



IBM Developer
SKILLS NETWORK

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 [PETSAL-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.

- [PETSAL-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

2.
 - 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**.

```

--#SET TERMINATOR @
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 the table

DYNAMIC RESULT SETS 1            -- Maximum possible number of result-sets to be returned to the caller
query

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 a result-set to the
caller query

    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 query

END
@                                -- Routine termination character

```

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
```

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 Cloud

Storage: 22%

Cookie Preferences

Discover

STORED PROCEDURES

Filter by schema name or procedure name

Select All

New implicit schema

AUDIT 2 procedures

ZJH17769 2 procedures

DB2INST1 1 procedure

ERRORSCHEMA 0 procedure

SQL74605 0 procedure

ST_INFORMTN_SCHEMA 0 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

```

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;

```

1 DROP PROCEDURE RETRIEVE_All;

2

3 CALL RETRIEVE_ALL;

4

Syntax assistant

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.

- 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 **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**.

<https://cf-courses-data.s3.us.cloud-object-storage.appdomain.cloud...d%20Procedures/instructional-labs.md.html?origin=www.coursera.org>

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- This procedure routine will take animal ID and health condition 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
```

The screenshot shows a SQL IDE interface. On the left, a code editor displays the SQL code for creating the `UPDATE_SALEPRICE` procedure, with line numbers 1 through 29. The code is syntax-highlighted. On the right, a results pane titled "Result - Dec 16, 2020 7..." shows the execution output. It indicates that the procedure was created successfully, with a status of "Success" and "Affected Rows: 0". The run time is listed as "0.069 s".

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;
```

Result - Dec 17, 2020 9:...

✓ CALL RETRIEVE_ALL Run 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_ALL Run 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

Run all Remember my last behavior

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;
```

SQL Script:

```
1 CALL RETRIEVE_ALL;
2
3 CALL UPDATE_SALEPRICE(3, 'WORSE');
4
5 CALL RETRIEVE_ALL;
6
```

Results:

CALL RETRIEVE_ALL (Run time: 0.020 s)

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_ALL (Run time: 0.008 s)

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**.

STORED PROCEDURES

Filter by schema name or procedure name

Schemas

- ☒ Select All
- ☐ New implicit schema
- ☒ AUDIT 2 procedures
- ☒ ZJH17769 2 procedures
- ☒ DB2INST1 1 procedure
- ☒ ERRORSHEMA 0 procedure
- ☒ SQL74605 0 procedure
- ☒ ST_INFORMTN_SCHEMA 0 procedure

Procedures

NAME	SCHEMA	PROPERTIES
<input type="checkbox"/> CONNECT_CHE...	DB2INST1	...
<input type="checkbox"/> LOAD	AUDIT	...
<input type="checkbox"/> RETRIEVE_ALL	ZJH17769	...
<input type="checkbox"/> UPDATE	AUDIT	...
<input checked="" type="checkbox"/> 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
```

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;

SQL Script:

```
1 DROP PROCEDURE UPDATE_SALEPRICE;
2
3 CALL UPDATE_SALEPRICE(5, 'BAD');
4
```

Results:

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)

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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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