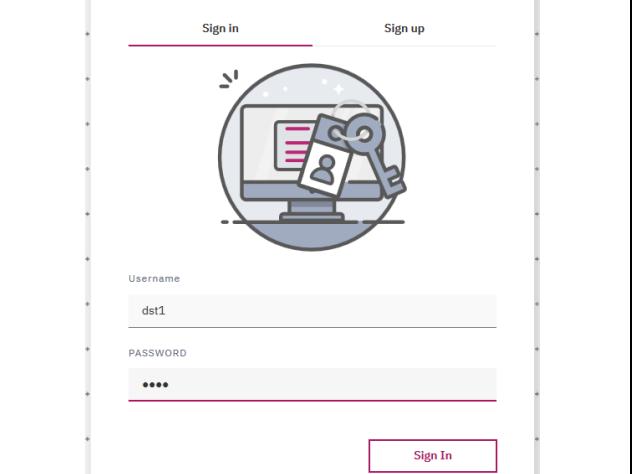
Search and select the rule **Income cannot be null** that you created earlier.

Click on **Save**

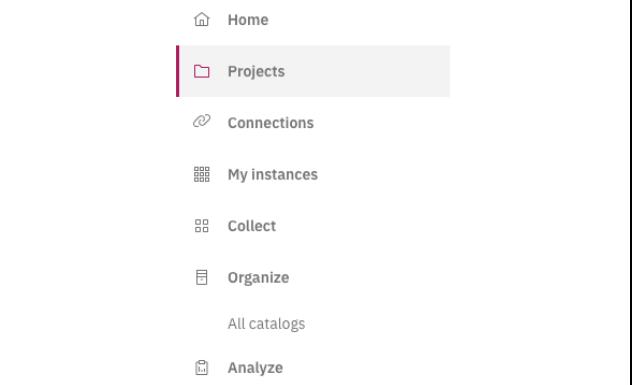
	<p>Log out from user 'dstw1'</p>
---	----------------------------------

## 8. Access data as a Data Scientist

Explore the data require for build a model

	<p>Sigh in to the Cloud Pak for Data web console as user 'dst1' and password is 'dst1' that you created earlier.</p>
--	--

### 8.1. Create analytic project

	<p>Create a new analytical project by 'Projects' from right pane.           Click on the  <b>New project</b> icon           Select <b>Create an empty project</b></p>
---	--

<p>Define project details</p> <p>Name mortgage_data</p> <p>Description Project description</p> <p>Choose project options <input type="checkbox"/> Integrate this project with Git</p>	<p>Provide a project name and click <b>Create</b></p> 
---	---

## 8.2. Assets from Glossary

Let's look for mortgage related terms in glossary to get an idea about different data assets available on the system.

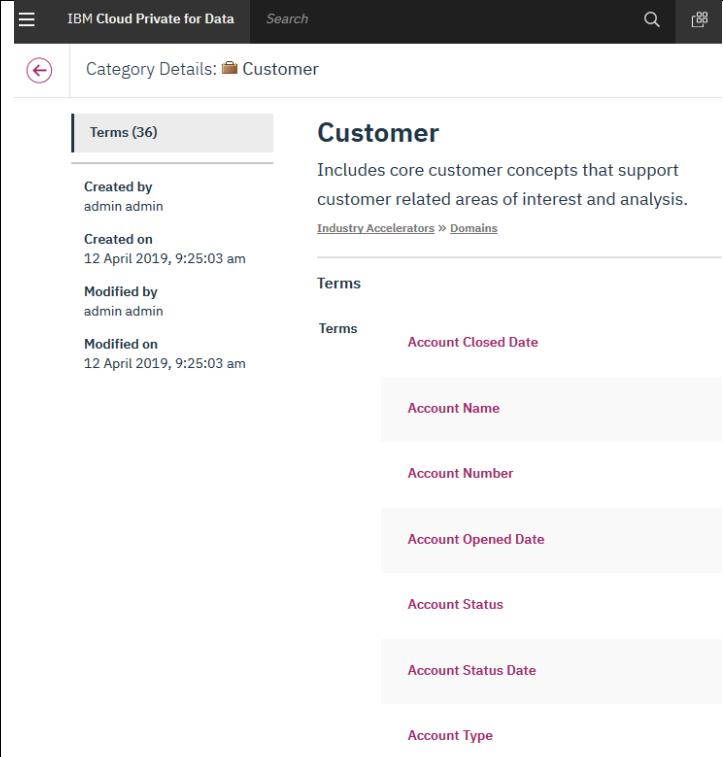
Choose **Organize** from the left pane, select **Data Catalog -> Queries -> Glossary Categories and Terms**.

You should have all mortgage related information as follows. Click on each **ASSET NAME, TERMS** for additional information. The **TERM DESCRIPTION** provides a basic information about each term.

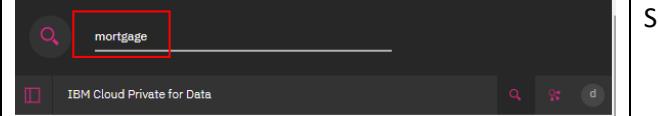
IBM Cloud Private for Data		Search	Cancel	Create
Query Details: Glossary Categories and Terms				
Query Results: 10				
Category				
ASSET NAME	CATEGORY DESCRIPTION	TERMS	TERM DESCRIPTION	
 Address Information	Location related glossary for a JK insurance customer	 Customer Zipcode  Continuity Of Address Segment  Address part 1  Customer City  Address part 2  Customer Street Suffix  Customer Street Name  Customer State  Customer House Label  Country Of Residence	Current zip code for customer's address Customer City Current suffix for street for customer address Current street name for customer's address Current state of residence for a customer House number with optional suffix	
 Crown Jewels	All data that is sensitive customer info per regulatory obligations	 Sensitive Personal Data	Any data deemed to be sensitive personal info for a customer	
 Insurance Customer Details	Category for individual insurance customers	 Gender  Market Segment  Summary	Customer's gender, if known Customer Market Segment Summary information about a JKLV insured customer	
For example, click on ASSET NAME <b>Customer</b>				

## a. Check Asset Details

Go through each item related to mortgage in glossary to have better idea about data you need for your project.

	<p>The asset <b>Customer</b> shows different terms associated with it.</p> <p>Check each <b>Terms</b> for additional information.</p>
--	---

## b. Enterprise search

	<p>Click on the enterprise search</p>
	<p>Search for ‘mortgage’ and hit enter</p>

**MORTGAGE\_PROPERTY**

**MORTGAGE\_PROPERTY**

Database Table  
idbc:db2://9.30.116.168:50000  
/MORTGAGE  
db2 > DB2INST1

★★★★★ 0 Ratings None Quality score

Description

Select your rating:

New Comment:

All Comments (0)

**Relationships**

```

graph TD
    MPT[MORTGAGE_PROPERTY Database Table] --- ID[+ ID Database Column]
    MPT --- LOC[+ LOCATION Database Column]
    MPT --- SP[+ SALE_PRICE Database Column]
    ID --- C1((Context))
    LOC --- C2((Context))
    SP --- C3((Context))
    C1 --- C2
    C2 --- C3
    C3 --- C1
  
```

Choose the **mortgage\_property** table and click on **Relationship Graph** to see details about the table.

Click on the '+' next to **Database Column** to expand list of columns in the table.

Same way you can view other mortgage related tables.

**39 Search Results**

**mortgage\_property** 67% RELEVANCY TABLE

**mortgage\_default** 67% RELEVANCY TABLE

**mortgage\_customer** 67% RELEVANCY TABLE

**mortgage customer** 67% RELEVANCY TERM

**mortgage\_join** 65% RELEVANCY TABLE

**mortgage\_default** 64% RELEVANCY COLUMN

**Go back to the enterprise Search Result**

The enterprise search will return all objects that mentioned word mortgage but as a data scientist you don't have access to any of those objects.

Click on the **New Data Request** on top right corner for request access to mortgage related datasets.

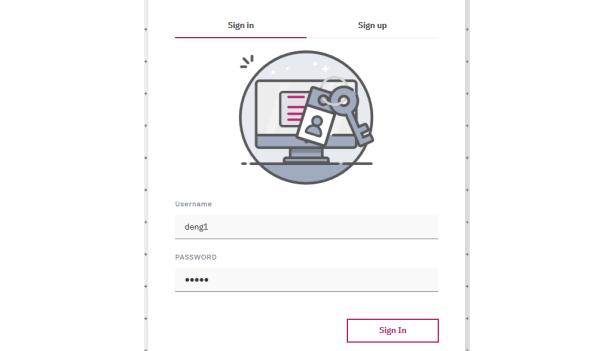
Fill up the **New Data Request** form with detail information as much possible, so a data engineer can provide accurate dataset. Click Confirm and then Submit request.

At this point you need to wait for data engineer to address the data request.

You can go to the home page by clicking on icon from left pane and check the status of the data request.

Sign out from user **dst1**

## 9. Review data request

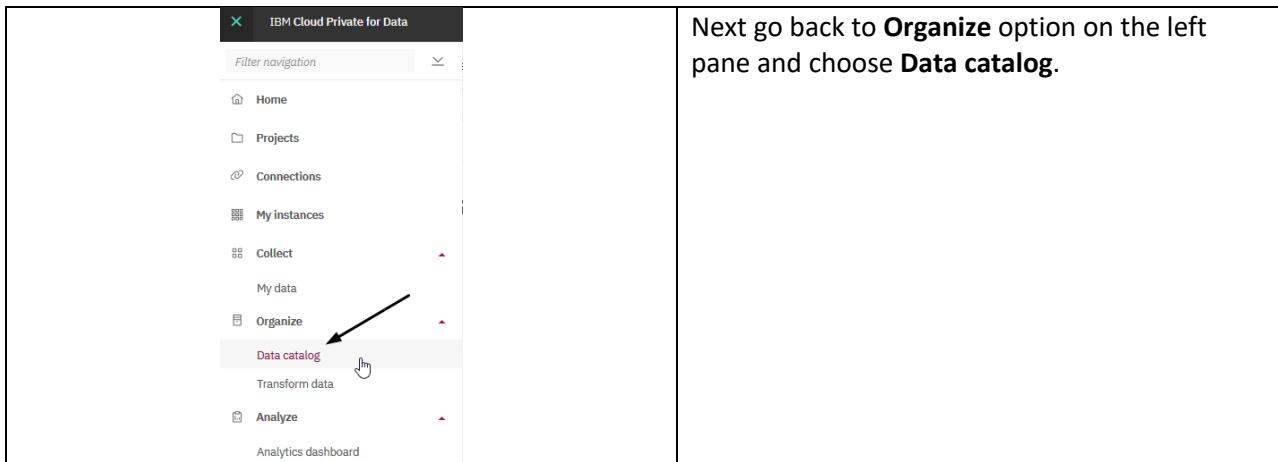
	<p>Sigh in to the Cloud Pak for Data web console as user 'deng1' and password is 'deng1' that you created earlier.</p>
---	--

	<p>After sing in Click on <a href="#" style="border: 1px solid red; padding: 2px;">Go to your home page</a></p> <p>Check the <b>Data Request</b> tab on the home page.</p>
---	--

<p>Click on the new data request that submitted by data scientist earlier for review. After reviewing the request click on Action in top right corner and select assign to me.</p> <div style="border: 1px solid #ccc; padding: 10px; margin-top: 10px;"> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>ID</th> <th>Name</th> <th>Status</th> <th>Requested by</th> <th>Assigned to</th> <th>Priority</th> <th>Last updated</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Mortgage_Data_Access</td> <td>Claimed</td> <td>dst1</td> <td>deng1</td> <td>Medium</td> <td>3 Jun 2019, 8:15 PM</td> </tr> <tr> <td>2</td> <td>Mortgage_Data_Access_Request</td> <td>Claimed</td> <td>dst1</td> <td>deng1</td> <td>Medium</td> <td>3 Jun 2019, 8:41 PM</td> </tr> <tr> <td>3</td> <td>Mortgage_Data_request1</td> <td>Claimed</td> <td>dst1</td> <td>deng1</td> <td>High</td> <td>3 Jun 2019, 8:39 PM</td> </tr> <tr> <td>4</td> <td>CustData</td> <td>New</td> <td>admin</td> <td>Unassigned</td> <td>High</td> <td>4 Jun 2019, 9:03 AM</td> </tr> </tbody> </table> <div style="margin-top: 10px;"> <span style="border: 1px solid #ccc; padding: 2px 10px; border-radius: 5px; display: inline-block;">Action</span> <div style="display: flex; justify-content: space-around; width: 150px; margin-top: 5px;"> <span></span> <span></span> <span></span> </div> <div style="margin-top: 10px;"> <span>Transform data</span> <span style="border: 1px solid #ccc; padding: 2px 10px; border-radius: 5px; display: inline-block; margin-left: 10px;">Assign to me</span> </div> </div> </div>							ID	Name	Status	Requested by	Assigned to	Priority	Last updated	1	Mortgage_Data_Access	Claimed	dst1	deng1	Medium	3 Jun 2019, 8:15 PM	2	Mortgage_Data_Access_Request	Claimed	dst1	deng1	Medium	3 Jun 2019, 8:41 PM	3	Mortgage_Data_request1	Claimed	dst1	deng1	High	3 Jun 2019, 8:39 PM	4	CustData	New	admin	Unassigned	High	4 Jun 2019, 9:03 AM
ID	Name	Status	Requested by	Assigned to	Priority	Last updated																																			
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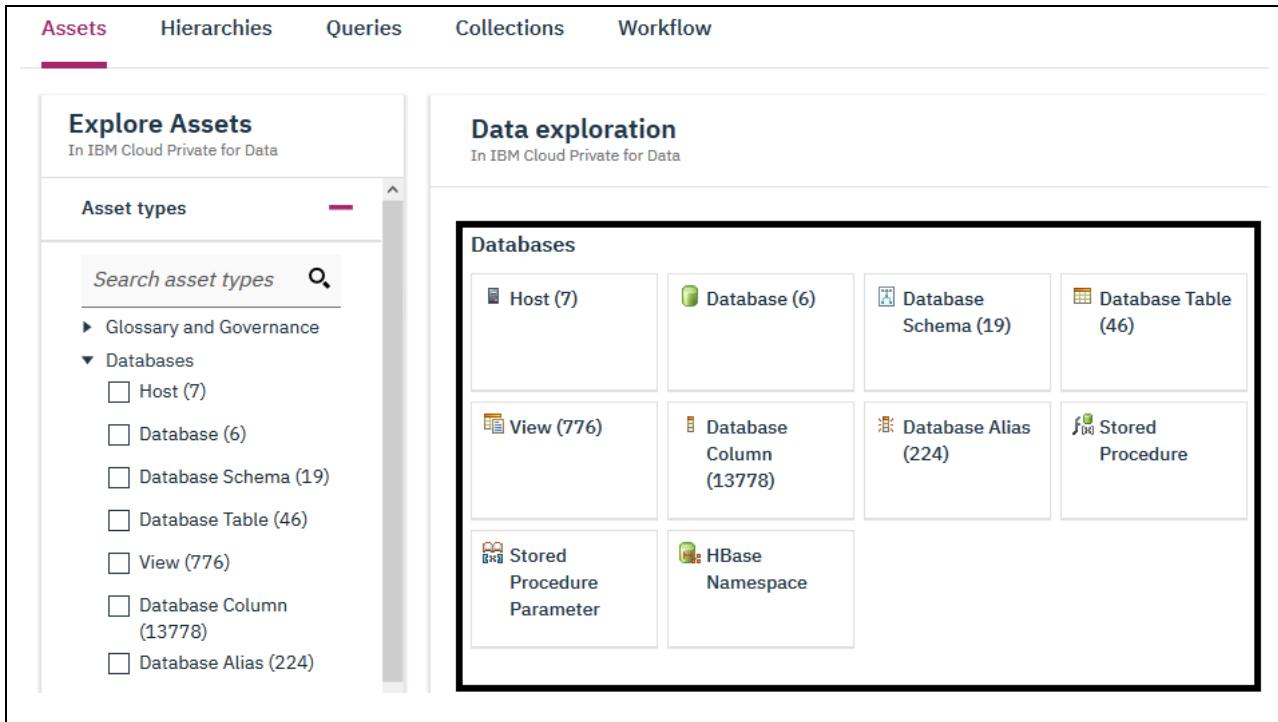
## 10. Navigate to data catalog

Once discover assets process completed. All database objects automatically cataloged in Cloud Pak for Data. You can review those database object in the catalog.



Next go back to **Organize** option on the left pane and choose **Data catalog**.

At this point Cloud Pak for Data should displays all the database objects. You can click each individual object under **Databases** to explore the catalog generated from discover asset previously. Click on the **Database Table** to check tables discovered from Db2. Take a look into the database named **mortgage**.



Category	Object Type	Count
Databases	Host	7
	Database	6
	Database Schema	19
	Database Table	46
	View	776
	Database Column	13778
	Database Alias	224
	Stored Procedure	1
Collections	Stored Procedure Parameter	1
	HBase Namespace	1

Under the **Database Tables** you can see ‘MORTGAGE\_CUSTOMER’, ‘MORTGAGE\_DEFAULT’ and ‘MORTGAGE\_PROPERTY’ tables, cataloged from Db2 database.

**Filter results**

[Clear all filters](#)

**Asset types (1)**

- Search asset types
- ▶ Glossary and Governance
- ▼ Databases (1)
  - Host
  - Database
  - Database Schema
  - Database Table (46)
  - View
  - Database Column
  - Database Alias
  - Stored Procedure
  - Stored Procedure Parameter
  - HBase Namespace
- ▶ Data Files

**All results**

46 results

No items selected

Item	Details
<a href="#">MORTGAGE</a> ↳ db2 > SYSTOOLS	Modified by InformationServerSystemUser on Jun 3, 2019, 6:52 PM
<a href="#">HMON_COLLECTION</a> ↳ <a href="#">jdbc:db2://10.208.125.125:50000/MORTGAGE</a> ↳ db2 > SYSTOOLS	Modified by InformationServerSystemUser on Jun 4, 2019, 11:30 AM
<a href="#">MONGO_MORTGAGE_DEFAULT</a> ↳ <a href="#">jdbc:db2://dv-server.zen.svc.cluster.local:32051/bisqal</a> ↳ db2 > USER999	Created by admin on Jun 3, 2019, 6:34 PM
<a href="#">MONGO_MORTGAGE_PROPERTY</a> ↳ <a href="#">jdbc:db2://dv-server.zen.svc.cluster.local:32051/bisqal</a> ↳ db2 > USER999	Modified by InformationServerSystemUser on Jun 3, 2019, 6:34 PM
<a href="#">MORTGAGE_CUSTOMER</a> ↳ <a href="#">jdbc:db2://10.208.125.125:50000/MORTGAGE</a> ↳ db2 > DB2INST1	Created by admin on Jun 4, 2019, 11:28 AM

## 11. Data Virtualization

Context: Data virtualization (DV) integrates data sources across multiple types and locations and turns it into one logical data view. In this case, you have data across three different tables. Creating a virtual table you can quickly view data from different tables.

### 11.1. Adding a new data source for Db2

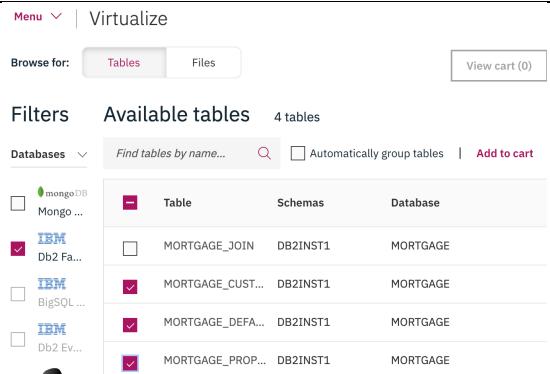
Context: DV supports many relational and non-relational data sources (as well as files that reside on a local disk or network file system) that you can add to your data source ecosystem. After a data source has been added, any user that has virtualize permission can create virtual tables. DV agents connect to relational data sources using JDBC protocol. In this tutorial you will add a data source for Db2 database.

Define a data connection to Db2. Use your existing Db2 database connection for Db2 data source.

1. Go to **Collect > Virtualized data > Menu > Data sources**
2. Click **Add > New data source > Add connection**
3. Select **Db2** that you created earlier and click **Next**

### 11.3. Select tables for virtualization

Context: the most common mechanism for virtualizing data is to create a "view" or virtual table. Virtual tables can be full or segment of data from one or more tables. You can then run queries against the resulting virtual table.

<ul style="list-style-type: none"> <li>• Click <b>Collect &gt; Virtualized data &gt; Menu &gt; Virtualize</b></li> <li>• Select tables <b>MORTGAGE_CUSTOMER</b>, <b>MORTGAGE_PROPERTY</b> and <b>MORTGAGE_DEFAULT</b> from <b>MORTGAGE</b> database, then click <b>Add to cart</b></li> <li>• Click <b>View cart</b></li> <li>• Click <b>Next</b></li> </ul>	 <p>The screenshot shows the 'Virtualize' screen with the following details:</p> <ul style="list-style-type: none"> <li><b>Menu</b> dropdown: Virtualize</li> <li><b>Browse for:</b> Tables</li> <li><b>Filters</b>: Databases dropdown set to IBM Db2 FA...</li> <li><b>Available tables</b>: 4 tables listed:       <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left;">Table</th> <th style="text-align: left;">Schemas</th> <th style="text-align: left;">Database</th> </tr> </thead> <tbody> <tr> <td>MORTGAGE_JOIN</td> <td>DB2INST1</td> <td>MORTGAGE</td> </tr> <tr> <td>MORTGAGE_CUST...</td> <td>DB2INST1</td> <td>MORTGAGE</td> </tr> <tr> <td>MORTGAGE_DEFA...</td> <td>DB2INST1</td> <td>MORTGAGE</td> </tr> <tr> <td>MORTGAGE_PROP...</td> <td>DB2INST1</td> <td>MORTGAGE</td> </tr> </tbody> </table> </li> <li><b>Databases</b> dropdown: IBM Db2 FA...</li> <li><b>Find tables by name...</b> search bar</li> <li><b>Automatically group tables</b> checkbox</li> <li><b>Add to cart</b> button</li> </ul>	Table	Schemas	Database	MORTGAGE_JOIN	DB2INST1	MORTGAGE	MORTGAGE_CUST...	DB2INST1	MORTGAGE	MORTGAGE_DEFA...	DB2INST1	MORTGAGE	MORTGAGE_PROP...	DB2INST1	MORTGAGE
Table	Schemas	Database														
MORTGAGE_JOIN	DB2INST1	MORTGAGE														
MORTGAGE_CUST...	DB2INST1	MORTGAGE														
MORTGAGE_DEFA...	DB2INST1	MORTGAGE														
MORTGAGE_PROP...	DB2INST1	MORTGAGE														

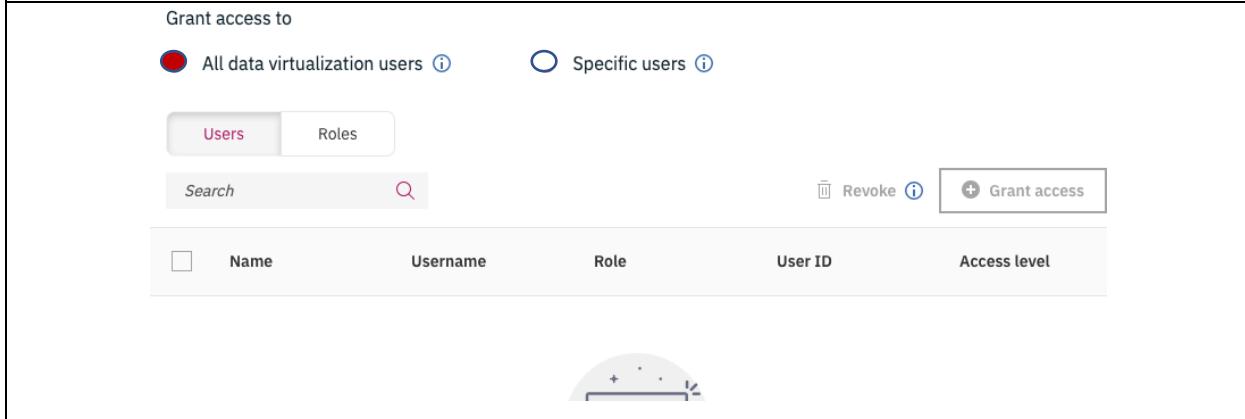
<ul style="list-style-type: none"> <li>• Select <b>Neither</b></li> <li>• Uncheck the box for <b>Submit to catalog</b></li> <li>• Click <b>Virtualize</b> to complete the process</li> </ul>	<p style="text-align: right;"><input type="checkbox"/> Submit to catalog   <a href="#">Cancel</a> <span style="border: 1px solid red; padding: 2px;">Virtualize</span></p> <p><b>Assign to</b></p> <p><input type="radio"/> Data request <a href="#">?</a>   <input type="radio"/> Project <a href="#">?</a>   <input checked="" type="radio"/> Assign to My virtualized data only</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>Table</th> <th>Schema</th> <th>Source schema</th> <th>Host/Database</th> <th>Grouped tables</th> </tr> </thead> <tbody> <tr> <td>MORTGAGE_CUSTOMER</td> <td>USER999</td> <td>X ▾</td> <td>DB2INST1</td> <td>169.46.33.180:MORTGAGE</td> </tr> <tr> <td>MORTGAGE_DEFAULT</td> <td>USER999</td> <td>X ▾</td> <td>DB2INST1</td> <td>169.46.33.180:MORTGAGE</td> </tr> <tr> <td>MORTGAGE_PROPERTY</td> <td>USER999</td> <td>X ▾</td> <td>DB2INST1</td> <td>169.46.33.180:MORTGAGE</td> </tr> </tbody> </table>	Table	Schema	Source schema	Host/Database	Grouped tables	MORTGAGE_CUSTOMER	USER999	X ▾	DB2INST1	169.46.33.180:MORTGAGE	MORTGAGE_DEFAULT	USER999	X ▾	DB2INST1	169.46.33.180:MORTGAGE	MORTGAGE_PROPERTY	USER999	X ▾	DB2INST1	169.46.33.180:MORTGAGE
Table	Schema	Source schema	Host/Database	Grouped tables																	
MORTGAGE_CUSTOMER	USER999	X ▾	DB2INST1	169.46.33.180:MORTGAGE																	
MORTGAGE_DEFAULT	USER999	X ▾	DB2INST1	169.46.33.180:MORTGAGE																	
MORTGAGE_PROPERTY	USER999	X ▾	DB2INST1	169.46.33.180:MORTGAGE																	

## 11.4. Creating virtual table

You can create a new virtual table based on existing tables under **My data** section. You can use “drag and drop” or write your own SQL to create the view.

<ul style="list-style-type: none"> <li>• Click <b>Collect &gt; Virtualized data &gt; Menu &gt; SQL editor</b> to access the editor.</li> <li>• Copy the following SQL statement and paste it on the editor</li> <li>• Click on <b>Run all</b></li> </ul>	<pre>CREATE VIEW MORTGAGE_JOIN_VIEW AS SELECT A.ID, INCOME, APPLIED_ONLINE, RESIDENCE, YRS_CURRENT_ADD,        YRS_CURRENT_EMP, NO_OF_CARDS, CARD_DEBT, CURRENT_LOANS,        LOAN_AMOUNT, SALE_PRICE, LOCATION, MORTGAGE_DEFAULT FROM   MORTGAGE_CUSTOMER A,        MORTGAGE_PROPERTY B,        MORTGAGE_DEFAULT C WHERE  A.ID = B.ID AND    A.ID = C.ID;</pre>
<p style="text-align: center;"><b>Menu</b> <span style="color: pink;">▼</span>   <b>SQL editor</b></p> <div style="border: 1px solid #ccc; padding: 5px; margin-top: 5px;"> <span style="font-size: small;">* Untitled - 1</span> <span style="margin-left: 10px;">⊕</span> <span style="float: right; margin-right: 10px;">Syntax assistant</span> </div> <pre style="font-family: monospace; font-size: small; margin-top: 10px;">1 2 3 CREATE VIEW MORTGAGE_JOIN_VIEW 4 AS 5 SELECT A.ID, INCOME, APPLIED_ONLINE, RESIDENCE, YRS_CURRENT_ 6 YRS_CURRENT_EMP, NO_OF_CARDS, CARD_DEBT, CURRENT_LOAN 7 LOAN_AMOUNT, SALE_PRICE, LOCATION, MORTGAGE_DEFAULT 8 FROM   MORTGAGE_CUSTOMER A, 9        MORTGAGE_PROPERTY B, 10       MORTGAGE_DEFAULT C 11 WHERE A.ID = B.ID 12 AND   A.ID = C.ID;</pre>	
<ul style="list-style-type: none"> <li>• Click <b>Collect &gt; Virtualized data &gt; Menu &gt; My virtualized data</b> to access the virtual table <b>MORTGAGE_JOIN_VIEW</b></li> <li>• Check the box associated with <b>MORTGAGE_JOIN_VIEW</b></li> </ul>	

- Click on the table actions menu 
- Select **Manage access** option
- On grant access window select All data virtualization users
- Click **Continue**



Grant access to

All data virtualization users [i](#)     Specific users [i](#)

[Users](#) [Roles](#)

Search 

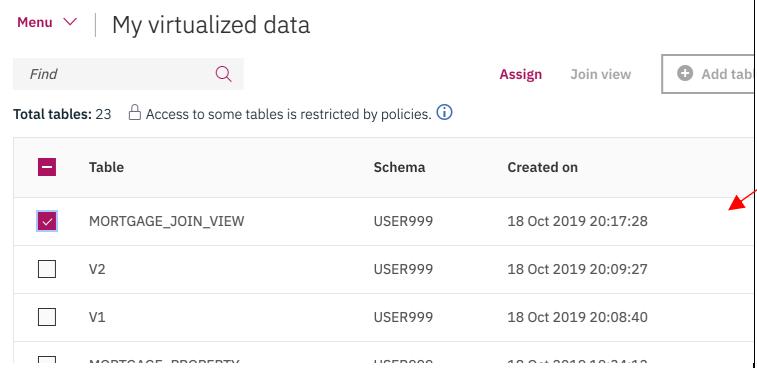
 Revoke [i](#)  Grant access

<input type="checkbox"/>	Name	Username	Role	User ID	Access level
					

## 11.5. Add virtual table to catalog

Once you create a virtual table, you can add it to the catalog, making it easily searchable.

- Click **Collect > Virtualized data > Menu > My data** to find the virtual table just created.
- Mark the checkbox associated with virtual table
- Choose **Submit to catalog** from table action
- Click on **Confirm**



Menu  | My virtualized data

Find 

Assign Join view 

Total tables: 23  Access to some tables is restricted by policies. [i](#)

 Table	Schema	Created on
<input checked="" type="checkbox"/> MORTGAGE_JOIN_VIEW	USER999	18 Oct 2019 20:17:28
<input type="checkbox"/> V2	USER999	18 Oct 2019 20:09:27
<input type="checkbox"/> V1	USER999	18 Oct 2019 20:08:40
<input type="checkbox"/> MORTGAGE_PROPERTY	USER999	18 Oct 2019 20:08:40

## 11.6. Publish virtualized table

A data steward needs approve the published request before the asset is added to the enterprise data catalog. You signed in as user 'admin', it should allow to publish the virtual table.

Pending Publish to Catalog Requests					
Name	Type	Project	Owner	Date Updated	Status
> USER999.MORTGAGE_JOIN_VIEW	view	-	admin	21 October 2019, 2:49PM	Pending
> USER999.Currency USER999.Country	table	-	admin	17 October 2019, 8:40AM	Pending

- Click on access the **Home** page
- Click on **Pending Publish to Catalog Requests**
- Click on icon on left for virtual table **MORTGAGE\_JOIN\_VIEW** that you created
- Click on **Approve**

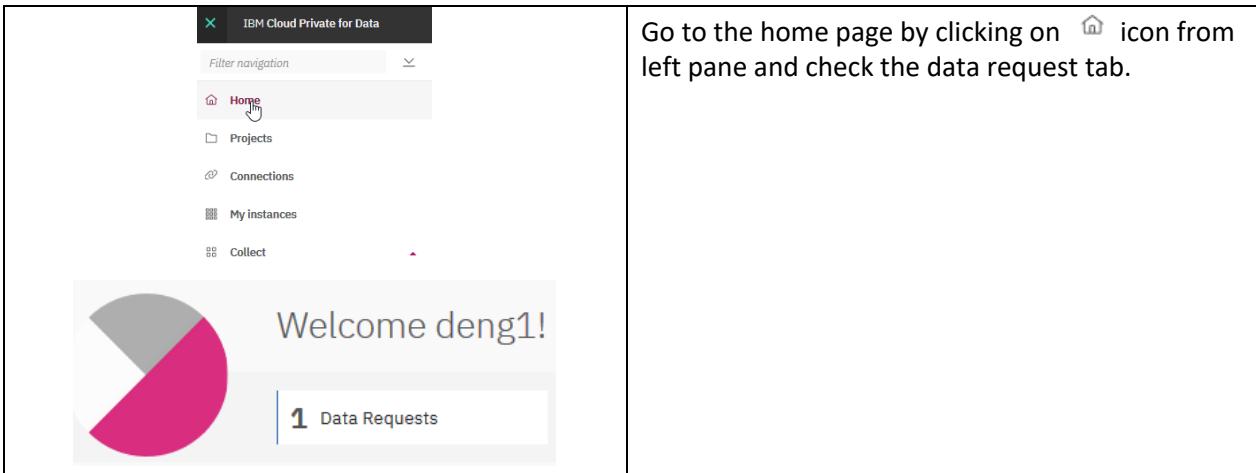
### 11.7. Access information for virtual table

To access virtual table from external application, you need the JDBC connection information. Click on **Collect > Virtualized data > Menu > Add-on settings** to find out access information. You will use this information later in the building model section.

The screenshot shows the 'Add-on settings' page with the following details:

- Access information** section
- User ID**: user999
- Password**: ..... (with **Show** link)
- JDBC connection URL**: jdbc:db2://dv-server.zen.svc.cluster.local:32051/...

## 11.8. Deliver Dataset



Go to the home page by clicking on  icon from left pane and check the data request tab.

Click on the data request for update that submitted by data scientist earlier.

### Data requests + Add new data request

	Name	ID	Status	Last Updated
1	Mortgage_Data_Access	2	New	27 Mar 2019, 11:15 AM

Click on the **Source** and fill out all the necessary information. This information will be picked up by the data scientist later.

Add the **remote data** set information that you created during data transformation. In this case remote data set is MORTGAGE\_JOIN\_VIEW. Use the **Access information** from the **Add-on settings** information from DV.

New data request

Overview Columns Source

## Source

Data source name: mortgage\_join

Type: DB2

Username: db2inst1

Password: \*\*\*\*\*

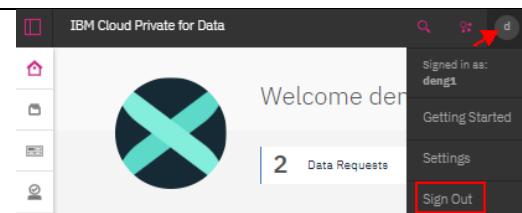
JDBC URL: 169.45.83.218

[+ Add new dataset](#)

	Remote data set name	Description	Schema	Table
1	mortgage_join		db2inst1	mortage_join

Click on the data request and change the status to **Deliver**.

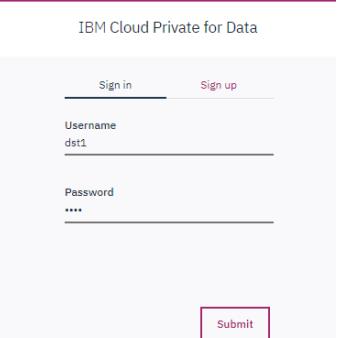
NAME	ID	STATUS	REQUESTED BY	ACCEPTED BY	LAST UPDATED	ACTIONS
mortagedata1	7	Delivered	dst1	deng1	6 Aug 2018, 12:55 PM	<a href="#">Deliver</a>
Mortgage_Data_Access	9	Accepted	dst1	deng1	15 Aug 2018, 1:17 AM	<a href="#">Deliver</a>



Sign out from user **deng1**

## 12. Build Model

With Cloud Pak for Data, you can collaborate with other team members on analytic projects to create visualizations and machine learning models with data from your enterprise. In this step you will build a simple model to predict the possibilities of mortgage default by customer. The object of this model is to show the functionality of Cloud Pak for Data, not the prediction accuracy. One can use lot more data and build a complex algorithm to get better accuracy.

	<p>Sign in to the Cloud Pak for Data web console as user 'dst1' and password is 'dst1' that you created earlier.</p>
---	--



### 12.1. Navigate to analytics project

Select **Projects** option from the left pane and click on the analytics project 'mortgage\_data' that you created earlier.

### 12.2. Create deployment space

Create a separate deployment space for your project 'mortgage\_data'.

Choose : My Projects > **mortgage\_data** > Settings > Associate a deployment space > New

<p>Connect to a deployment space</p> <p><b>New</b>    <b>Existing</b></p> <p>Name MortgageDeploymentSpace</p> <p>Description (Optional) <i>Description of deployment space</i></p> <p style="text-align: right;"><b>Cancel</b>    <b>Associate</b></p>	<p>Name new deployment space as 'MortgageDeploymentSpace'</p> <p><b>Click on Associate</b></p>
--	--

### 12.3. Create notebook

Create a notebook from a predefined Jupyter notebook that available on Github.

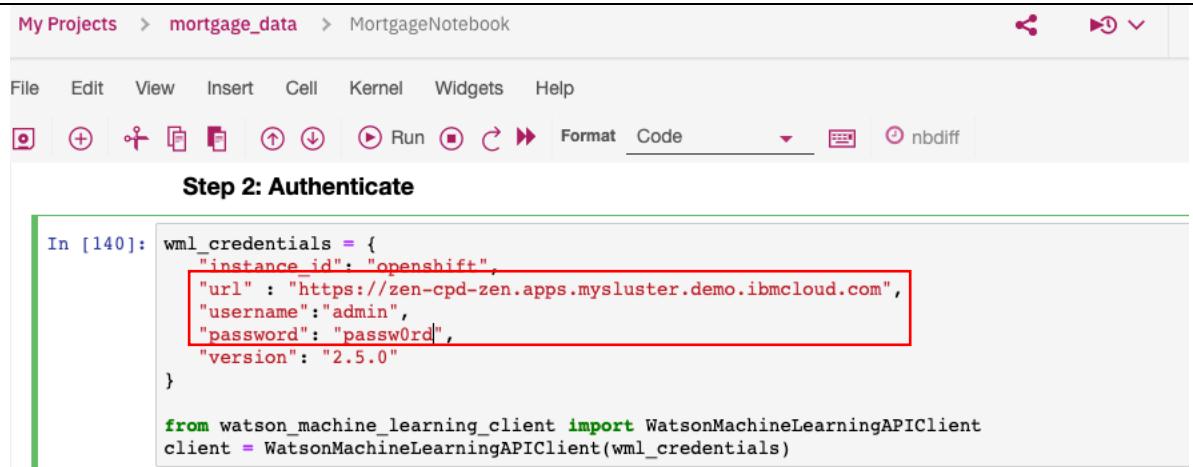
<ul style="list-style-type: none"> <li>• Go to : My Projects &gt; <b>mortgage_data</b> &gt; Add to project</li> <li>• Choose asset type as Notebook</li> <li>• The new notebook needs to create from URL</li> <li>• Name the notebook as <b>MortgageNotebook</b></li> <li>• Use notebook URL as <a href="https://github.com/IBM-ICP4D/icp4d-tutorials/blob/master/assets/mortgage-002/MortgageNotebook.V25.jupyter-py36.ipynb">https://github.com/IBM-ICP4D/icp4d-tutorials/blob/master/assets/mortgage-002/MortgageNotebook.V25.jupyter-py36.ipynb</a></li> <li>• Click on <b>Create Notebook</b></li> </ul> <p>My Projects &gt; mortgage_data &gt; Add Notebook</p> <p>New notebook</p> <p>Blank    From file    <b>From URL</b></p> <p>Name MortgageNotebook    24 characters remaining</p> <p>Description (optional) <i>Type your Description here</i>    500 characters remaining</p> <p>Select runtime Default Python 3.6 (1 vCPU and 2 GB RAM) ▾</p> <p>Notebook URL <a href="https://github.com/IBM-ICP4D/icp4d-tutorials/blob/master/assets/mortgage-002/MortgageNotebook.V25">https://github.com/IBM-ICP4D/icp4d-tutorials/blob/master/assets/mortgage-002/MortgageNotebook.V25</a></p> <p style="text-align: right;"><b>Cancel</b>    <b>Create Notebook</b></p>
---

## 12.4. Review and run notebook

The majority of the code in the notebook is standard open source code that's used for various steps in the predictive analytics process.

Switch to edit mode by clicking on  icon from top of the screen

First go the **Step 2: Authenticate** section and update the **url**, **username** and **password** fields with your CPD UI console details and access credential.

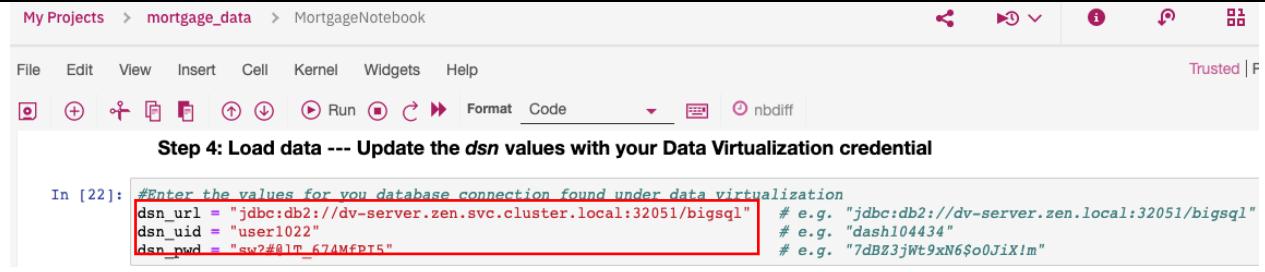


The screenshot shows the Jupyter Notebook interface in edit mode. The title bar says "My Projects > mortgage\_data > MortgageNotebook". The toolbar includes icons for file operations, cell types, and kernel selection. A red box highlights the "Edit" mode icon in the toolbar. The main area contains Python code:

```
In [140]: wml_credentials = {
    "instance_id": "openshift",
    "url" : "https://zen-cpd-zen.apps.mysluster.demo.ibmcloud.com",
    "username": "admin",
    "password": "passw0rd",
    "version": "2.5.0"
}

from watson_machine_learning_client import WatsonMachineLearningAPIClient
client = WatsonMachineLearningAPIClient(wml_credentials)
```

Next, go the Step 4: Load data section and update the **dsn\_url**, **dsn\_uid** and **dsn\_pwd** values with the information available from **Collect > Virtualized data > Menu > Add-on settings**.



The screenshot shows the Jupyter Notebook interface in edit mode. The title bar says "My Projects > mortgage\_data > MortgageNotebook". The toolbar includes icons for file operations, cell types, and kernel selection. A red box highlights the "Edit" mode icon in the toolbar. The main area contains Python code:

```
In [22]: #Enter the values for your database connection found under data virtualization
dsn_url = "jdbc:db2://dv-server.zen.svc.cluster.local:32051/bigrsql" # e.g. "jdbc:db2://dv-server.zen.local:32051/bigrsql"
dsn_uid = "user1022" # e.g. "dash104434"
dsn_pwd = "sw2#01T_674MFPT5" # e.g. "7dBZ3jWt9xN6$o0JiX!m"
```

Run through it so that you generate a model. The easiest way to do this is to open the notebook, scroll down to Step 6, click on it, then in the menu select Cell -> Run all above.

The screenshot shows a Jupyter Notebook interface with the following details:

- File Bar:** mortgage\_data > Notebooks > MortgageNotebook
- Toolbar:** File, Edit, View, Insert, Cell, Kernel, Widgets, Help
- Cell Menu:** Run Cells, Run Cells and Select Below, Run Cells and Insert Below, Run All, Run All Above (highlighted with a red arrow), Run All Below.
- Input Form:**
  - INCOME \*: 44202
  - APPLIED\_ONLINE \*: Y
  - RESIDENCE \*: O
  - YRS\_CURRENT\_ADD \*: 8
  - YRS\_CURRENT\_EMP \*: 0
  - NO\_OF\_CARDS \*:
- Result:** A pie chart titled "Result" showing two segments: one blue segment labeled "N" and one cyan segment labeled "Y".

### a. Test the model

Save the notebook and switch to the Models tab of the project (hint: right click the project name link, **mortgage\_data**, at the top, and open with another tab in your browser).

The screenshot shows the Cloud Pak for Data interface with the following details:

- Project Bar:** mortgage\_data > Notebooks > MortgageNotebook
- Toolbar:** File, Edit, View, Insert, Cell, Kernel, Widgets, Help
- Section Header:** Step 6: Test Saved Model with Test UI
- List:**
  1. Save the notebook and switch to the Models tab of the project (hint: right click the project name link, mortgage\_data, at the top, and open with another tab in your browser).
  2. Under Models, find and click into your saved model.
  3. Click the Test link to Real-time score the model. You can use the data for testing that already loaded:

**mortgage\_data**

Chose the **Mortgage\_Prediction\_Model**

**Mortgage\_Prediction\_Model v1**

LAST MODIFIED  
27 Mar 2019, 11:34 AM

TYPE  
Spark

Overview Real-time score Batch score Evaluate

Accuracy Accuracy history

62%

Click on the **Real-time score** to test the model.

Once your model is open, check the the mortgage default predeiction based on the sample data in the **Input** section.

mortgage\_data > Models > Mortgage\_Prediction\_Model

Mortgage\_Prediction\_Model v1

LAST MODIFIED 15 Dec 2018, 4:15 PM

TYPE Spark

ALGORITHM PipelineModel (Classification)

ENCODING Python 3.6

Overview Real-time score Batch score Evaluate

Input

INCOME *	44202
APPLIED_ONLINE *	Y
RESIDENCE *	0
YRS_CURRENT_ADD *	0
YRS_CURRENT_EMP *	0

Result

CARD\_DEBT \*

748

CURRENT\_LOANS \*

0

LOAN\_AMOUNT \*

10455

SALE\_PRICE \*

170000

LOCATION \*

100

If you want you can change some values in the Input section.  
Then click on **Submit**.

