



# Hands-on Lab: Stored Procedures

**Estimated time needed:** 10 minutes

In this lab, you will create and execute stored procedures on IBM Db2 using SQL. A stored procedure is a set of SQL statements that are stored and executed on the database server. So instead of sending multiple SQL statements from the client to the server, you encapsulate them in a stored procedure on the server and send one statement from the client to execute them. Also, stored procedures can be useful if you have an SQL query that you write over and over again. You can save it as a stored procedure, and then just call it to execute it. In stored procedures, you can also pass parameters so that a stored procedure can act based on the passed parameter values.

## Software Used in this Lab

In this lab, you will use an [IBM Db2 Database](#). Db2 is a Relational Database Management System (RDBMS) from IBM, designed to store, analyze and retrieve data efficiently.

To complete this lab you will utilize a Db2 database service on IBM Cloud. If you did not already complete this lab task earlier in this module, you will not yet have access to Db2 on IBM Cloud, and you will need to follow the lab below first:

- [Hands-on Lab : Sign up for IBM Cloud, Create Db2 service instance and Get started with the Db2 console](#)

## Data Used in this Lab

The data used in this lab is internal data. You will be working on the **PETSALE** table.

ID ^	ANIMAL	SALEPRICE	SALEDATE	QUANTITY
1	Cat	450.09	2018-05-29	9
2	Dog	666.66	2018-06-01	3
3	Parrot	50.00	2018-06-04	2
4	Hamster	60.60	2018-06-11	6
5	Goldfish	48.48	2018-06-14	24

This lab requires you to have the PETSALE table populated with sample data on Db2. You might have created and populated a PETSALE table in a previous lab. But for this lab, it is recommended you download the **PETSALE-CREATE-v2.sql** script below, upload it to Db2 console and run it. The script will create a new PETSALE table dropping any previous PETSALE table if exists, and will populate it with the required sample data.

- [PETSALE-CREATE-v2.sql](#)

Please go through the lab below to learn how to upload and run a script on Db2 console (for this case, you need don't need to know anything else other than how to upload and run a script):

- [Hands-on Lab : Create tables using SQL scripts and Load data into tables](#)

## Objectives

After completing this lab, you will be able to:

- Create stored procedures
- Execute stored procedures

## Instructions

When you approach the exercises in this lab, follow the instructions to run the queries on Db2:

- Go to the [Resource List](#) of IBM Cloud by logging in where you can find the Db2 service instance that you created in a previous lab under **Services** section. Click on the **Db2-xx service**. Next, open the Db2 Console by clicking on **Open Console** button. Click on the 3-bar menu icon in the top left corner and go to the **Run SQL** page. The Run SQL tool enables you to run SQL statements.
  - If needed, follow [Hands-on Lab : Sign up for IBM Cloud, Create Db2 service instance and Get started with the Db2 console](#)

# Exercise 1

In this exercise, you will create and execute a stored procedure to read data from a table on Db2 using SQL.

1. Make sure you have created and populated the **PETSALE** table following the steps in the **"Data Used in this Lab"** section of this lab.

ID ▲	ANIMAL	SALEPRICE	SALEDATE	QUANTITY
1	Cat	450.09	2018-05-29	9
2	Dog	666.66	2018-06-01	3
3	Parrot	50.00	2018-06-04	2
4	Hamster	60.60	2018-06-11	6
5	Goldfish	48.48	2018-06-14	24

- You will create a stored procedure routine named **RETRIEVE\_ALL**.
  - This **RETRIEVE\_ALL** routine will contain an SQL query to retrieve all the records from the PETSale table, so you don't need to write the same query over and over again. You just call the stored procedure routine to execute the query everytime.
  - To create the stored procedure routine, copy the code below and paste it to the textbox of the **Run SQL** page. Click **Run all**.

[illegible]

The screenshot displays a SQL development environment with a code editor on the left and a results pane on the right. The code editor contains a SQL script for creating a stored procedure named `RETRIEVE_All`. The script includes comments, a `CREATE PROCEDURE` statement, a `LANGUAGE SQL` declaration, `READS SQL DATA` privilege, `DYNAMIC RESULT SETS 1` declaration, and a `BEGIN` block. Inside the block, there is a `DECLARE C1 CURSOR WITH RETURN FOR` statement, a `SELECT * FROM PETSale;` query, and an `OPEN C1;` statement. The script ends with `END` and a `@` symbol. The results pane on the right shows the execution status: a green checkmark, the text `CREATE PROCEDURE RETRIEVE_All -- Name of this stored procedure routine ...`, and a run time of `0.052 s`. Below this, a status bar indicates `Status: Success` and `Affected Rows: 0`.

```
1  --SET TERMINATOR @
2  CREATE PROCEDURE RETRIEVE_All
3
4  LANGUAGE SQL
5  READS SQL DATA
6
7  DYNAMIC RESULT SETS 1
8
9  BEGIN
10
11     DECLARE C1 CURSOR
12     WITH RETURN FOR
13
14     SELECT * FROM PETSale;
15
16     OPEN C1;
17
18 END
19 @
20
```

Result - Dec 16, 2020 7:...

✓ CREATE PROCEDURE RETRIEVE\_All -- Name of this stored procedure routine ... Run time: 0.052 s

Status: Success | Affected Rows: 0

3. To call the RETRIEVE\_ALL routine, copy the code below in a **new blank script** and paste it to the textbox of the **Run SQL** page. Click **Run all**. You will have all the records retrieved from the PETSALE table.

CALL RETRIEVE\_ALL; -- Caller query

1CALL RETRIEVE\_ALL;

2

3

CALL RETRIEVE\_ALL

Run time: 0.120 s

Result set 1

ID	ANIMAL	SALEPRICE	SALEDATE	QUANTITY
1	Cat	450.09	2018-05-29	9
2	Dog	666.66	2018-06-01	3
3	Parrot	50.00	2018-06-04	2
4	Hamster	60.60	2018-06-11	6
5	Goldfish	48.48	2018-06-14	24

4. You can view the created stored procedure routine RETRIEVE\_ALL. Click on the 3-bar menu icon in the top left corner and click **EXPLORE > APPLICATION OBJECTS > Stored Procedures**. Find the procedure routine RETRIEVE\_ALL from Procedures by clicking **Select All**. Click on the procedure routine **RETRIEVE\_ALL**.

IBM Db2 on CloudStorage: 22%Cookie PreferencesDiscoverRefresh

STORED PROCEDURES

Filter by schema name or procedure name

Schemas

Select AllNew implicit schema

AUDIT2 procedures

ZJH177692 procedures

DB2INST11 procedure

ERRORSCHEMA0 procedure

SQL746050 procedure

ST\_INFORMTN\_SCHEMA0 procedure

Procedures

NAME	SCHEMA	PROPERTIES
CONNECT_CHE...	DB2INST1	...
LOAD	AUDIT	...
RETRIEVE_ALL	ZJH17769	...
UPDATE	AUDIT	...
UPDATE_SALEP...	ZJH17769	...

Procedure Parameters

RETRIEVE\_ALL

CREATE PROCEDURE RETRIEVE\_All

-- Name of this stored procedure routine

LANGUAGE SQL

-- Language used in this routine

READS SQL DATA

-- This routine will only read data from table

DYNAMIC RESULT SETS 1

-- Maximum possible number of result-sets to be returned to the caller

BEGIN

DECLARE C1 CURSOR

-- CURSOR C1 will handle the result-set by retrieving records row by row from the table

WITH RETURN FOR

-- This routine will return retrieved records as result-set to the caller

SELECT \* FROM PETSALE;

-- Query to retrieve all the records from the table

OPEN C1;

-- Keeping the CURSOR C1 open so that result-set can be returned to the caller

END

Show less

PARAMETER	DATA TYPE	MODE	LENGTH	SCALE	LOCAT
-----------	-----------	------	--------	-------	-------

5. If you wish to drop the stored procedure routine RETRIEVE\_ALL, copy the code below and paste it to the textbox of the **Run SQL** page. Click **Run all**.

DROP PROCEDURE RETRIEVE\_ALL;

CALL RETRIEVE\_ALL;

1DROP PROCEDURE RETRIEVE\_All;

2

3CALL RETRIEVE\_ALL;

4

Result - Dec 16, 2020 5:...

DROP PROCEDURE RETRIEVE\_All

Run time: 0.023 s

Status: Success | Affected Rows: 0

CALL RETRIEVE\_ALL

Run time: 0.008 s

Status: Failed

Error message

No authorized routine named "RETRIEVE\_ALL" of type "PROCEDURE" having compatible arguments was found.. SQLCODE=-440, SQLSTATE=42884, DRIVER=4.26.14

Learn more about this error

## Exercise 2

In this exercise, you will create and execute a stored procedure to write/modify data in a table on Db2 using SQL.

1. Make sure you have created and populated the **PETSALE** table following the steps in the **"Data Used in this Lab"** section of this lab.

https://cf-courses-data.s3.us.cloud-object-storage.appdomain.cloud/IBMDeveloperSkillsNetwork-DB0201EN-SkillsNetwork/labs/Labs\_Coursera\_V5/labs/Lab - Stored Procedures/instructional-labs.md.html?origin=www.coursera.org3/7

ID ^	ANIMAL	SALEPRICE	SALEDATE	QUANTITY
1	Cat	450.09	2018-05-29	9
2	Dog	666.66	2018-06-01	3
3	Parrot	50.00	2018-06-04	2
4	Hamster	60.60	2018-06-11	6
5	Goldfish	48.48	2018-06-14	24

2.
- You will create a stored procedure routine named **UPDATE\_SALEPRICE** with parameters **Animal\_ID** and **Animal\_Health**.

This **UPDATE\_SALEPRICE** routine will contain SQL queries to update the sale price of the animals in the PETSALE table depending on their health conditions, **BAD** or **WORSE**.

This procedure routine will take animal ID and health conditon as parameters which will be used to update the sale price of animal in the PETSALE table by an amount depending on their health condition. Suppose -

For animal with ID XX having BAD health condition, the sale price will be reduced further by 25%.

For animal with ID YY having WORSE health condition, the sale price will be reduced further by 50%.

For animal with ID ZZ having other health condition, the sale price won't change.

To create the stored procedure routine, copy the code below and paste it to the textbox of the **Run SQL** page. Click **Run all**.
- ```
--#SET TERMINATOR @
CREATE PROCEDURE UPDATE_SALEPRICE (
    IN Animal_ID INTEGER, IN Animal_Health VARCHAR(5) )    -- ( { IN/OUT type } { parameter-name } { data-type }, ... )

LANGUAGE SQL   -- Language used in this routine
MODIFIES SQL DATA                                    -- This routine will only write/modify data in the
table

BEGIN

    IF Animal_Health = 'BAD' THEN                        -- Start of conditional statement
        UPDATE PETSALE
        SET SALEPRICE = SALEPRICE - (SALEPRICE * 0.25)
        WHERE ID = Animal_ID;

    ELSEIF Animal_Health = 'WORSE' THEN
        UPDATE PETSALE
        SET SALEPRICE = SALEPRICE - (SALEPRICE * 0.5)
        WHERE ID = Animal_ID;

    ELSE
        UPDATE PETSALE
        SET SALEPRICE = SALEPRICE
        WHERE ID = Animal_ID;

    END IF;   -- End of conditional statement

END
@  -- Routine termination character
```
- 1

--#SET TERMINATOR @

2

CREATE PROCEDURE UPDATE\_SALEPRICE (

3

IN Animal\_ID INTEGER, IN Animal\_Health VARCHAR(5) )

4

5

LANGUAGE SQL

6

MODIFIES SQL DATA

7

8

BEGIN

9

10

IF Animal\_Health = 'BAD' THEN

11

UPDATE PETSALE

12

SET SALEPRICE = SALEPRICE - (SALEPRICE \* 0.25)

13

WHERE ID = Animal\_ID;

14

15

ELSEIF Animal\_Health = 'WORSE' THEN

16

UPDATE PETSALE

17

SET SALEPRICE = SALEPRICE - (SALEPRICE \* 0.5)

18

WHERE ID = Animal\_ID;

19

20

ELSE

21

UPDATE PETSALE

22

SET SALEPRICE = SALEPRICE

23

WHERE ID = Animal\_ID;

24

25

END IF;

26

27

END

28

@

29

Syntax assistant

Result - Dec 16, 2020 7:...

CREATE PROCEDURE UPDATE\_SALEPRICE ( IN Animal\_ID INTEGER, IN A...

Run time: 0.069 s

Status: Success | Affected Rows: 0
- https://cf-courses-data.s3.us.cloud-object-storage.appdomain.cloud/IBMDDeveloperSkillsNetwork-DB0201EN-SkillsNetwork/labs/Labs\_Coursera\_V5/labs/Lab - Stored Procedures/instructional-labs.md.html?origin=www.coursera.org

4/7

3. Let's call the UPDATE\_SALEPRICE routine. We want to update the sale price of animal with ID **1** having **BAD** health condition in the PETSALE table. Copy the code below in a **new blank script** and paste it to the textbox of the **Run SQL** page. Click **Run all**. You will have all the records retrieved from the PETSALE table.

```
CALL RETRIEVE_ALL;

CALL UPDATE_SALEPRICE(1, 'BAD');      -- Caller query

CALL RETRIEVE_ALL;
```

1CALL RETRIEVE\_ALL;  
2CALL UPDATE\_SALEPRICE(1, 'BAD');  
3CALL RETRIEVE\_ALL;  
4  
5  
6

Run allRemember my last behavior

Result - Dec 17, 2020 9:...

CALL RETRIEVE\_ALLRun time: 0.027 s

Result set 1

| ID | ANIMAL   | SALEPRICE | SALEDATE   | QUANTITY |
|----|----------|-----------|------------|----------|
| 1  | Cat      | 450.09    | 2018-05-29 | 9        |
| 2  | Dog      | 666.66    | 2018-06-01 | 3        |
| 3  | Parrot   | 50.00     | 2018-06-04 | 2        |
| 4  | Hamster  | 60.60     | 2018-06-11 | 6        |
| 5  | Goldfish | 48.48     | 2018-06-14 | 24       |

CALL UPDATE\_SALEPRICE(1, 'BAD')Run time: 0.017 s

Status: Success | Affected Rows: 0

CALL RETRIEVE\_ALLRun time: 0.007 s

Result set 1

| ID | ANIMAL   | SALEPRICE | SALEDATE   | QUANTITY |
|----|----------|-----------|------------|----------|
| 1  | Cat      | 337.56    | 2018-05-29 | 9        |
| 2  | Dog      | 666.66    | 2018-06-01 | 3        |
| 3  | Parrot   | 50.00     | 2018-06-04 | 2        |
| 4  | Hamster  | 60.60     | 2018-06-11 | 6        |
| 5  | Goldfish | 48.48     | 2018-06-14 | 24       |

4. Let's call the UPDATE\_SALEPRICE routine once again. We want to update the sale price of animal with ID **3** having **WORSE** health condition in the PETSALE table. Copy the code below and paste it to the textbox of the **Run SQL** page. Click **Run all**. You will have all the records retrieved from the PETSALE table.

```
CALL RETRIEVE_ALL;

CALL UPDATE_SALEPRICE(3, 'WORSE');    -- Caller query

CALL RETRIEVE_ALL;
```

1CALL RETRIEVE\_ALL;  
2CALL UPDATE\_SALEPRICE(3, 'WORSE');  
3CALL RETRIEVE\_ALL;  
4  
5  
6

Run allRemember my last behavior

Result - Dec 17, 2020 9:...

CALL RETRIEVE\_ALLRun time: 0.020 s

Result set 1

| ID | ANIMAL   | SALEPRICE | SALEDATE   | QUANTITY |
|----|----------|-----------|------------|----------|
| 1  | Cat      | 337.56    | 2018-05-29 | 9        |
| 2  | Dog      | 666.66    | 2018-06-01 | 3        |
| 3  | Parrot   | 50.00     | 2018-06-04 | 2        |
| 4  | Hamster  | 60.60     | 2018-06-11 | 6        |
| 5  | Goldfish | 48.48     | 2018-06-14 | 24       |

CALL UPDATE\_SALEPRICE(3, 'WORSE')Run time: 0.018 s

Status: Success | Affected Rows: 0

CALL RETRIEVE\_ALLRun time: 0.008 s

Result set 1

| ID | ANIMAL   | SALEPRICE | SALEDATE   | QUANTITY |
|----|----------|-----------|------------|----------|
| 1  | Cat      | 337.56    | 2018-05-29 | 9        |
| 2  | Dog      | 666.66    | 2018-06-01 | 3        |
| 3  | Parrot   | 25.00     | 2018-06-04 | 2        |
| 4  | Hamster  | 60.60     | 2018-06-11 | 6        |
| 5  | Goldfish | 48.48     | 2018-06-14 | 24       |



5. You can view the created stored procedure routine UPDATE\_SALEPRICE. Click on the 3-bar menu icon in the top left corner and click **EXPLORE > APPLICATION OBJECTS > Stored Procedures**. Find the procedure routine UPDATE\_SALEPRICE from Procedures by clicking **Select All**. Click on the procedure routine **UPDATE\_SALEPRICE**.

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STORED PROCEDURES

Filter by schema name or procedure name

Schemas

Select All

New implicit schema

AUDIT2 procedures

ZJH177692 procedures

DB2INST11 procedure

ERRORSCHEMA0 procedure

SQL746050 procedure

ST\_INFORMTN\_SCHEMA0 procedure

Procedures

| NAME            | SCHEMA   | PROPERTIES |
|-----------------|----------|------------|
| CONNECT_CHE...  | DB2INST1 | ...        |
| LOAD            | AUDIT    | ...        |
| RETRIEVE_ALL    | ZJH17769 | ...        |
| UPDATE          | AUDIT    | ...        |
| UPDATE_SALEP... | ZJH17769 | ...        |

Procedure Parameters

UPDATE\_SALEPRICE

CREATE PROCEDURE UPDATE\_SALEPRICE (  
IN Animal\_ID INTEGER, IN Animal\_Health VARCHAR(5) ) -- {  
input/output type parameter {{ parameter-name }} data-type }  
  
LANGUAGE SQL

Show more

| PARAMETER     | DATA TYPE | MODE | LENGTH | SCALE | LOCAT |
|---------------|-----------|------|--------|-------|-------|
| ANIMAL_ID     | INTEGER   | IN   | 4      | 0     | No    |
| ANIMAL_HEA... | VARCHAR   | IN   | 5      | 0     | No    |

6. If you wish to drop the stored procedure routine UPDATE\_SALEPRICE, copy the code below and paste it to the textbox of the **Run SQL** page. Click **Run all**.

DROP PROCEDURE UPDATE\_SALEPRICE;

1234

DROP PROCEDURE UPDATE\_SALEPRICE;  
CALL UPDATE\_SALEPRICE(5, 'BAD');

Syntax assistant

Result - Dec 16, 2020 8:...

✓

DROP PROCEDURE UPDATE\_SALEPRICE

Run time: 0.024 s

Status: Success | Affected Rows: 0

✗

CALL UPDATE\_SALEPRICE(5, 'BAD')

Run time: 0.008 s

Status: Failed

Error message

No authorized routine named "UPDATE\_SALEPRICE" of type "PROCEDURE" having compatible arguments was found..  
SQLCODE=-440, SQLSTATE=42884, DRIVER=4.26.14

Learn more about this error

Congratulations! You have completed this lab, and you are ready for the next topic.

Author(s)

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Other Contributor(s)

- 

## Changelog

| Date       | Version | Changed by      | Change Description      |
|------------|---------|-----------------|-------------------------|
| 2020-12-25 | 1.1     | Steve Ryan      | ID Reviewed             |
| 2020-12-14 | 1.0     | Sandip Saha Joy | Created initial version |

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