

IBM CLOUD PAK FOR DATA 4.5

DATA VIRTUALIZATION HANDS ON LAB

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Data Virtualization Lab

Access Your Cluster

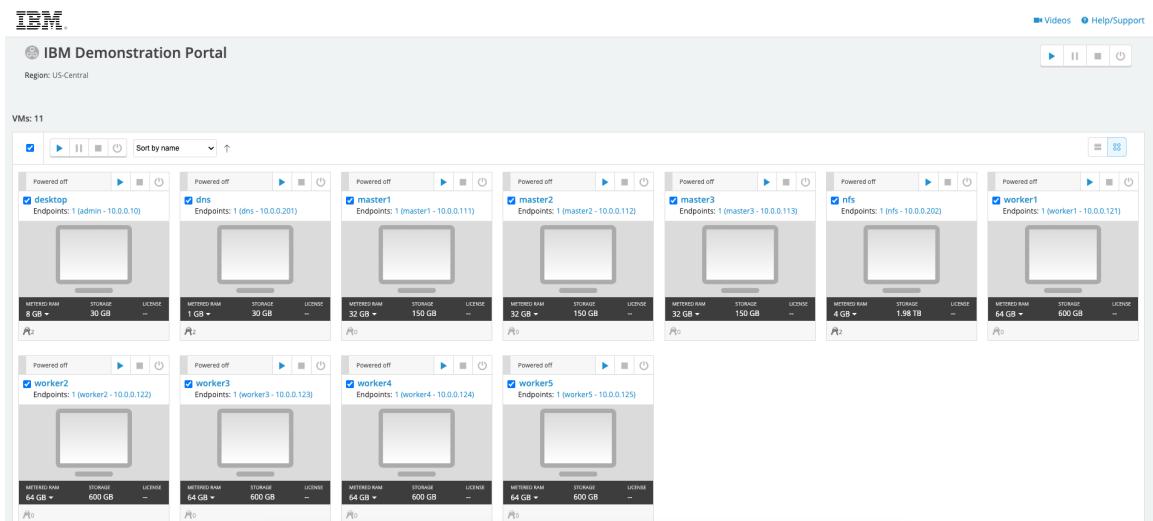
- 1) Access the OpenShift cluster on Skytap as per the skytap cluster URL and credential provided. Eg.

https://cloud.skytap.com/vms/xxxxx/desktops?sort=name&thumbnails=shown&view=html5&vm_id

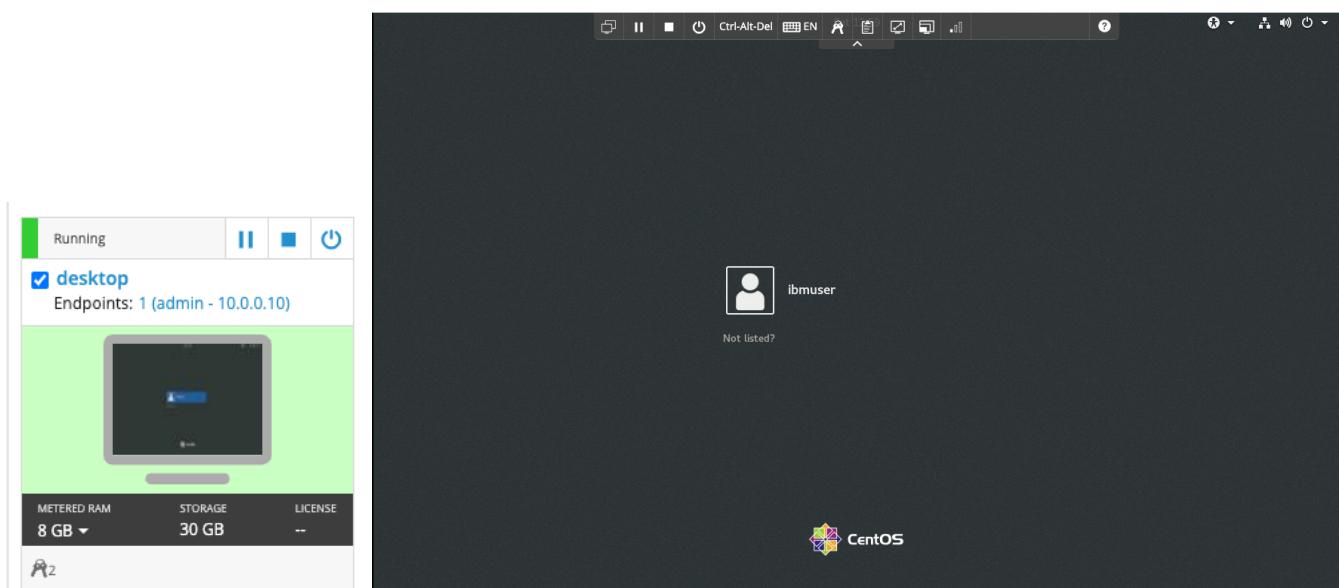
- 2) If the VMs are powered off, then Power on all VMs using the Top Start VM button



which starts all VMs in appropriate order.



- 3) Once all VMs are up, wait for few minutes and then click on the **desktop** VM to login to user desktop for accessing client applications. Login using the credentials provided.



- 4) Open the Chrome Browser shortcut from desktop. Open the Cloud pak for Data Web Console using the Bookmark. Eg.

<https://cpd-cpd-instance.apps.demo.ibmdte.net/zen/#/homepage>

- 5) Login to Web Console using **admin** ID and credentials provided.

Manage Users

- Once login, you will see the CP4D Console Home Page.

The screenshot shows the IBM Cloud Pak for Data home page. At the top, there's a header with a back arrow, forward arrow, a red warning icon, and the URL 'Not secure | cpd-cpd-instance.apps.demo.ibmndte.net/zen/#/homepage'. Below the header, there are three main sections: 'Discover services' (Extend the functionality of the platform by installing services from the catalog), 'Manage users' (Connect to your identity provider and specify who can access the platform), and 'Stay informed' (Monitor the services that are running and understand how you are using resources). To the right of these sections is a dark background graphic featuring blue and purple 3D cubes and a magnifying glass. Below these sections is an 'Overview' section with links to 'All projects', 'Instances', and 'Databases'. On the right side of the overview, there are four cards: 'Recent projects' (Banking Demo Project, Jul 13, 2022, 07:02 AM), 'Requests' (Data requests 0), and 'Notifications' (No notifications). The URL 'https://cpd-cpd-instance.apps.demo.ibmndte.net/zen/#/homepage...' is visible at the bottom of the page.

- An Admin User can further create more users eg. their team members to share the platform functionalities with them with appropriate access control. To create users, Navigate to **Administration -> Access Control**.

The screenshot shows the 'Administration' menu. The 'Access control' option is highlighted with a white box. Other options in the menu include Catalogs, Workflows, Customizations, Monitoring, Configurations, and Storage volumes.

- You can see the current list of Users. Click on **Add User +** to add more users.

The screenshot shows the 'Access control' page. At the top, there are tabs for 'Users', 'User groups', and 'Roles'. A 'Filter by: All roles' dropdown is open. Below the tabs is a search bar with 'Find users' placeholder text. The main area displays a table of users:

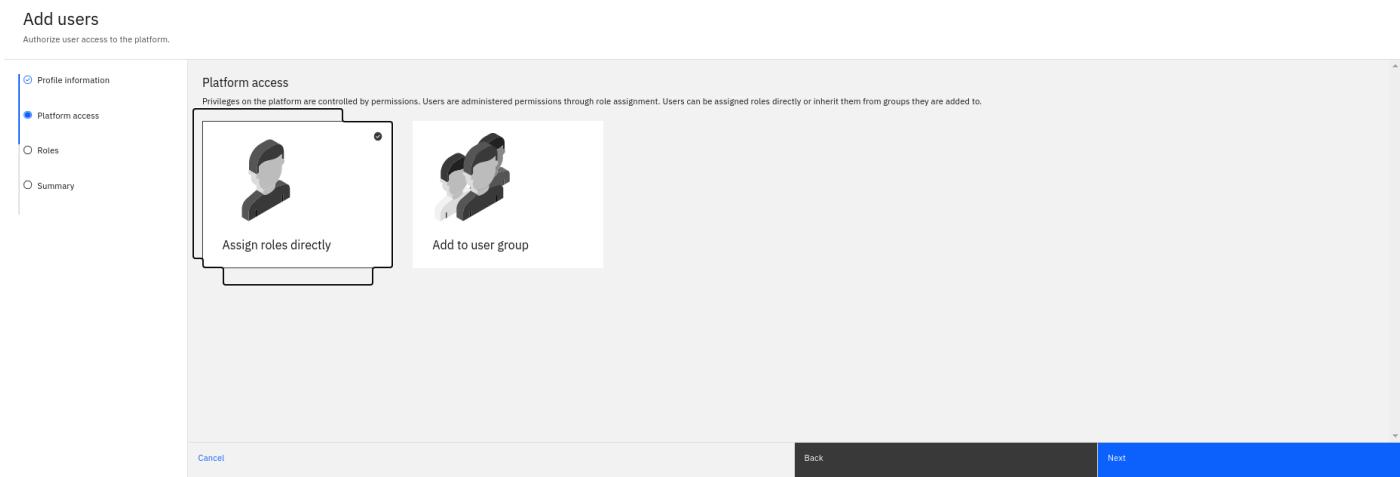
Name	User ID	Username	Created on	Roles
Jojo Joseph	1000331002	jojo	Jul 20, 2022 11:44 PM	Administrator + 8 more
admin	1000330999	admin	Jul 1, 2022 12:36 AM	Administrator + 6 more

At the bottom right of the table is a blue button labeled 'Add users +'. The URL 'https://cpd-cpd-instance.apps.demo.ibmndte.net/zen/#/access-control...' is visible at the bottom of the page.

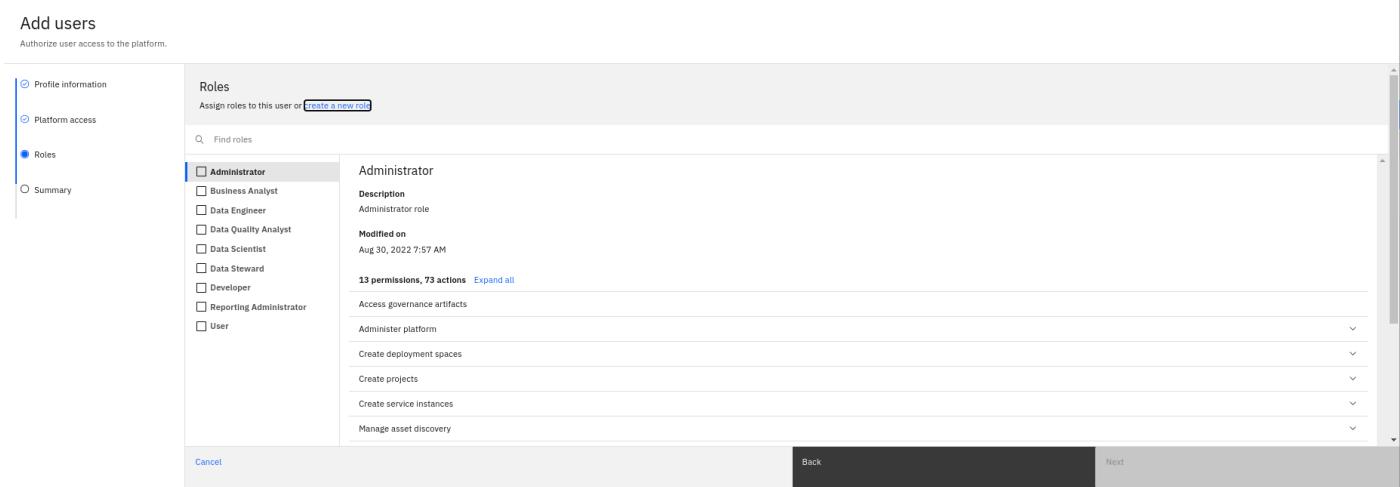
- Define the new user profile information. Click **Next**.

The screenshot shows the 'Add users' profile information form. The left sidebar has three tabs: 'Profile information' (selected), 'Platform access', and 'Summary'. The 'Profile information' tab contains fields for 'Full name (optional)' (db2admin), 'Username' (db2admin), 'Email (optional)' (The user's email address), 'Password' (*****), and 'Confirm password' (*****). Below these fields is a link 'Add additional user +'. At the bottom of the form are 'Cancel', 'Back', and a large blue 'Next' button.

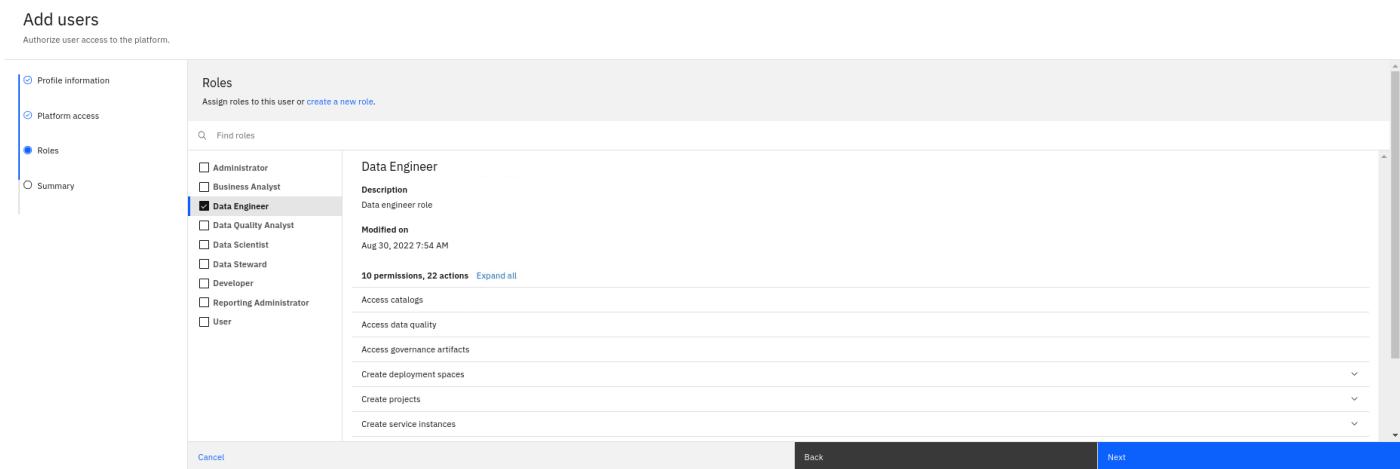
5) Select **Assign Roles Directly** and click on **Next**.



6) Select the Data Engineer Role. To see the full details of all roles and permissioned, refer [here](#).



7) Click Next.



8) Click Add on the Summary Window.

Add users

Authorize user access to the platform.

The screenshot shows the 'Add users' interface with a sidebar containing 'Profile information', 'Platform access', 'Roles', and 'Summary'. The main area displays a 'Summary' section with a note to review the following summary before adding the user. It includes sections for 'Profile information' (Username: db2admin, Name: db2admin, Email: -), 'Roles' (Role name: Data Engineer, Description: Data engineer role), and 'Access' (Permissions: Access catalogs, Access data quality). At the bottom are 'Cancel', 'Back', and 'Add' buttons.

- 9) The New User will be added. Similarly you may add more users as needed for your team members.

The screenshot shows the 'Access control' interface with tabs for 'Users', 'User groups', and 'Roles'. A search bar and a 'Find users' input field are at the top. A table lists three users: db2admin, Jojo Joseph, and admin, with columns for Name, User ID, Username, Created on, and Roles. An 'Add users' button is visible on the right.

Provision the necessary services

This lab requires the Data Virtualisation service as well as a Db2 service to prepare the data source.

- 1) Navigate back to CP4D Web Console Home Page.

The screenshot shows the IBM Cloud Pak for Data homepage with a 'Welcome, admin!' message. It features three main sections: 'Discover services' (Extend functionality by installing services from the catalog), 'Manage users' (Connect to your identity provider and specify who can access the platform), and 'Stay informed' (Monitor running services and understand resource usage). Below these are sections for 'Overview', 'Recent projects' (Banking Demo Project, Jul 13, 2022 07:02 AM), 'Requests' (Data requests 0), and 'Notifications' (No notifications).

- 2) Review all the Menu Items. Click on **Services -> Instances** to check the status of all instances.

The screenshot shows two side-by-side views of the IBM Cloud Pak for Data navigation menu. Both menus have a 'Filter navigation' search bar at the top. The left menu shows a flat list of items: Home, Task inbox, Data (with Platform connections, Databases, Data virtualization, Data requests), Projects (All projects, Jobs, Active runtimes), Catalogs (All catalogs, Model inventory). The right menu shows a hierarchical structure: Model inventory, Governance, Deployments, Services (Services catalog, Instances), Administration (Catalogs, Workflows, Access control, Monitoring, Customizations, Configurations, Storage volumes), Support. The 'Instances' item under 'Services' is highlighted in both menus.

- 3) Review the currently provided instances and its status. The status for all the services should be **green**. Data Virtualization Instance (dv) should already be provisioned, along with Data Management Console to manage the DB2/Data Virtualization Data.
- 4) Click **New Instance +** Button to see what all services are already enabled.

The screenshot shows the 'Instances' page in the IBM Cloud Pak for Data interface. At the top, there's a search bar and a 'New instance +' button. Below is a table with columns: Name, Type, Created by, vCPU requests, Memory requests (GiB), Users, Status, and Created on. The table lists four services:

Name	Type	Created by	vCPU requests	Memory requests (GiB)	Users	Status	Created on
ds-px-default The default DataStage runtime insta...	datastage	admin	2.50	6.00 Gi	1	Green	Jul 12, 2022
data-virtualization	dv	admin	11.50	38.50 Gi	1	Green	Jul 6, 2022
data-management-console Data Management Console	dmc	admin	4.20	10.62 Gi	1	Green	Jul 6, 2022
openscale-defaultinstance IBM Watson OpenScale	aio	admin	0.00	0.00 Gi	1	Green	Jul 1, 2022

- 5) Review the status for all services. You will see that many services like Watson Studio or Cognos Dashboard are already enabled.

The screenshot shows the 'Select a service' page in the IBM Cloud Pak for Data interface. At the top, it says 'Instances / Select a service /'. Below is a section titled 'Select a service' with the sub-instruction 'Select the service for which you want to create a new instance.' A note below says 'AI 3 items'. There are three service cards:

- Watson Machine Learning**: IBM. Description: Build and train machine learning models with tools for all skill levels. Deploy and manage models at scale. Status: Enabled ✓
- Watson OpenScale**: IBM. Description: Infuse your AI with trust and transparency. Understand how your AI models make decisions to detect and mitigate bias. Status: Enabled ✓
- Watson Studio**: IBM. Description: Unleash the power of your data. Build custom models and infuse your business with AI and machine learning. Status: Enabled ✓

IBM Cloud Pak for Data

Instances / Select a service /

Select a service

Select the service for which you want to create a new instance.

Analytics 5 items

Analytics Engine powered by Apache Spark IBM Automatically spin up lightweight, dedicated Apache Spark clusters to run a wide range of workloads. Enabled ✓	Data Refinery IBM Simplify the process of preparing large amounts of raw data for analysis. Enabled ✓	DataStage IBM • Premium Build trusted ETL and ELT pipelines to integrate data for AI and operational use. Enabled ✓	Decision Optimization IBM Evaluate millions of possibilities to find the best solution to any given problem. Enabled ✓	SPSS Modeler IBM Create flows to prepare and blend data, build and manage models, and visualize the results. Enabled ✓
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Dashboards 1 item

Cognos Dashboards IBM Identify patterns in your data with sophisticated visualizations. No coding needed. Enabled ✓
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IBM Cloud Pak for Data

Instances / Select a service /

Select a service

Select the service for which you want to create a new instance.

Watson Knowledge Catalog
IBM

Organize and govern data. Automatically discover, classify, profile, and protect your data so data scientists can find trusted data fast.
Enabled ✓

Data sources 3 items

Data Virtualization IBM Query many data sources as one. Enabled ✓	Db2 IBM Relational database that delivers advanced data management and analytics capabilities for transactional and warehousing workloads. Available ⓘ	Db2 Data Management Console IBM Administer, monitor, manage, and optimize your Db2 databases from a single web-based console. Enabled ✓
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DB2

1. If you have a *Db2* service listed, then there is no need to provision another instance. Otherwise, follow these steps to procure a DB2 instance.
2. Under the services selection page, select **DB2**. Note that the service status is Available. For rest, the status is enabled.

IBM Cloud Pak for Data

Instances / Select a service /

Select a service

Select the service for which you want to create a new instance.

Data sources 3 items

Data Virtualization IBM Query many data sources as one. Enabled ✓	Db2 IBM Relational database that delivers advanced data management and analytics capabilities for transactional and warehousing workloads. Available ⓘ	Db2 Data Management Console IBM Administer, monitor, manage, and optimize your Db2 databases from a single web-based console. Enabled ✓
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Developer tools 1 item

RStudio Server with R3.6 Partner Optional development environment for

3. Click New Instance.

The screenshot shows the IBM Cloud Pak for Data Instances page. On the left, there's a sidebar with 'Db2' selected. The main area displays 'Summary' information for the Db2 service, including its type (Database), version (11.5.7.0-cn5-x86_64), provider (IBM), category (Data sources), and related links (Docs). A large red box highlights the 'New instance' button in the top right corner of the main content area.

4. Provide the DB Details like DB Name (Max 8 Chars). Scroll Down.

The screenshot shows the 'Create a database' configuration page under the 'Type' tab. The 'Database name' field is filled with 'Customer'. Other configuration options include 'Number of nodes' (set to 1), 'CPU per node for Db2' (set to 2.1), 'Memory per node for Db2' (set to 5.5), and a checkbox for 'Deploy database on dedicated nodes'. The 'Configure' tab is also visible on the left.

5. Select Single Location for all Data Option and click Next.

The screenshot shows the 'Create a database' configuration page under the 'Storage structure' tab. The 'Memory per node for Db2' slider is set between 5.5 and 18, with 5.5 selected. The 'Select a storage option' section has the 'Single location for all data' radio button selected, which is highlighted with a red box. The 'Next' button at the bottom is also highlighted with a red box.

6. Click **Next** on the advanced configuration.

The screenshot shows the 'Advanced configuration' step of the database creation process. On the left, a sidebar lists steps: Type, Configure, Advanced configuration (which is selected), Storage, and Finalize. The main panel title is 'Advanced configuration'. It contains an unchecked checkbox for 'Oracle compatibility' and a dropdown menu for 'Page size' set to '16384'. In the bottom right corner, there are 'Cancel', 'Previous', and 'Next' buttons, with 'Next' being highlighted with a red box.

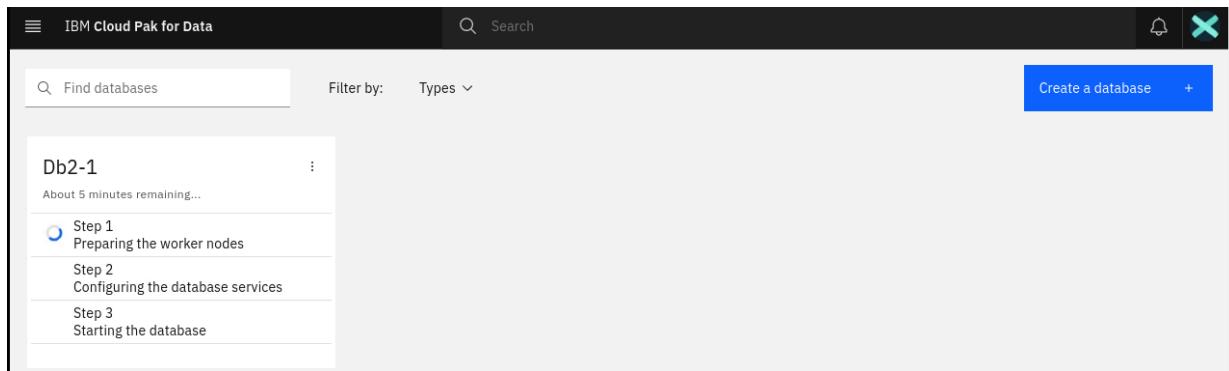
7. Configure the Storage Size and Click **Next**.

The screenshot shows the 'Storage' step of the database creation process. The sidebar shows 'Storage' is selected. The main panel title is 'Storage'. It includes options for 'Create new storage' (selected) or 'Use existing storage', and sub-options for 'Use storage template' (selected) or 'Define storage parameters'. A 'Storage class' dropdown is set to 'managed-nfs'. Below it, a 'Size' field is highlighted with a red box, showing a slider at '1', a value input field at '1000', and a unit dropdown at 'GiB'. At the bottom right are 'Cancel', 'Previous', and 'Next' buttons, with 'Next' being highlighted with a red box.

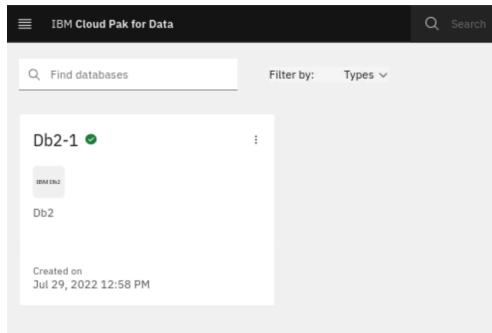
8. Click **Create** on the summary screen.

The screenshot shows the summary screen after all steps have been completed. A yellow warning box at the top states: 'Warning: You did not select deployment on dedicated nodes. For production environments, you must deploy the database on one or more dedicated nodes. For information on setting up dedicated nodes, see <https://www.ibm.com/docs/en/cloud-paks/cp-data/4.0?topic=db2-setting-up-dedicated-nodes>'. The sidebar shows all steps are completed: Type, Configure, Advanced configuration, Storage, and Finalize. The main panel title is 'Finalize'. It displays 'Database details' (Database name: Customer, Database type: db2oltp, Software version: 11.5.7.0-cn5-x86_64, Number of nodes: 1 Nodes, CPU per node: 2.1 Cores) and 'Storage' settings (HADR: Disabled, Storage class: managed-nfs, Size: 1 GiB). At the bottom right are 'Cancel', 'Previous', and 'Create' buttons, with 'Create' being highlighted with a red box.

9. It will start provisioning the service.



10. The service will be provisioned in 10-20 min depends on the configuration chosen.



11. Verify that the services are provisioned on your *Service instances* page.

Instances							
Filter by: Type ▾ Status ▾							
Find instances							
Name	Type	Created by	vCPU requests	Memory requests (GiB)	Users	Status	Created on
Db2-1 Service instance for db2oltp-16591138850024...	db2oltp	admin	2.20	5.75 Gi	1	Green	Jul 29, 2022
ds-px-default The default DataStage runtime instance	datastage	admin	2.50	6.00 Gi	1	Green	Jul 12, 2022
data-virtualization	dv	admin	11.50	38.50 Gi	1	Green	Jul 6, 2022
data-management-console Data Management Console	dmc	admin	4.20	10.62 Gi	1	Green	Jul 6, 2022
openscale-defaultinstance IBM Watson OpenScale	aios	admin	0.00	0.00 Gi	1	Green	Jul 1, 2022

12. For the *Db2 instance*, and select **Manage Access**.

Instances							
Filter by: Type ▾ Status ▾							
Find instances							
Name	Type	Created by	vCPU requests	Memory requests (GiB)	Users	Status	Created on
Db2-1 Service instance for db2oltp-16591138850024...	db2oltp	admin	2.20	5.75 Gi	1	Green	Jul 29, 2022
ds-px-default The default DataStage runtime instance	datastage	admin	2.50	6.00 Gi	1	Green	Jul 12, 2022
data-virtualization	dv	admin	11.50	38.50 Gi	1	Green	Jul 6, 2022
data-management-console Data Management Console	dmc	admin	4.20	10.62 Gi	1	Green	Jul 6, 2022
openscale-defaultinstance IBM Watson OpenScale	aios	admin	0.00	0.00 Gi	1	Green	Jul 1, 2022

13. Review the users with Access to DB2.

The screenshot shows the 'Access management' page for the 'Db2-1' instance. At the top, there's a search bar and a 'Find users' button. Below that is a table with columns: 'Name', 'Username', and 'Service role'. A single row is shown for the user 'admin', which is highlighted with a green checkmark icon. To the right of the table is a blue 'Add users' button with a '+' sign. The table has a header row with checkboxes for filtering by name.

14. You may need to add new users here for them to have access to manage DB2 Services.

PostgreSQL

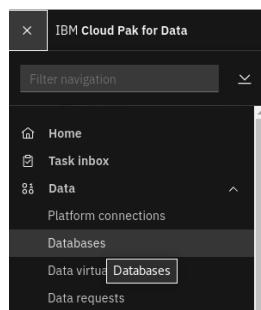
A external PostgreSQL DB database has been already prepared for the lab with the following connection details.

- Database Name: vlyawtap
- Host Name: tiny.db.elephantsql.com
- Port: 5432
- User Name: vlyawtap
- Password: fXt4TyCB_W0d0LCaCaPF7MbLKWlpti60

Load data into your Db2 data source

The data sets you will use in this tutorial are available in the Practicum Github. You need to load those data sets into Db2.

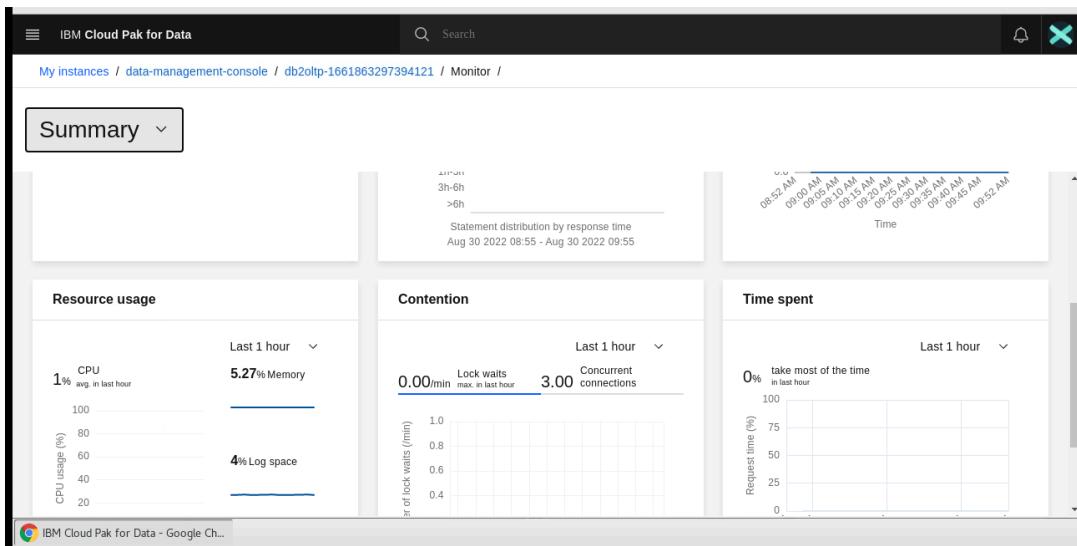
1. Access these two data sets in the GitHub, and download them to your local machine:
 - **Customers data set -> customers.csv** (To upload data in DB2 Database)
 - **Sales data set -> sales.csv** (For Reference only, as its already loaded in PostgreSQL DB)
2. Navigate to **Data -> Databases.**



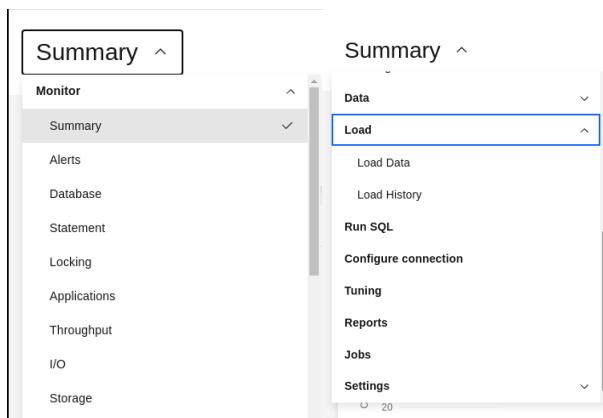
3. Click on **Open Database**

The screenshot shows the 'Databases' list. A context menu is open over the 'Db2-1' database entry. The menu items are: 'Open database', 'Details', 'Submit connection for approval', 'Manage access', and 'Delete'. The 'Open database' option is highlighted with a blue border. To the left of the menu, there's a small preview of the database entry, showing it's an 'IBM DB2' type and was created on 'Aug 30, 2022 8:41 AM'.

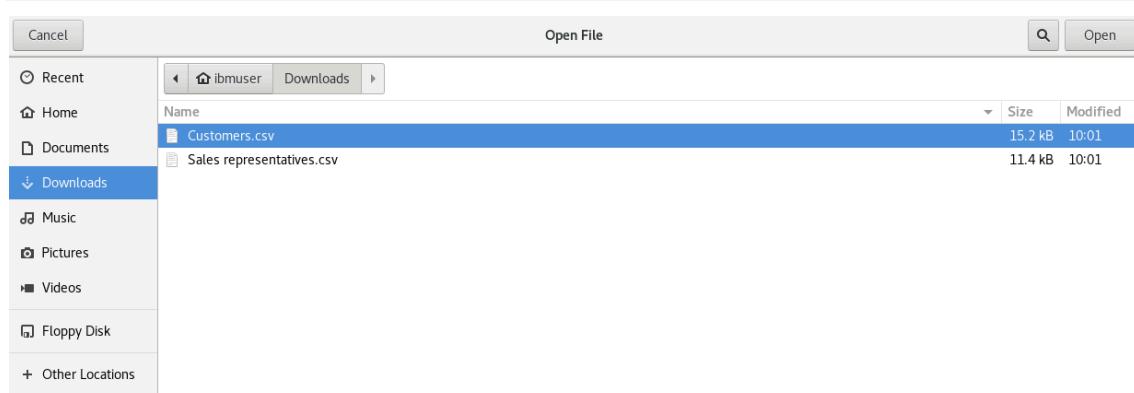
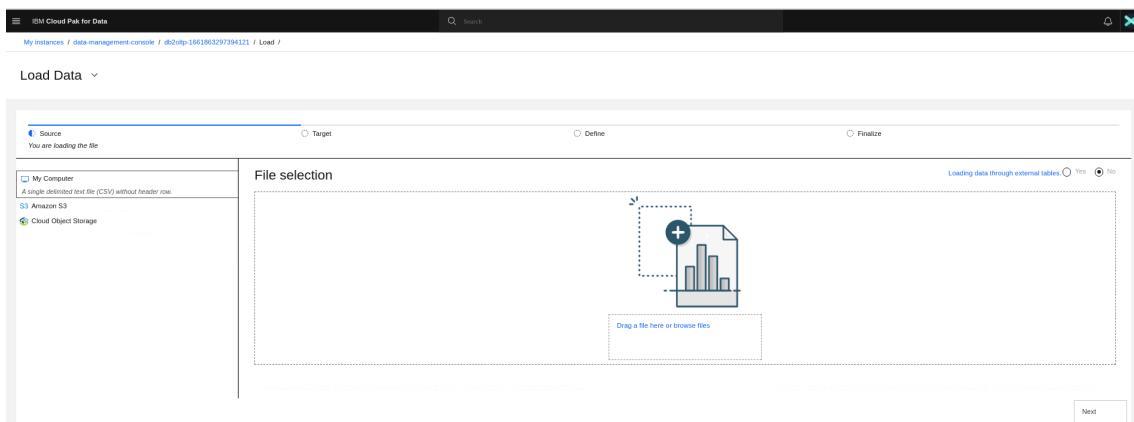
4. You will see the DB2 Database Summary. Click on the Summary Drop Down.



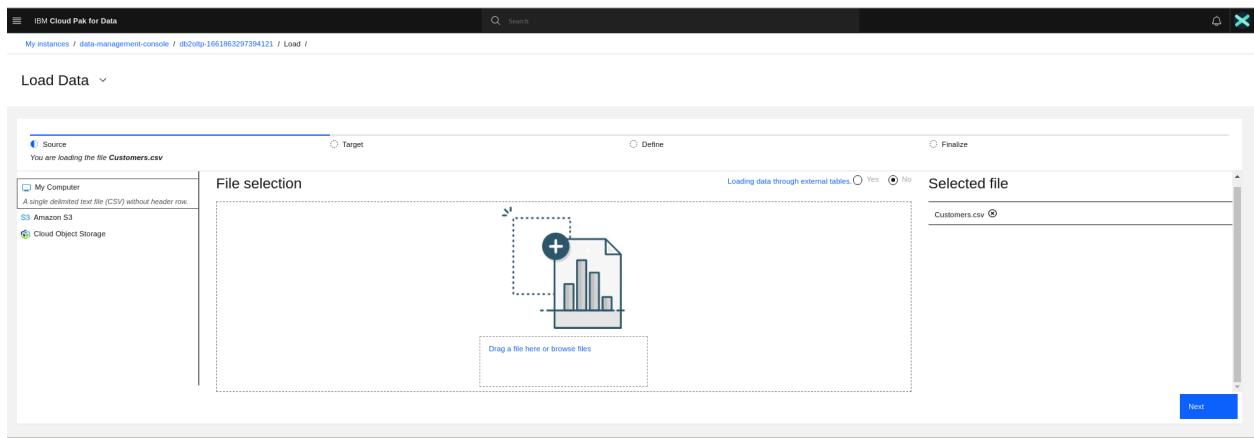
5. Under the Summary Drop down, click on Load -> Load Data.



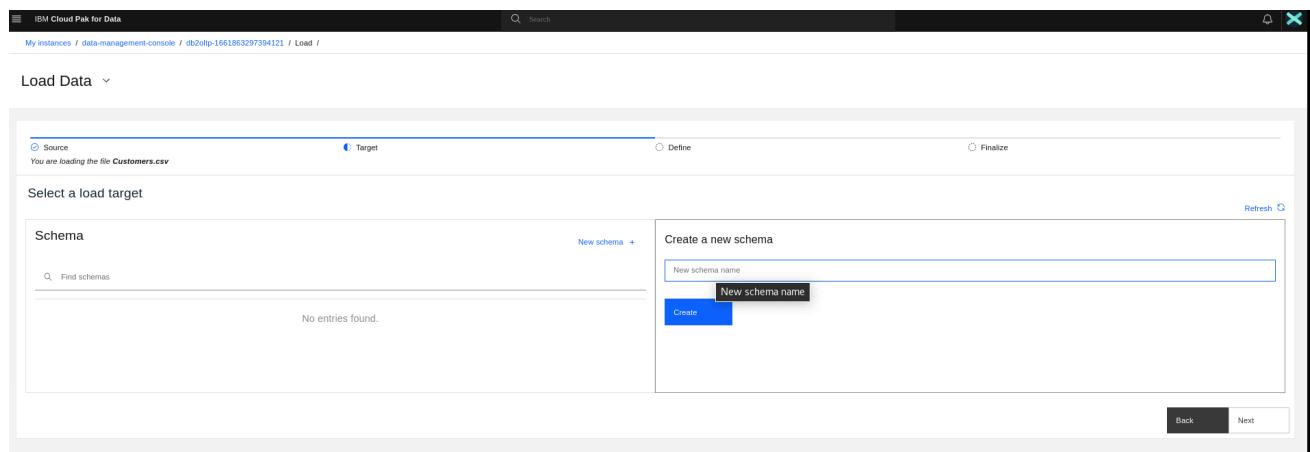
6. The DB2 Load Data Page will appear. Select or Drag the **customers.csv** file from your local machine into the *File Selection* panel in the Db2 console.



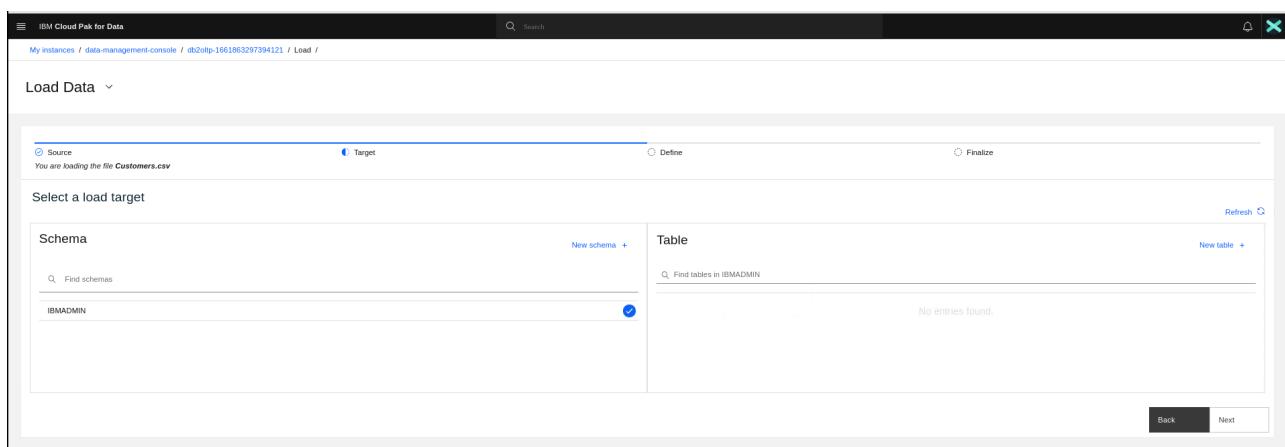
7. Click **Next**.



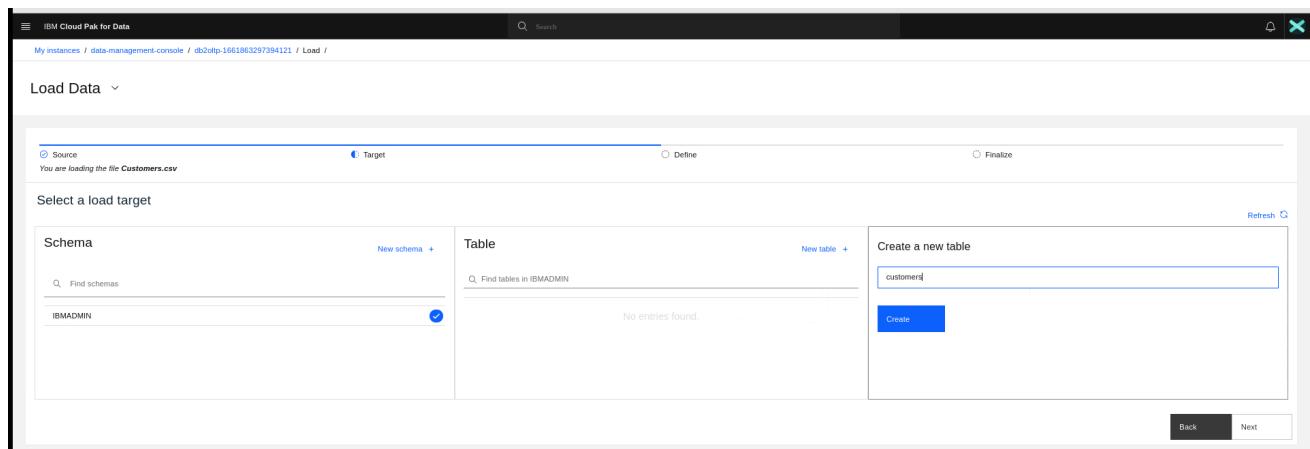
8. Click **New Schema +**. Enter a suitable name, eg. IBMADMIN. Click **Create**.



9. Click **New table +**.



10. Type **customers** for the table name, and click **Create**.



11.Click **Next** to continue.

The screenshot shows the 'Load Data' interface. At the top, it says 'Source' and 'Target'. Below that, it says 'You are loading the file Customers.csv into IBMADMIN.CUSTOMERS'. On the left, under 'Schema', there is a list of schemas including 'IBMADMIN'. On the right, under 'Table', there is a list of tables including 'CUSTOMERS'. At the bottom right, there are 'Back' and 'Next' buttons.

12.Review the data to be loaded, and click **Next**.

The screenshot shows the 'Load Data' interface with the 'Source' tab selected. It displays a preview of the 'Customers.csv' file data. The columns are labeled: CUST_ID, CUSTNAME, CITY, STATE, COUNTRY_CODE, POSTAL_CODE, EMAIL_ADDRESS, PHONE_NUMBER, and YTD_SALES. The data includes 10 rows of customer information. At the bottom right, there are 'Back' and 'Next' buttons.

13.Review the summary, and click **Begin Load**.

The screenshot shows the 'Load Data' interface with the 'Summary' section open. It displays various settings: Code page (1208), Separator (,), Time format (HH:MM:SS), Date format (YYYY-MM-DD), Timestamp format (YYYY-MM-DD HH:MM:SS), and String delimiter (Default). To the right, there is an 'Option' section with a maximum number of warnings set to 1000. At the bottom right, there are 'Back' and 'Begin Load' buttons.

14.Verify that the load is successful. Click **View Table**.

The screenshot shows the 'Load Details' interface. It displays a summary of the load: 100 rows read, 100 rows loaded, and 0 rows rejected. The status bar indicates the job is complete. The message 'The data load job succeeded.' is shown, along with 'No errors'. There are 'View Table' and 'Load More Data' buttons at the top right.

15.Table details will appear.

CUST_ID	CUSTNAME	CITY	STATE	OUNTRY_CODE	POSTAL_CODE	EMAIL_ADDRE...	PHONE_NUMBER	YTD_SALES	SALESREP_ID	NATIONALITY	NATIONAL_ID	CREDITCARD_...	CREDITCARD_...	CREDITCARD_...	CREDITCARD_...
	VARCHAR(20)	VARCHAR(20)	VARCHAR(20)	VARCHAR(20)	VARCHAR(20)	VARCHAR(50)	VARCHAR(20)	DECIMAL(6,2)	VARCHAR(4)	VARCHAR(4)	VARCHAR(10)	VARCHAR(20)	VARCHAR(20)	VARCHAR(20)	VARCHAR(20)
1	Michael Gorler	Aberdeen Alpina	TO	IT	10060	Michael.Gorler@spac	724-454-8453	90.30	SE133	IT	152-374-114	5668369040063070	American Express	10-24	4950
2	Renee Mullins	Columbus	OH	US	45101	Renee.K.mullins@spac	229-990-2162	0.00	NC169	UK	124-168-918	514658534673810	American Express	10-24	6951
3	Allen Schmidt	Aberdeen	PG	IT	6040	Allen.M.schmidt@spac	288-202-8653	304.00	RP385	U.S.	346-450-984	3410798390214380	Master Card	10-24	6120
4	Robert May	Houston	TX	US	79601	Robert.C.may@spac	630-492-6535	304.00	SE337	U.S.	516-264-270	49614185139110	VISA	10-24	1794
5	Joe Cruz	Harrisburg	VA	US	24210	Joe.D.cruz@spacbo	448-788-1089	180.30	WE355	ES	768-887-613	4914921923872130	VISA	10-24	7596
6	Rebecca White	Acone	RG	IT	97011	Rebecca.white@spac	828-268-4303	52.00	SC325	IT	910-870-499	5786936469848100	American Express	10-24	7822
7	Anthony Johnson	Achietten	DE		88480	Anthony.H.johnson@spac	907-111-5490	354.00	WE349	IT	595-442-524	419756259700000	VISA	11-24	9785
8	Alberto Fabian	Acquabona	BL	IT	32043	Alberto.T.fabian@spac	113-785-7672	352.00	SW211	CA	270-598-741	580393421795690	American Express	11-24	2725
9	Ronald Gordon	Acquaeris Del Capo	LE	IT	73040	Ronald.J.gordon@spac	994-960-8006	0.00	NW313	IT	862-654-325	561207670391070	American Express	11-24	5606
10	Christopher Marcello	Acquaeris	SA	IT	84080	Christopher.V.marcello@spac	717-217-7230	180.30	NC160	FR	173-526-693	595239336288150	American Express	11-24	7416
11	Chris Green	ACTON	UK		SY9 6CX	Chris.M.green@spac	933-753-6160	5860.40	RP385	U.S.	321-821-746	2781451162480500	Discover	11-24	6391
12	Neibert Crawford	Lansing	MI	US	49301	Neibert.T.crawford@spac	963-926-6221	6101.00	SW280	CA	626-436-952	2390938497157940	Discover	11-24	1802

16.Repeat steps 5-10 to load the **sales.csv** data set into the same schema with the table name **sales**.
<not needed as same table is uploaded and available from PostgreSQL DB>

17.Navigate back to **Data -> Databases** from the main navigation menu.

Db2-1

Created on Aug 30, 2022 8:41 AM

18.Click on Details .

Open database

19.Note down the connection details for this DB instance like hostname (worker1), Database Name (Customer), Port (30812 non SSL / 30076 SSL). You can use the admin user id credential to connect to the database later.

Details: Db2-1

About this database

Database name	Customer	Storage class (Storage)	managed-mls
Database type	db2oltp	Size (Storage)	1 GiB
Database software version	11.5.7.0-cn5-x86_64	Access information	
Processor	x86-64	JDBC Connection URL	jdbc:db2://CLUSTER_ACCESSIBLE_IP:30812/Customer;user=;password=;<password>3;securityMechanism=9;encryptionAlgorithm=2
Deployment id	db2oltp-1661863297394121	JDBC Connection URL (SSL)	jdbc:db2://CLUSTER_ACCESSIBLE_IP:30076/Customer;user=;password=;<password>3;securityMechanism=9;sslConnection=true;encryptionAlgorithm=2
Created on	Aug 30, 2022 8:41 AM	Download SSL Certificate	
Status	Available		

Nodes

HOSTNAME	CPU	MEMORY
worker1	2.1 cores	5.5 GiB

20. Again open the DB2 Database and Open the Summary Menu and select **Run SQL**.

The screenshot shows the IBM Cloud Pak for Data interface. The left sidebar has a tree view under 'Data' with nodes like Tables, Views, Indexes, Aliases, MQTs, Schemas, Sequences, Storage objects, Application objects, Authorization, Workloads, Load, Run SQL, Configure connection, Tuning, and Reports. The 'Authorization' node is expanded. The main area shows a table with columns 'Type' and 'Name'. The types listed are USER, GROUP, ROLE, and GROUP. The names listed are IBADM, IBMCONSOLE, IBM_RTMON, NULLID, SQLJ, SYSCAT, SYSFUN, SYSIBM, SYSIBADM, SYSIBINTERNAL, SYSIBMTS, SYSPROC, SYSPUBLIC, SYSTAT, and SYSTOOLS.

21. You can use the SQL interface to update the DB2 database as usual.

The screenshot shows the 'Run SQL' interface. On the left is a tree view of database objects: IBADMIN, IBMCONSOLE, IBM_RTMON, NULLID, SQLJ, SYSCAT, SYSFUN, SYSIBM, SYSIBADM, SYSIBINTERNAL, SYSIBMTS, SYSPROC, SYSPUBLIC, SYSTAT, and SYSTOOLS. The main area is titled 'Untitled - 1' and contains a SQL editor with the following script:

```
grant dbadmin on database to user db2admin;
grant secadm on database to user db2admin;
```

22. For example you can run below commands to grant full access to the database to newly created users.

The screenshot shows the 'Run SQL' interface with the same script as before. Below the editor, there are tabs for 'History' and 'Results'. The 'History' tab shows the command execution. The 'Results' tab shows a table with three rows:

Script	Date	Status	Runtime
grant dbadmin on database to user db2admin;	Aug 30, 2022 10:46:32 AM	2	0.028 s
grant secadm on database to user db2admin;		1	0.022 s
grant secadm on database to user db2admin;		1	0.006 s

Setting up Data Virtualization

You can use **Data Virtualization** to create a virtual table to segment or combine data from one or more tables. **Data Virtualization** connects multiple data sources into a single self-balancing collection of data sources or databases.

Task 1: Create a project

You need a project to store the virtualized data.

1. Login to CPD Platform. Click on the Hamburger Icon on the top left.

2. Select **View all Projects**. Alternatively All Projects can be accessed from Home Page under Overview Section.
3. If you have an existing project and want to reuse it, open it. If you don't have an existing project or want to use fresh new project, click **New project** on your **Projects** page.

4. Select **Create an empty project**.

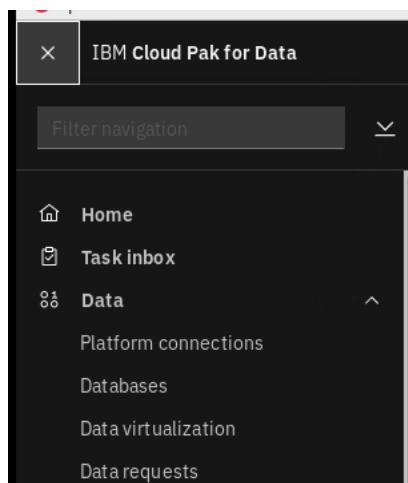
5. On the **Create a project** screen, add a name and optional description for the project. Click **Create**.

6. The Project will be created successfully.

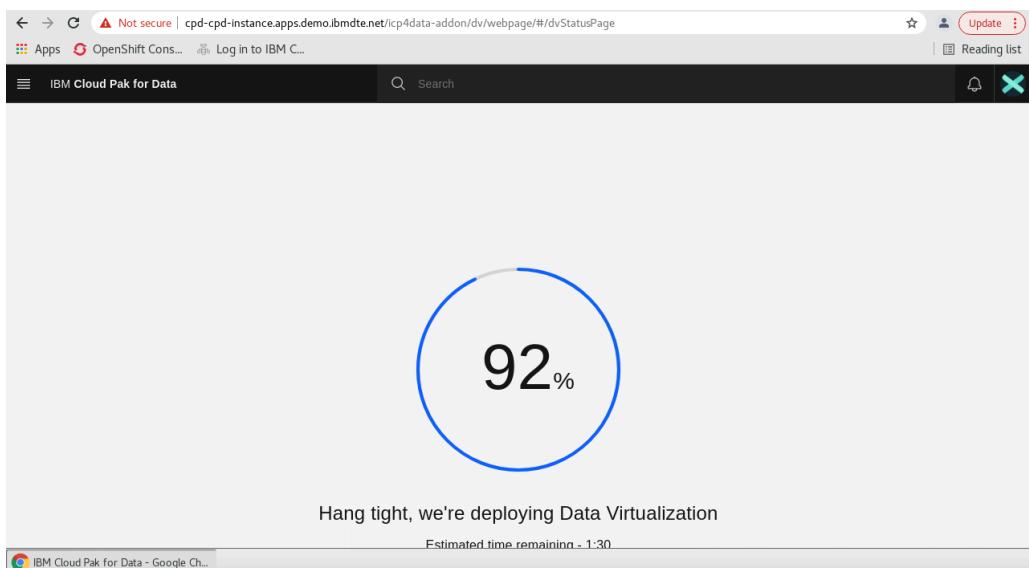
Task 2: Add a connection to your Db2 data source

Before you can virtualize the data, you need to create a connection to the data source.

- From the main navigation menu, select **Data > Data virtualization**.



- If opening for the first time, the Data Virtualization component may start to get initialized. Just wait until its fully deployed and Next screen appears.



- After initial initialization, the Data Virtualization Data Sources Page appears.

A screenshot of the Data Virtualization Data Sources page. The top navigation bar includes 'IBM Cloud Pak for Data', a search bar, and a 'Data sources' dropdown. Below the navigation is a toolbar with 'Set up remote connector' and 'Add connection' buttons. A 'Table view' button is selected. The main area displays a table with columns: Name, Endpoint, Type, Status, and Listed tables. The table currently shows a single row with a question mark icon and a person icon. The status column indicates 'Unknown'.

4. Click Add connection > New connection.

You don't have any data sources yet
Add a data source by creating a new connection or select from an existing platform connection or by searching for a data source via a remote connector

5. Select Db2. Click Select.

6. Complete the connection details based on the credentials you copied for your db2 instance .

7. Enter Database Name, Host Name and Non SSL Port as we noted earlier. Select the Credential Setting as Personal.

8. Enter Personal Credential of admin User. Click Create.

Create connection: Db2

Enter the connection information.

Connection overview
Connection details
Credentials
Certificates

Personal Shared

Cloud Pak for Data authentication ⓘ

Username* ⓘ
admin

Password* ⓘ

Username and Password Security Mechanism ⓘ
Default

Username and Password Encryption Algorithm ⓘ
Default

Certificates

Port is SSL-enabled ⓘ

Cancel Back Create

9. Click Skip

IBM Cloud Pak for Data

My instances / data-management-console / dv-1657090051946032 /

Add to a remote connector (optional)

You can add connections to remote connectors to enhance parallelism during processing and improve query performance.

Skip Add to connector

Remote connector	Hostname	Description	Port	Username

You haven't set up any remote connectors yet.
You must set up a remote connector to assign data sources to the connector. You must have the required permissions to set up remote connectors.

Set up remote connector +

10. The DB2 Data Source will be added as a Data Virtualization Source.

IBM Cloud Pak for Data

My instances / data-management-console / dv-1657090051946032 / Virtualization /

Data sources ▾

Set up remote connector Add connection +

Tell IBM what you think
Let us know what you think about IBM Cloud Pak for Data - Data Virtualization service. It only takes a few minutes, and your feedback will help us improve our product.
IBM Privacy Policy

No thanks Provide feedback

Table view Constellation view

Connections: 1 | Remote connectors: 0

Find by Name, Endpoint, Type

Name	Endpoint	Type	Status	Listed tables
CP4D DB2 Connection	worker1: 30812	Db2 Family	Active	318 / 318

Database Port Username Remote connector Description

Customer 30812 admin - CP4D DB2 Connection for Customers Data

Task 3: Add a connection to a PostgreSQL data source

For the purpose of Validating the Data Virtualization from Multiple Types of Data Sources, We have prepared a **PostgreSQL DB** as well with the *Sales.csv* data uploaded in table named *Sales_Rep*. Use below steps and given credentials to use the data from this PostgreSQL Data Source.

1. From the main navigation menu , select **Data > Platform Connections**. The list of configured *Data sources* displays.

2. Click **New connection**.

The screenshot shows the 'Data sources' section of the IBM Cloud Pak for Data interface. At the top right, there are buttons for 'Set up remote connector', 'Add connection', 'New connection', 'Existing platform connection', and 'Remote data source'. Below these, a feedback survey is displayed with 'Provide feedback' highlighted. The main table lists one connection:

Name	Endpoint	Type	Status	Listed tables
CP4D DB2 Connection	worker1: 30812	Db2 Family	Active	318 / 318
Database	Port	Username	Remote connector	Description
Customer	30812	admin	-	CP4D DB2 Connection for Customers Data

3. Select **PostgreSQL** and click **Select**.

The screenshot shows the 'New connection' dialog. On the left, a provider dropdown shows 'IBM', 'Third-party', and 'User-defined'. A search bar at the top right contains 'Supported connection types'. The main area shows a list of connection types under 'All connection types', with 'PostgreSQL' highlighted. To the right, a sidebar shows 'Selected connection type' set to 'PostgreSQL'.

4. Enter the Connection Name and Description.

The screenshot shows the 'Create connection: PostgreSQL' dialog. The 'Connection overview' tab is selected. It displays a 'Name' field containing 'PostgreSQL on ElephantSQL' and a 'Description' field containing 'Added by Sandeep Ved - Testing'. Navigation buttons at the bottom include 'Cancel', 'Back', and 'Create'.

5. Enter the Connection Details and Credentials as below. Click **Next**.

- Database Name: vlyawtap
- Host Name: tiny.db.elephantsql.com
- Port: 5432
- Credential: Personal
- User Name: vlyawtap
- Password: fXt4TyCB_W0d0LCaCaPF7MbLKWlpti60

Create connection: PostgreSQL

Enter the connection information.

Connection overview	Database* ⓘ vlyewtsp
Connection details	Hostname or IP address* ⓘ tinydb.elephantsql.com
Credentials	Port* ⓘ 5432
Certificates	
Credentials	
Credential setting ⓘ <input checked="" type="radio"/> Personal <input type="radio"/> Shared	
Username* ⓘ vlyewtsp	
Password* ⓘ <input type="button" value="Show password"/>	
Certificates	
<input type="checkbox"/> Port is SSL-enabled ⓘ	

[Cancel](#) [Back](#) [Create](#)

6. Click Skip.

My instances / data-management-console / dv-1649188282576777 /

Add to a remote connector (optional)

You can add connections to remote connectors to enhance parallelism during processing and improve query performance.

[Skip](#) [Add to connector](#)

Remote connector	Hostname	Description	Port	Username
				

You haven't set up any remote connectors yet.

7. The new data source will be added.

IBM Cloud Pak for Data

My instances / data-management-console / dv-1657090051946032 / Virtualization /

Data sources

[Table view](#) [Constellation view](#) [Set up remote connector](#) [Add connection](#)

Connections: 2 | Remote connectors: 0

[Find by Name, Endpoint, Type](#)

Name	Endpoint	Type	Status	Listed tables
PostgreSQL db on ElephantSQL	tinydb.elephantsql.com: 5432	PostgreSQL	Active	2 / 2
CP4D DB2 Connection	worker1: 30812	DB2 Family	Active	318 / 318

Task 4: Add tables to your virtualized data

With the connection defined, you can virtualize data from that data source.

- From the *Data sources* menu, select **Virtualization > Virtualize**.

IBM Cloud Pak for Data

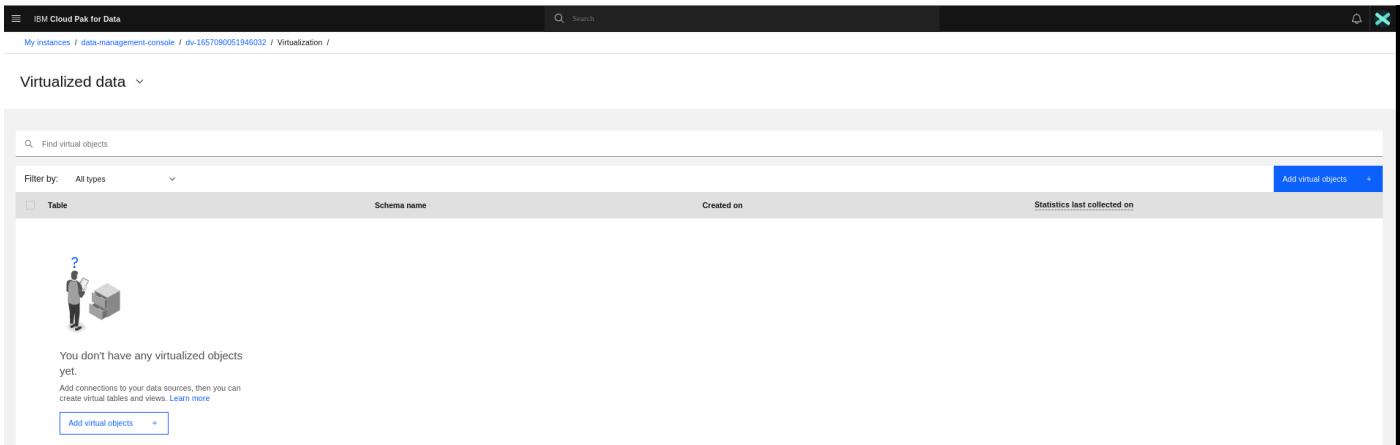
My instances / data-management-console / dv-1657090051946032 / Virtualization /

Data sources

- Virtualization
 - Data sources
- Virtualize
 - Virtualized data
 - Cache management
- Monitor
- Data
- Run SQL
- Administration

Endpoint
tinydb.elephantsql.com: 5432
worker1: 30812

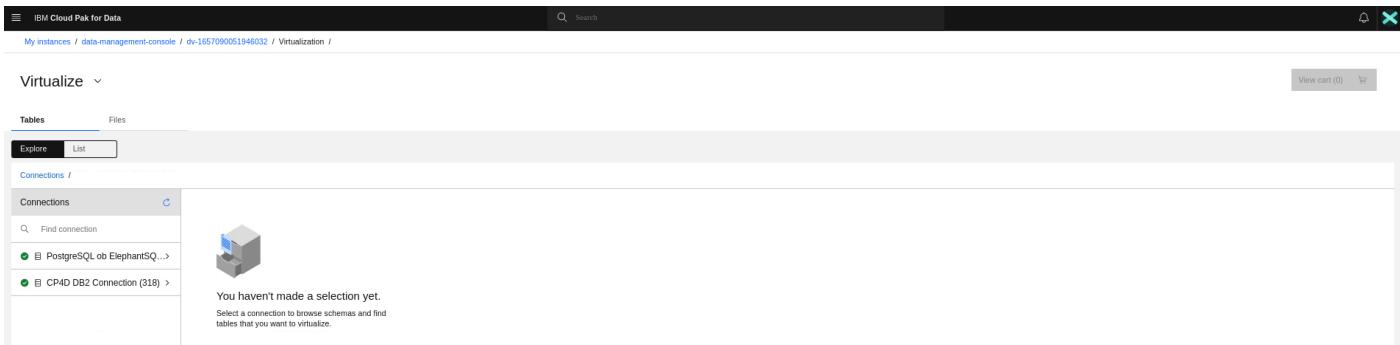
2. Click on Add Virtual Objects.



You don't have any virtualized objects yet.
Add connections to your data sources, then you can create virtual tables and views. [Learn more](#)

Add virtual objects

3. You will see the available connections from where data can be virtualized.

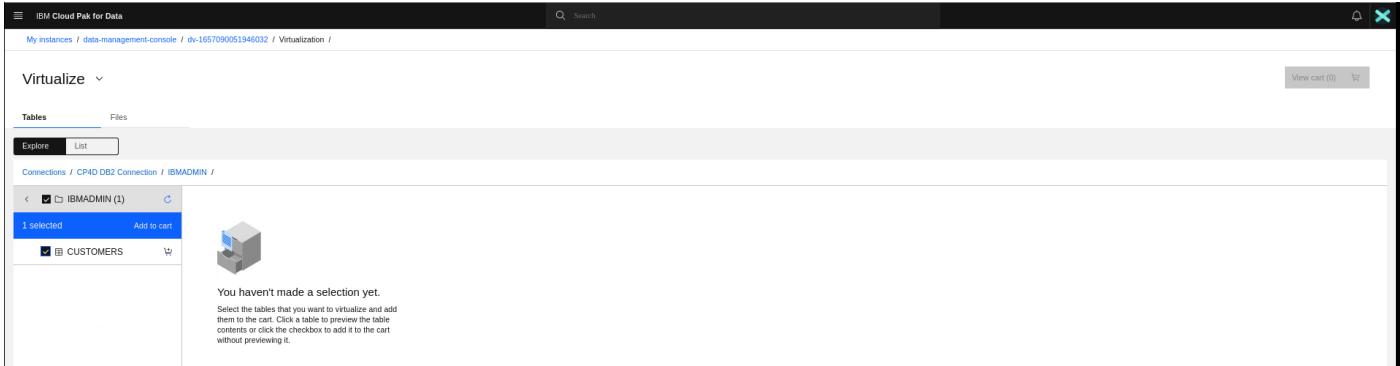


Find connection

- PostgreSQL on ElephantSQL...
- CP4D DB2 Connection (318)

You haven't made a selection yet.
Select a connection to browse schemas and find tables that you want to virtualize.

4. Select CP4D DB2 Connection -> IBMADMIN -> CUSTOMERS Table and click Add to cart.

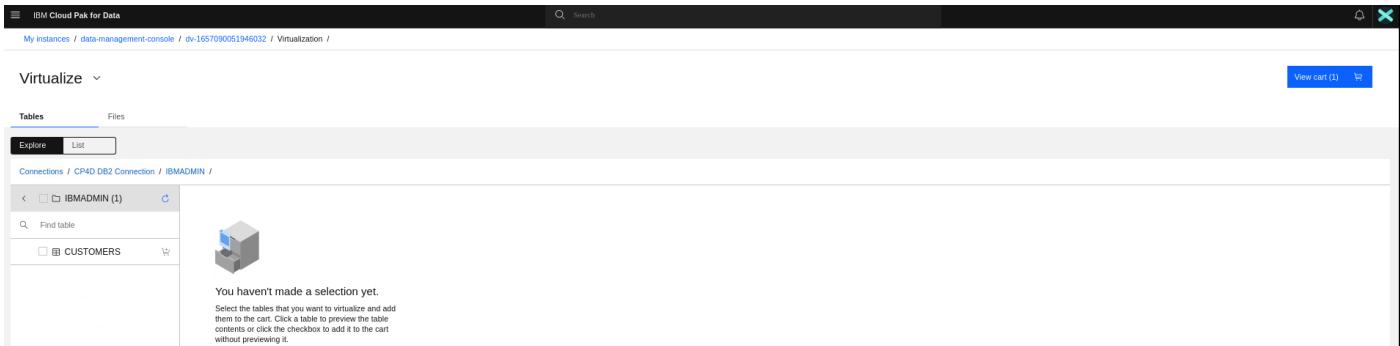


Find table

- CUSTOMERS

You haven't made a selection yet.
Select the tables that you want to virtualize and add them to the cart. Click a table to preview the table contents or click the checkbox to add it to the cart without previewing it.

5. Click on Connections link again.



Find table

- CUSTOMERS

You haven't made a selection yet.
Select the tables that you want to virtualize and add them to the cart. Click a table to preview the table contents or click the checkbox to add it to the cart without previewing it.

6. Select PostgreSQL on ElephantSQL -> sample -> sales_rep tables from the list, and click Add to cart.

7. Click View cart.

8. Select Assign to **Virtualized data** to add these two tables to your list of virtualized data. Click **Virtualize**.

9. Click **Confirm**.

10. Click **Go to virtualized data**.

Table	Schema	Virtualization status	Publish status
CUSTOMERS	ADMIN	✓ Success	✓ Success
SALES_REP	ADMIN	✓ Success	✓ Success

11. You can see the virtualized data.

The screenshot shows the 'Virtualized data' screen in the IBM Cloud Pak for Data interface. At the top, there is a search bar and a navigation bar with the path: My instances / data-management-console / dv-1657090051946032 / Virtualization /. Below the navigation is a dropdown menu labeled 'Virtualized data'. A search bar with the placeholder 'Find virtual objects' is present. A blue header bar indicates '1 item selected'. The main table has columns: 'Table', 'Schema name', 'Created on', and 'Statistics last collected on'. Two rows are listed: 'SALES_REP' (Schema: ADMIN, Created: Sep 2, 2022 11:21 AM, Statistics: Not collected) and 'CUSTOMERS' (Schema: ADMIN, Created: Sep 2, 2022 11:21 AM, Statistics: Not collected). Action buttons at the top right include 'Manage access', 'Join', 'Assign', 'Publish to catalog', and 'Cancel'.

Task 5: Join and Publish virtualized data to project

Next, join two tables to create a virtualized asset and publish that to a catalog and project.

1. On the *Virtualized data* screen, select the **customers** and **sales_rep** tables from the list, and click **Join**.

The screenshot shows the 'Virtualized data' screen with '2 items selected'. The 'SALES_REP' and 'CUSTOMERS' tables are now checked in the list. The rest of the interface is identical to the previous screenshot, showing the same schema and creation dates.

2. Connect the **SALESREP_ID** columns in the two tables. Click **Preview**.

The screenshot shows the 'Join virtual objects' screen. It displays two tables: 'Table 1: SALES_REP' and 'Table 2: CUSTOMERS'. Both tables have a 'Find columns' search bar. The 'SALESREP_ID' column is selected in both tables. A blue line with arrows connects the 'SALESREP_ID' column in Table 1 to the 'SALESREP_ID' column in Table 2, indicating they are being joined. The right side of the screen shows a preview area with tabs for 'Back', 'Preview' (which is active), and 'Next'. It also includes an 'Open in SQL editor' button, 'Join keys' (with 'SALESREP_ID' selected), and 'Filters'. A note says: 'After you select at least two columns of different data types, click Preview to ensure that the columns were properly joined. Preview can take a while if you are joining large tables. Click Next to continue joining these tables.' A preview table shows the joined columns: 'SALESREP_ID' from 'SALES_REP' and 'SALESREP_ID' from 'CUSTOMERS'.

3. Close the Preview Popup and Click **Next**.

New join preview

SALESREP_ID	FIRST_NAME	LAST_NAME	NATIONALITY	NATIONAL_ID	PHONE_NUMBER	AGE	SEX	TERRITORY	EM
NC160	Betsy	Adams	UK	124-168-918	229-990-2162	35	F	NorthCentral	Bets
NC166	Penney	Hayes	FR	516-264-270	630-492-6535	50	F	NorthCentral	Pen
NC169	Fredericka	King	ES	766-887-613	448-788-1089	88	F	NorthCentral	Fre
NC169	Fredericka	King	ES	766-887-613	448-788-1089	88	F	NorthCentral	Fre
NC232	Lakeesha	Jenkins	IT	910-870-499	828-268-4303	21	F	NorthCentral	Lak
NC232	Lakeesha	Jenkins	IT	910-870-499	828-268-4303	21	F	NorthCentral	Lak

4. Review the joined table, and click **Next**.

Edit column names

SALESREP_ID	FIRST_NAME	LAST_NAME	NATIONALITY	NATIONAL_ID	PHONE_NUMBER	AGE
NC160	Betsy	Adams	UK	124-168-918	229-990-2162	35
NC166	Penney	Hayes	FR	516-264-270	630-492-6535	50
NC169	Fredericka	King	ES	766-887-613	448-788-1089	88
NC169	Fredericka	King	ES	766-887-613	448-788-1089	88
NC232	Lakeesha	Jenkins	IT	910-870-499	828-268-4303	21
NC232	Lakeesha	Jenkins	IT	910-870-499	828-268-4303	21

5. For the view name, type joined_customers_sales_table. Select a project from the list that was created earlier, eg. Data Virtualization Project. Click **Create view**.

Assign and review

View name: joined_customers_sales_table

Schema name: ADMIN

Assign to (all tables will be assigned to the same project)

Data request Project Virtualized data

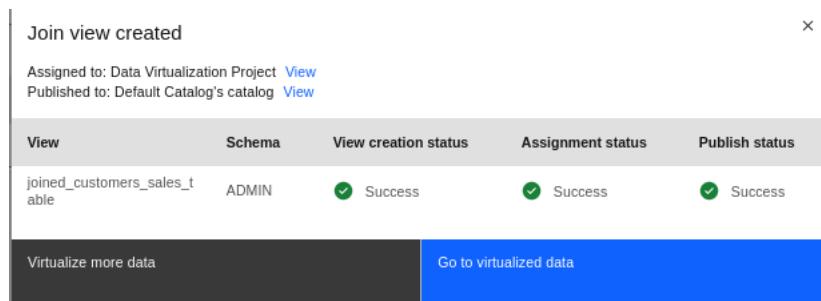
Publish to

Catalog

Default Catalog

Create view

6. When the process completes, Click **Go to Virtualized Data**.



7. Navigate to Projects -> Data Virtualization Project to view the project to preview the virtualized data.

Table	Schema name	Created on	Statistics last collected on
joined_customers_sales_table	ADMIN	Sep 2, 2022 11:28 AM	Not applicable
SALES_REP	ADMIN	Sep 2, 2022 11:21 AM	Not collected
CUSTOMERS	ADMIN	Sep 2, 2022 11:21 AM	Not collected

8. Click on the project created earlier.

Name	Date created	Your role	Collaborators
Data Virtualization Project	3 days ago	Admin	AA
Banking Demo Project	2 months ago	Admin	AA
Datastage Demo Assets	2 months ago	Admin	AA

9. Navigate to **Assets** Tab. You will see the virtual view and the connect object to the Data Virtualization Service.

10. Normally, You will need an Credential or API key to view the data in the project. This credential can be saved in the connection object so that its not prompted again and again. Click on the Connection object eg. DSXXXXXX.

Name	Last modified
joined_customers_sales_table	4 minutes ago admin (You)
DS16621325392290910	4 minutes ago admin (You)

11.Click on Credentials.

IBM Cloud Pak for Data

Edit connection: Data Virtualization

Review the connection information.

Test connection

Connection overview

Name: DS16621325392290910

Description: Connection description

Connection details

Database*: BIGSQL

Cancel Save

12.Select one of the Authentication Method as the personal connection.

IBM Cloud Pak for Data

Edit connection: Data Virtualization

Review the connection information.

Test connection

Connection overview

Credentials

Credential setting: Personal

Authentication method*

Certificates

Port is SSL-enabled

SSL certificate

-----BEGIN CERTIFICATE-----
MIIDBzCCAgEgAwIBAgRAIyOHEkIpGPu/kYybPFWFUwDQYJKoZIhvcNAQELBQA
wHTBmBkGA1UEAxMSemVuLWNhLNcnRpZmljYXRIMB4XDThMDYzMDiMDQyN1oX
DTI1MDYyOTIxMDkyN1owHTBmBkGA1UEAxMSemVuLWNhLNcnRpZmljYXRIMIIB
TIANBekhkkiG9w0BA0FFAAOCAC08AMTBCdKCAQEA0TOY5Nkiv3s9H66Jii/vCifx

Cancel Save

13.Chose User Name and Password.

IBM Cloud Pak for Data

Edit connection: Data Virtualization

Review the connection information.

Test connection

Connection overview

Credentials

Credential setting: Personal

Authentication method*

API key

Username and password

Port is SSL-enabled

SSL certificate

-----BEGIN CERTIFICATE-----
MIIDBzCCAgEgAwIBAgRAIyOHEkIpGPu/kYybPFWFUwDQYJKoZIhvcNAQELBQA
wHTBmBkGA1UEAxMSemVuLWNhLNcnRpZmljYXRIMB4XDThMDYzMDiMDQyN1oX
DTI1MDYyOTIxMDkyN1owHTBmBkGA1UEAxMSemVuLWNhLNcnRpZmljYXRIMIIB
TIANBekhkkiG9w0BA0FFAAOCAC08AMTBCdKCAQEA0TOY5Nkiv3s9H66Jii/vCifx

Cancel Save

14. Enter the CP4D credentials and click on **Test Connection**. It should be successful. Click **Save** to save the credential information in the connection.

15. Now Click on the Virtualized Data Asset ADMIN.joined_customers_sales_table.

16. You should be able to preview the data without being prompted for credentials.

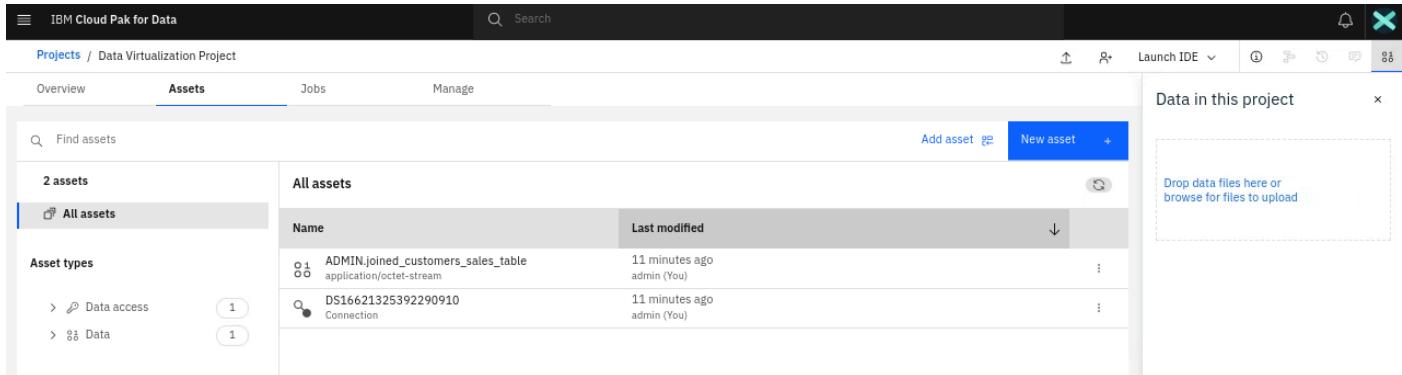
17. Optionally you can click on **Refine** button to explore or refine this data using **Watson Data Refinery**. The part of virtualized data can be saved as CSV file in the project using the Data Refinery Jobs.

Next steps

Now your virtual data is ready to be used. For example, you can these tasks:

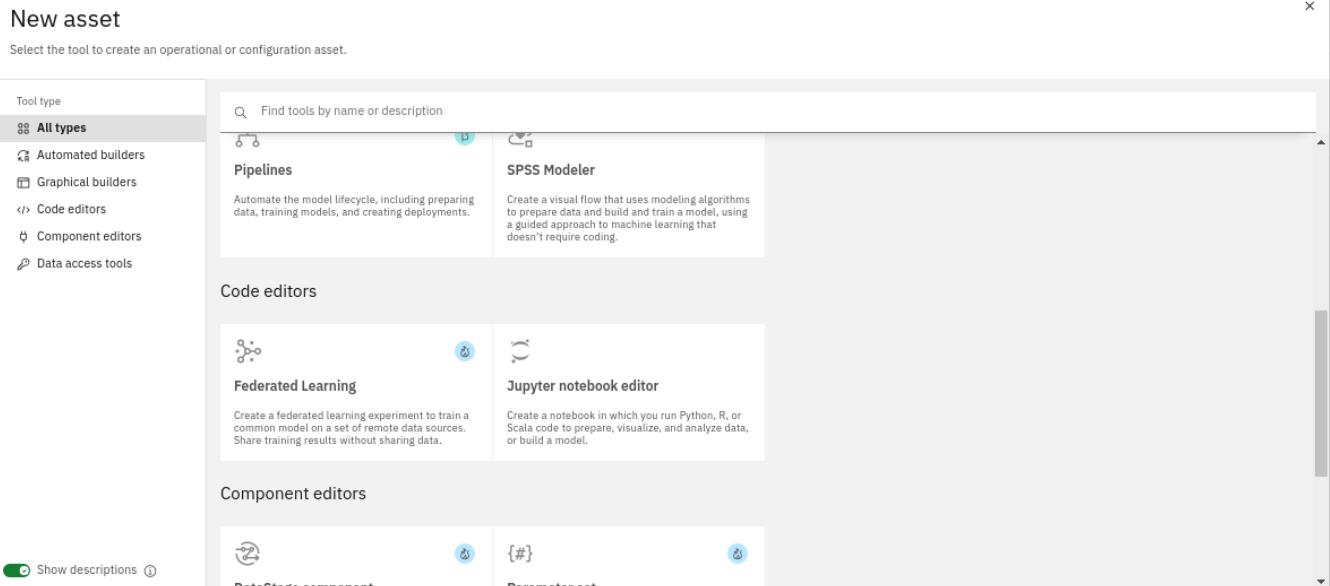
Analyze the data in a notebook

- 1) Under the Data Virtualization Project, In **Assets** Tab, Click on **New Asset +** to add a notebook Asset.



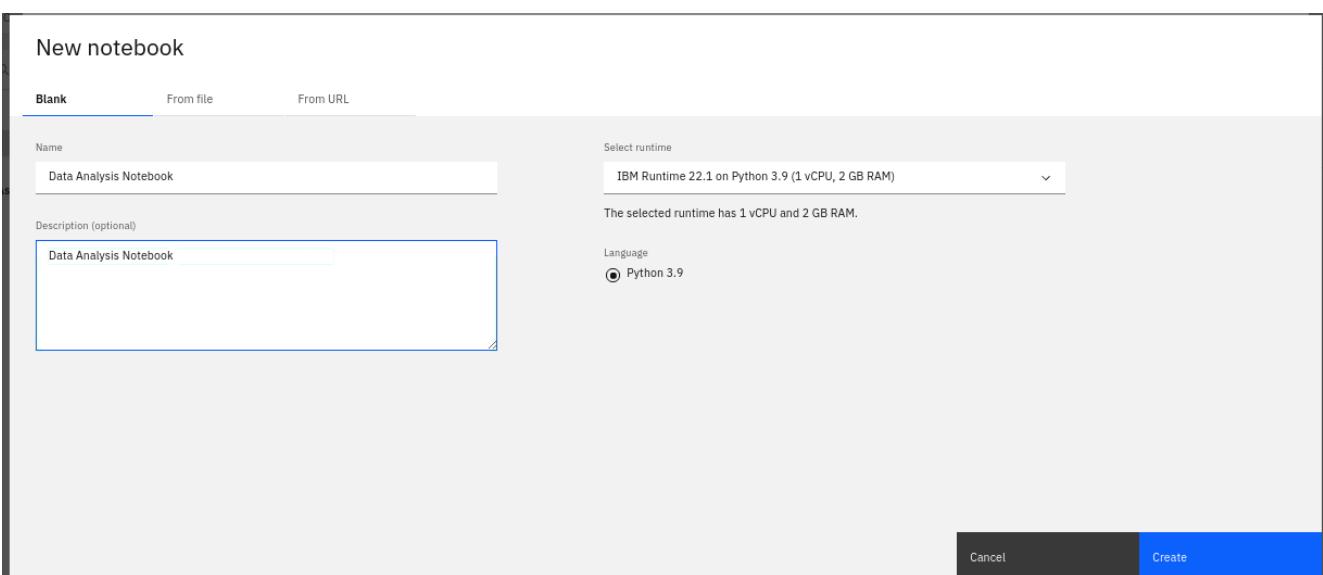
The screenshot shows the 'Assets' tab in the IBM Cloud Pak for Data interface. On the left, there's a sidebar with '2 assets' and categories like 'All assets', 'Asset types', 'Data access', and 'Data'. The main area shows a table of assets with columns for 'Name' and 'Last modified'. Two assets are listed: 'ADMIN.joined_customers_sales_table' (modified 11 minutes ago) and 'DS16621325392290910' (modified 11 minutes ago). To the right, there's a section titled 'Data in this project' with a placeholder 'Drop data files here or browse for files to upload'.

- 2) Click on **Jupyter notebook Editor**.



The screenshot shows the 'New asset' dialog for creating a Jupyter notebook editor. The 'Tool type' section has 'All types' selected. Other options include 'Automated builders', 'Graphical builders', 'Code editors', 'Component editors', and 'Data access tools'. The 'Code editors' section contains 'Federated Learning' and 'Jupyter notebook editor'. 'Federated Learning' is described as automating the model lifecycle. 'Jupyter notebook editor' is described as creating a notebook to run Python, R, or Scala code. At the bottom, there's a 'Show descriptions' toggle and buttons for 'DataStage component' and 'Parameter set'.

- 3) Enter the Notebook Name and Credentials and Click **Create**.

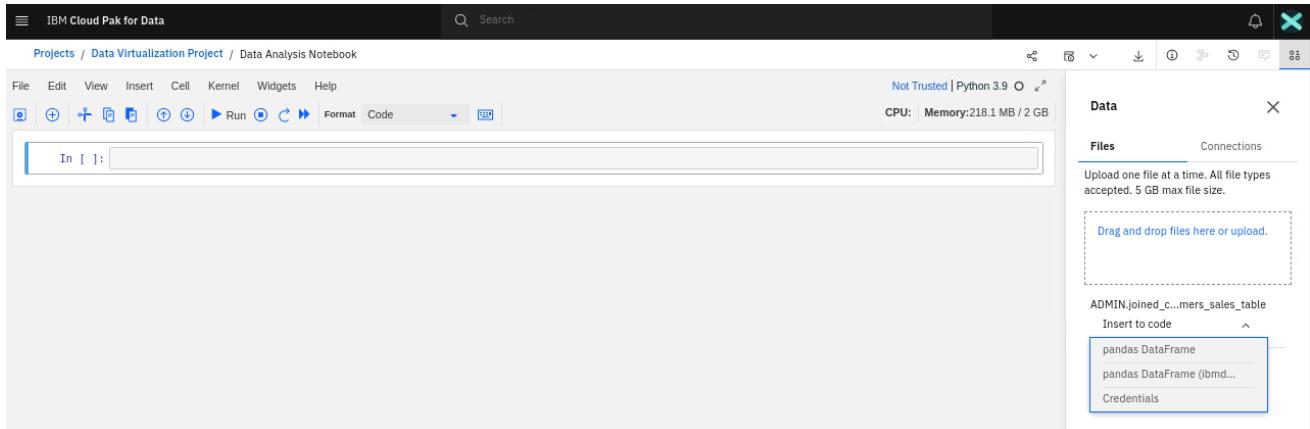


The screenshot shows the 'New notebook' dialog. It has tabs for 'Blank', 'From file', and 'From URL', with 'Blank' selected. The 'Name' field contains 'Data Analysis Notebook'. The 'Select runtime' dropdown shows 'IBM Runtime 22.1 on Python 3.9 (1 vCPU, 2 GB RAM)'. Below it, a note says 'The selected runtime has 1 vCPU and 2 GB RAM.' The 'Language' field is set to 'Python 3.9'. There's also a 'Description (optional)' field with 'Data Analysis Notebook' and a large text area below it. At the bottom, there are 'Cancel' and 'Create' buttons, with 'Create' being highlighted.

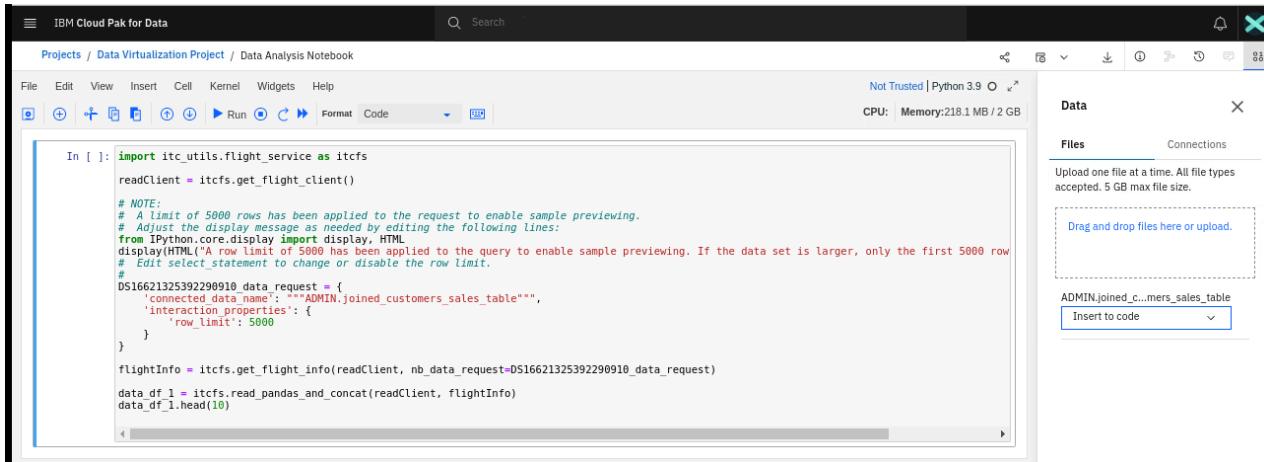
4) Click on  icon to View the Find and Add Data.



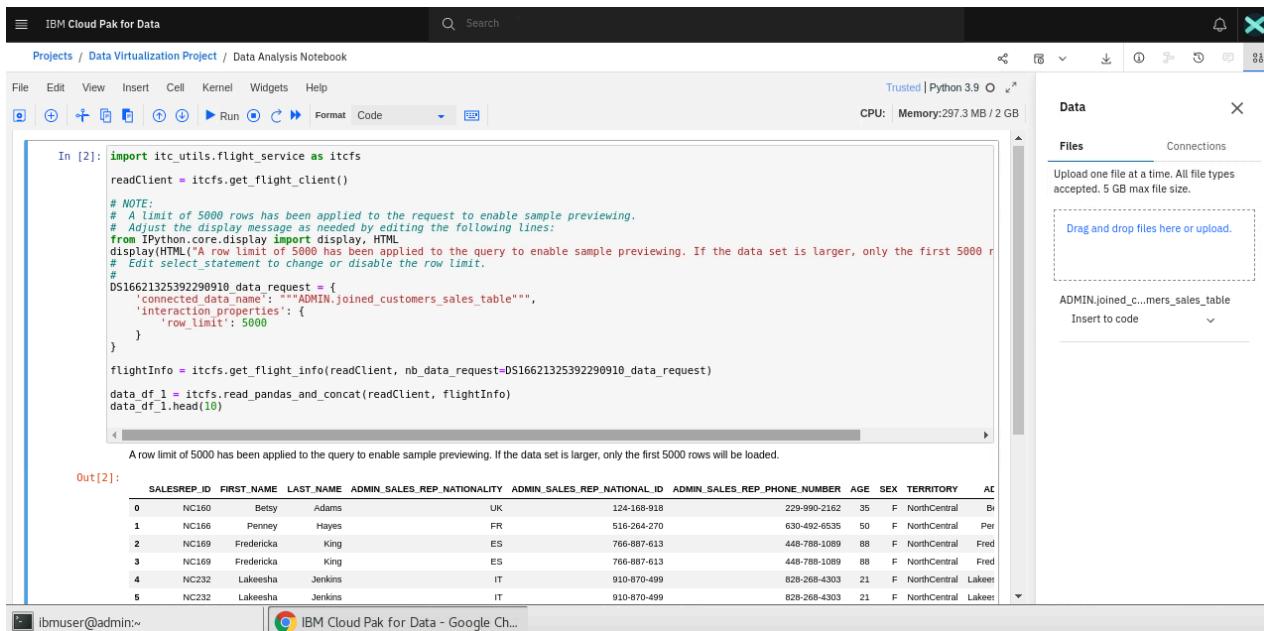
5) Under the Files tab, Click **Insert to Code -> pandas DataFrame** For the Virtual Table in the project.



6) The code will be added automatically. Click Run button in the toolbar to execute the code.



7) You should be able to access the virtualized data in the Watson Studio Notebook.



SALESREP_ID	FIRST_NAME	LAST_NAME	ADMIN.SALES.REP.NATIONALITY	ADMIN.SALES.REP.NATIONAL_ID	ADMIN.SALES.REP.PHONE_NUMBER	AGE	SEX	TERRITORY	AC	
0	NC160	Betsy	Adams	UK	124-168-918	229-990-2162	35	F	NorthCentral	Bi
1	NC166	Penny	Hayes	FR	516-264-270	630-492-6535	50	F	NorthCentral	Per
2	NC169	Frederick	King	ES	766-887-613	448-789-1089	88	F	NorthCentral	Fred
3	NC169	Frederick	King	ES	766-887-613	448-789-1089	88	F	NorthCentral	Fred
4	NC232	Lakeisha	Jenkins	IT	910-870-499	828-268-4303	21	F	NorthCentral	Lakeer
5	NC232	Lakeisha	Jenkins	IT	910-870-499	828-268-4303	21	F	NorthCentral	Lakeer

Visualize the data with a dashboard

- Under the Data Virtualization Project, In **Assets** Tab, Click on **New Asset +** to add a new Dashboard.

The screenshot shows the 'Assets' tab in the IBM Cloud Pak for Data interface. On the left, there's a sidebar with 'Asset types': Data access (1), Data (1), and Source Code (1). The main area shows a table titled 'All assets' with columns 'Name' and 'Last modified'. Three assets are listed:

Name	Last modified
Data Analysis Notebook Notebook	1 minute ago admin (You)
ADMIN.joined_customers_sales_table application/octet-stream	50 minutes ago admin (You)
DS16621325392290910 Connection	50 minutes ago admin (You)

To the right, there's a panel titled 'Data in this project' with a message: 'Drop data files here or browse for files to upload'.

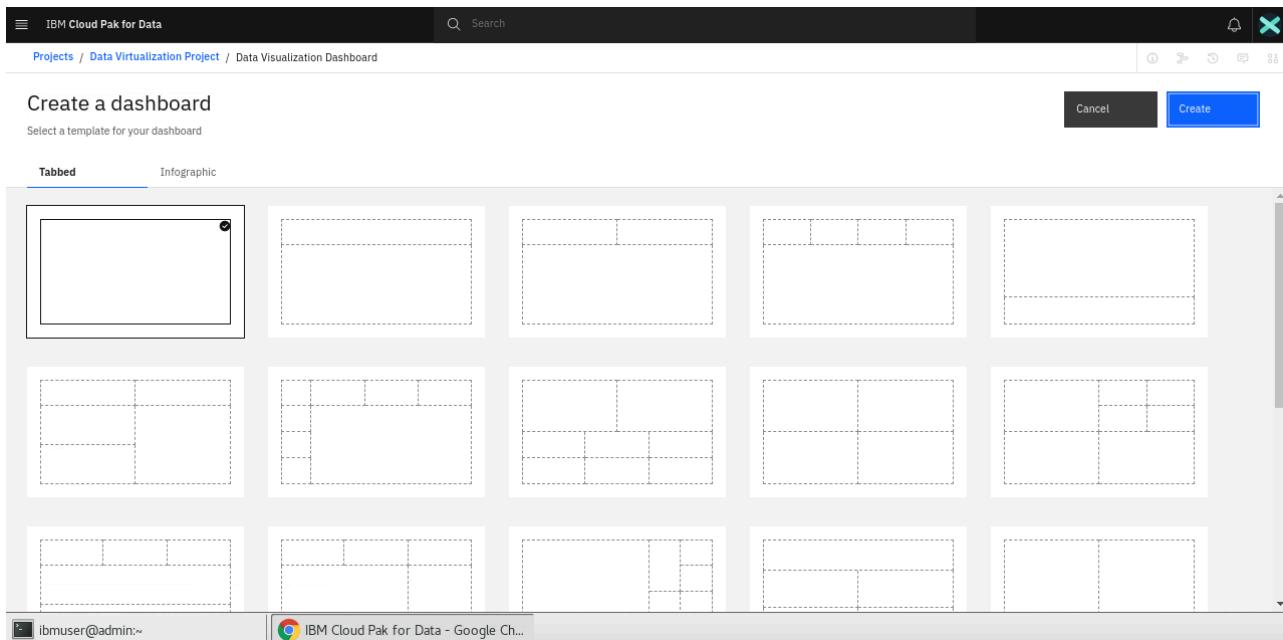
- Click on **Dashboard Editor**.

The screenshot shows the 'New asset' dialog for creating a new asset. The 'Tool type' dropdown is set to 'All types'. Under 'Automated builders', 'AutoAI' and 'Metadata enrichment' are listed. Under 'Graphical builders', 'Dashboard editor', 'Data Refinery', 'DataStage', and 'Decision Optimization' are listed. A 'Show descriptions' button is at the bottom left.

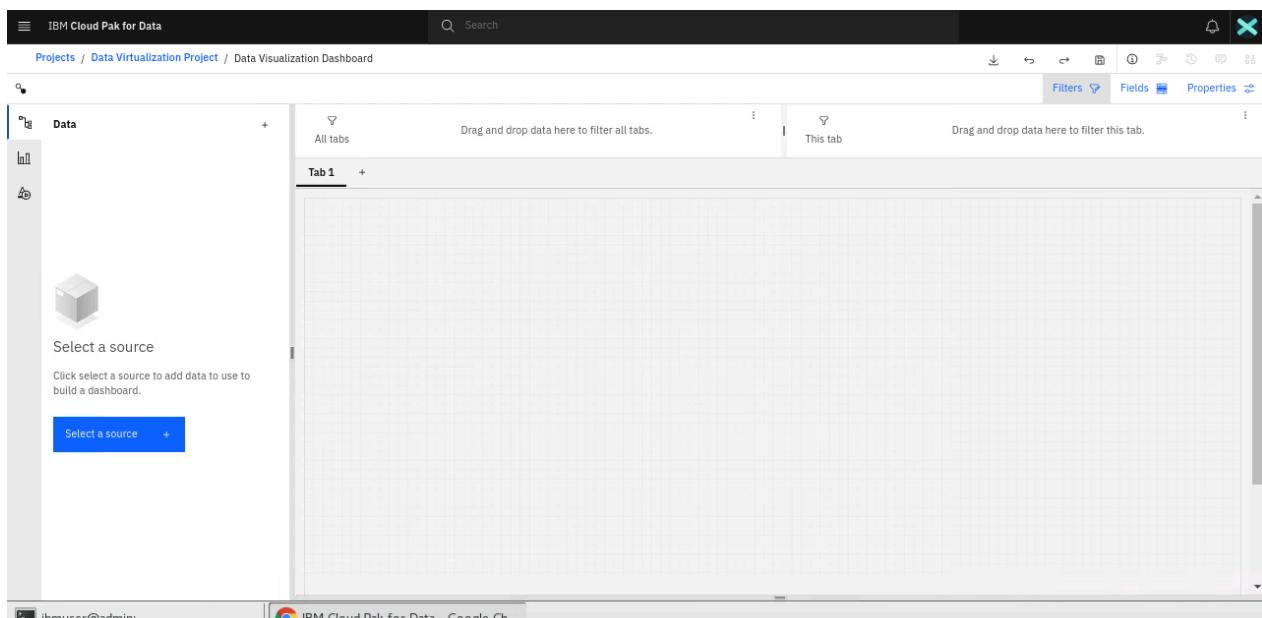
- Enter the name and description and click Create.

The screenshot shows the 'Create asset' dialog for a dashboard. The 'Name' field contains 'Data Visualization Dashboard'. The 'Description (Optional)' field also contains 'Data Visualization Dashboard'. At the bottom right, there are 'Cancel' and 'Create' buttons, with 'Create' being the active one.

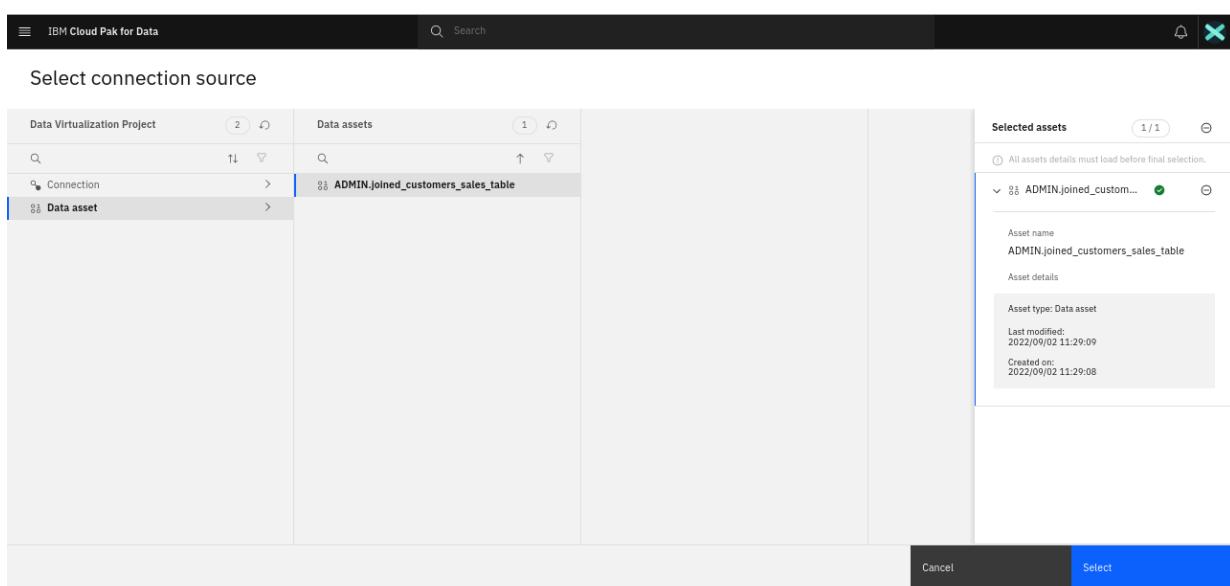
4) Click Create to create an empty tabbed Dashboard.



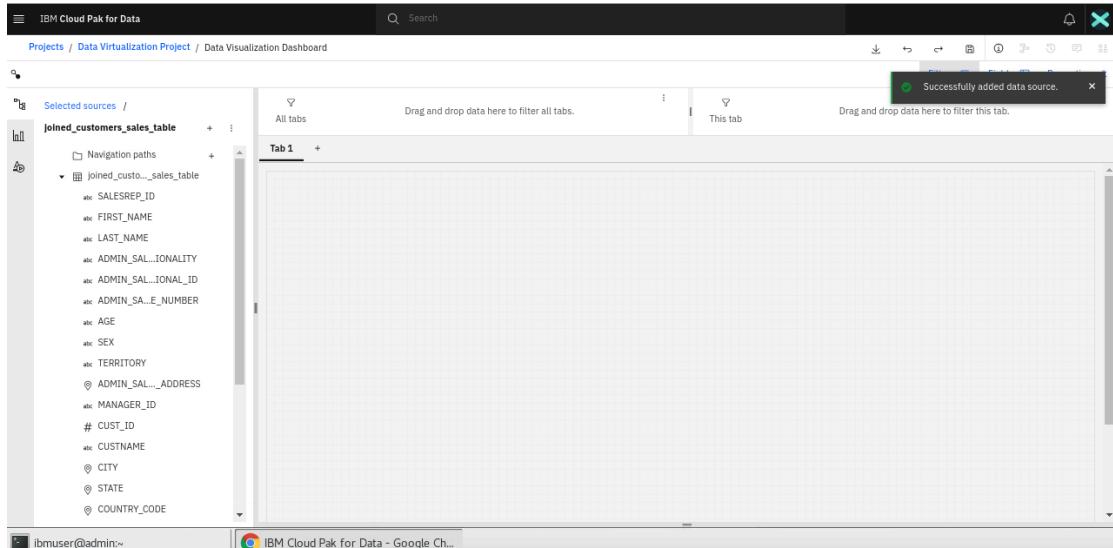
5) Click Select a source + button in the Data Pane to select a data source.



6) Select the Virtual Table. Click Select.

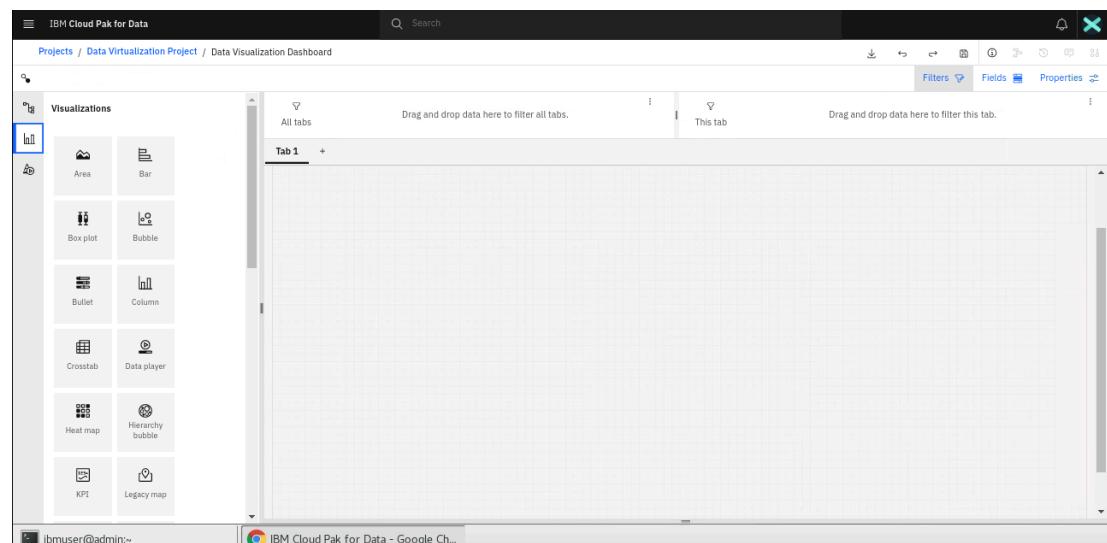


- 7) The Data source will be added successfully. Click on **Visualization** Tab  to see the types of Visualization to be used.



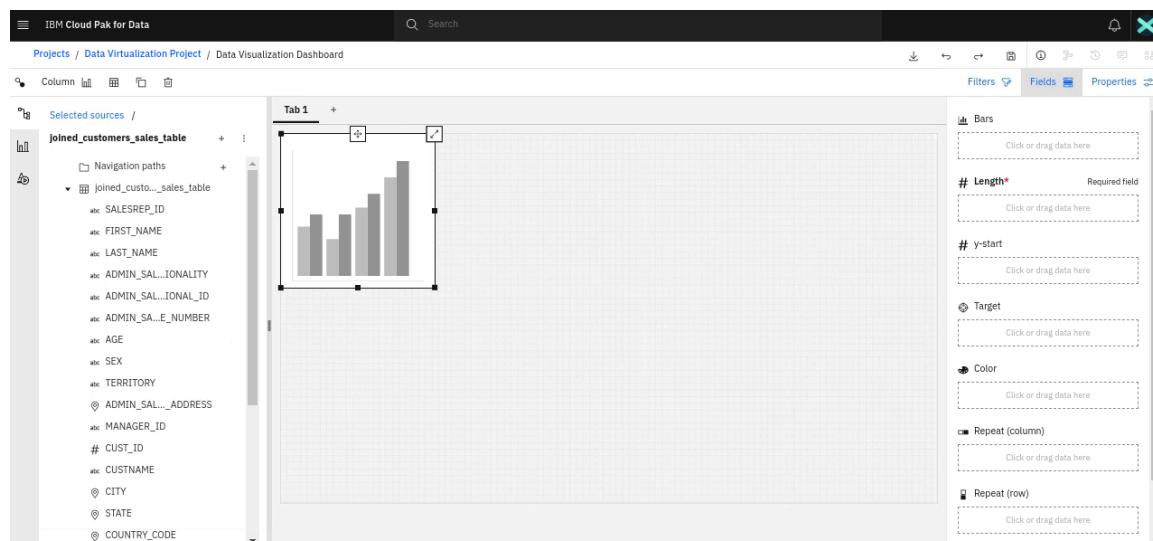
The screenshot shows the IBM Cloud Pak for Data interface. On the left, the 'Selected sources' panel displays a tree view of the 'joined_customers_sales_table'. The tree includes 'Navigation paths' and 'joined_customers_sales_table' with fields like SALESREP_ID, FIRST_NAME, LAST_NAME, ADMIN_SAL...IONALITY, ADMIN_SAL...IONAL_ID, ADMIN_SA...E_NUMBER, AGE, SEX, TERRITORY, ADMIN_SAL...ADDRESS, MANAGER_ID, CUST_ID, CUSTNAME, CITY, STATE, and COUNTRY_CODE. On the right, 'Tab 1' is open with a message 'Successfully added data source.' in the top right corner.

- 8) Click on the required visualization to add it to the dashboard.



The screenshot shows the 'Visualizations' panel on the left side of the dashboard. It contains icons for various chart types: Area, Bar, Box plot, Bubble, Bullet, Column, Crosstab, Data player, Heat map, Hierarchy bubble, KPI, and Legacy map. The main workspace 'Tab 1' is empty.

- 9) Configure the chart to show the required visualization. Eg. X Axis/Y Axis fields.
Alternatively, New charts can also be created by directly dragging and dropping a field from the virtual table to the dashboard.



The screenshot shows a Bar chart on 'Tab 1'. The Y-axis is labeled '# Length*' and the X-axis is labeled '# SALESREP_ID'. The chart displays several bars of increasing height corresponding to different sales rep IDs. The 'Fields' panel on the right is open, showing options for Bars, Length, y-start, Target, Color, Repeat (column), and Repeat (row). The 'Selected sources' panel on the left shows the same table structure as before.

