

COBOL - Database Interface

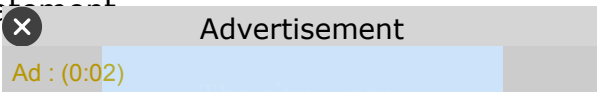
As of now, we have learnt the use of files in COBOL. Now, we will discuss how a COBOL program interacts with DB2. It involves the following terms –

- Embedded SQL
- DB2 Application Programming
- Host Variables
- SQLCA
- SQL Queries
- Cursors

Embedded SQL

Embedded SQL statements are used in COBOL programs to perform standard SQL operations. Embedded SQL statements are preprocessed by the SQL processor before the application program is compiled. COBOL is known as the **Host Language**. COBOL-DB2 applications are those applications that include both COBOL and DB2.

Embedded SQL statements work like normal SQL statements with some minor changes. For example, the output of a query is directed to a predefined set of variables which are referred as **Host Variables**. An additional INTO clause is placed in the SELECT statement.



DB2 Application Programming

Following are rules to be followed while coding a COBOL-DB2 program –

- All the SQL statements must be delimited between **EXEC SQL** and **ENDEXEC..**
- SQL statements must be coded in Area B.
- All the tables that are used in a program must be declared in the WorkingStorage Section. This is done by using the **INCLUDE** statement.
- All SQL statements other than INCLUDE and DECLARE TABLE must appear in the Procedure Division.

Host Variables

Host variables are used for receiving data from a table or inserting data in a table. Host variables must be declared for all values that are to be passed between the program and the DB2. They are declared in the Working-Storage Section.

Host variables cannot be group items, but they may be grouped together in host structure. They cannot be **Renamed** or **Redefined**. Using host variables with SQL statements, prefix them with a **colon (:)**.

Syntax

Following is the syntax to declare host variables and include tables in the Working-Storage Section.



```
EXEC SQL BEGIN DECLARE SECTION
END-EXEC.
```

```
01 STUDENT-REC.
    05 STUDENT-ID PIC 9(4).
    05 STUDENT-NAME PIC X(25).
    05 STUDENT-ADDRESS X(50).
EXEC SQL END DECLARE SECTION
END-EXEC.
```

SQLCA

SQLCA is a SQL communication area through which DB2 passes the feedback of SQL execution to the program. It tells the program whether an execution was successful or not. There are a number of predefined variables under SQLCA like **SQLCODE** which contains the error code. The value '000' in SQLCODE states a successful execution.

Syntax

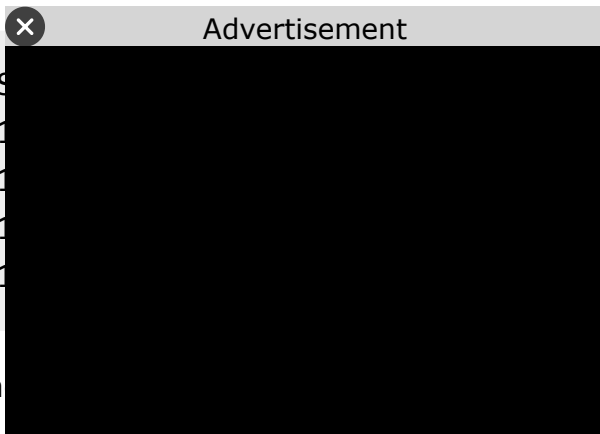
Following is the syntax to declare an SQLCA in the Working-Storage section –

```
DATA DIVISION.
WORKING-STORAGE SECTION.
    EXEC SQL
    INCLUDE SQLCA
    END-EXEC.
```

SQL Queries

Lets assume we have one table named as 'Student' that contains Student-Id, Student-Name, and Student-Address.

The STUDENT table contains the following data –



```
Student Address
Hyderabad
    Delhi
    Mumbai
    Lucknow
```

Th

SELECT query in a COBOL program –

```
IDENTIFICATION DIVISION.
```

```
PROGRAM-ID. HELLO.
```

```
DATA DIVISION.
```

```
WORKING-STORAGE SECTION.
```

```
EXEC SQL
```

```
INCLUDE SQLCA
```

```
END-EXEC.
```

```
EXEC SQL
```

```
INCLUDE STUDENT
```

```
END-EXEC.
```

```
EXEC SQL BEGIN DECLARE SECTION
```

```
END-EXEC.
```

```
01 WS-STUDENT-REC.
```

```
05 WS-STUDENT-ID PIC 9(4).
```

```
05 WS-STUDENT-NAME PIC X(25).
```

```
05 WS-STUDENT-ADDRESS X(50).
```

```
EXEC SQL END DECLARE SECTION
```

```
END-EXEC.
```

```
PROCEDURE DIVISION.
```

```
EXEC SQL
```

```
SELECT STUDENT-ID, STUDENT-NAME, STUDENT-ADDRESS
```

```
INTO :WS-STUDENT-ID, :WS-STUDENT-NAME, WS-STUDENT-ADDRESS FROM
```

```
STUDENT
```

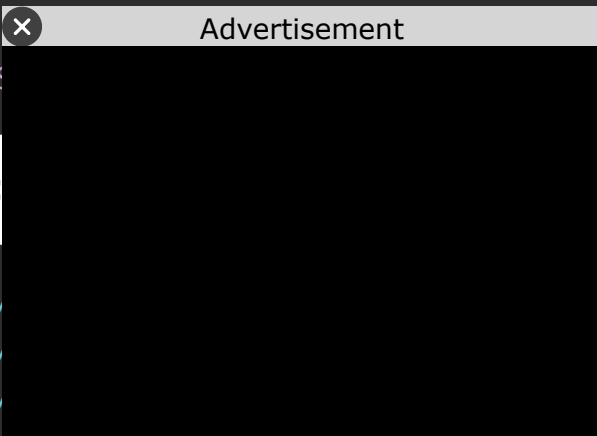
```
WHERE STUDENT-ID=1004
```

```
END-EXEC.
```

```
IF SQLCODE = 0
```

```
DISPLAY WS-STUDENT-RECORD
```

```
ELSE DISPLAY 'Error'
```



```
//SYSPRINT DD SYSOUT=*
//SYSUDUMP DD SYSOUT=*
//SYSOUT   DD SYSOUT=*
//SYSTSIN  DD *
    DSN SYSTEM(SSID)
    RUN PROGRAM(HELLO) PLAN(PLANNAME) -
    END
/*
```

When you compile and execute the above program, it produces the following result –

```
1004 Chulbul Pandey      Lucknow
```

The following example shows the usage of **INSERT** query in a COBOL program –

```
IDENTIFICATION DIVISION.
PROGRAM-ID. HELLO.

DATA DIVISION.
    WORKING-STORAGE SECTION.
        EXEC SQL
        INCLUDE SQLCA
        END-EXEC.

        EXEC SQL
        INCLUDE STUDENT
        END-EXEC.

        EXEC SQL BEGIN DECLARE SECTION
        END-EXEC.
        01 WS-STUDENT-REC.
            05 WS-STUDENT-ID PIC 9(4).
            05 WS-STUDENT-NAME PIC X(25).
            05 WS-STUDENT-ADDRESS PIC X(50).

IDENTIFICATION-NAME.
-ADDRESS.
```

```

EXEC SQL
    INSERT INTO STUDENT(STUDENT-ID, STUDENT-NAME, STUDENT-ADDRESS)
    VALUES (:WS-STUDENT-ID, :WS-STUDENT-NAME, WS-STUDENT-ADDRESS)
END-EXEC.

IF SQLCODE = 0
    DISPLAY 'Record Inserted Successfully'
    DISPLAY WS-STUDENT-REC
ELSE DISPLAY 'Error'
END-IF.
STOP RUN.

```

JCL to execute the above COBOL program –

```

//SAMPLE JOB(TESTJCL,XXXXXX),CLASS = A,MSGCLASS = C
//STEP001 EXEC PGM = IKJEFT01
//STEPLIB DD DSN = MYDATA.URMI.DBRMLIB,DISP=SHR
//SYSPRINT DD SYSOUT = *
//SYSUDUMP DD SYSOUT = *
//SYSOUT DD SYSOUT = *
//SYSTSIN DD *
    DSN SYSTEM(SSID)
    RUN PROGRAM(HELLO) PLAN(PLANNAME) -
    END
/*

```

When you compile and execute the above program, it produces the following result –

```

Record Inserted Successfully
1005 Tutorialspoint      Hyderabad

```

Th  Advertisement **UPDATE** query in a COBOL program –

```

INCLUDE SQLCA
END-EXEC.

EXEC SQL
INCLUDE STUDENT
END-EXEC.

EXEC SQL BEGIN DECLARE SECTION
END-EXEC.
    01 WS-STUDENT-REC.
        05 WS-STUDENT-ID PIC 9(4).
        05 WS-STUDENT-NAME PIC X(25).
        05 WS-STUDENT-ADDRESS X(50).
EXEC SQL END DECLARE SECTION
END-EXEC.

PROCEDURE DIVISION.
    MOVE 'Bangalore' TO WS-STUDENT-ADDRESS.
    EXEC SQL
        UPDATE STUDENT SET STUDENT-ADDRESS=:WS-STUDENT-ADDRESS
        WHERE STUDENT-ID = 1003
    END-EXEC.

    IF SQLCODE = 0
        DISPLAY 'Record Updated Successfully'
    ELSE DISPLAY 'Error'
    END-IF.
STOP RUN.

```

JCL to execute the above COBOL program –

```

//SAMPLE JOB(TESTJCL,XXXXXX),CLASS = A,MSGCLASS = C
//STEP001 EXEC PGM = IKJEFT01
        BRMLIB,DISP = SHR

```

```
END
```

```
/*
```

When you compile and execute the above program, it produces the following result –

Record Updated Successfully

The following **example** shows the usage of **DELETE** query in a COBOL program –

```
IDENTIFICATION DIVISION.
PROGRAM-ID. HELLO.

DATA DIVISION.
WORKING-STORAGE SECTION.

    EXEC SQL
    INCLUDE SQLCA
    END-EXEC.

    EXEC SQL
    INCLUDE STUDENT
    END-EXEC.

    EXEC SQL BEGIN DECLARE SECTION
    END-EXEC.
        01 WS-STUDENT-REC.
            05 WS-STUDENT-ID PIC 9(4).
            05 WS-STUDENT-NAME PIC X(25).
            05 WS-STUDENT-ADDRESS X(50).
    EXEC SQL END DECLARE SECTION
    END-EXEC.
```

```
PROCEDURE DIVISION
```



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-ID


```

        DISPLAY 'Record Deleted Successfully'
    ELSE DISPLAY 'Error'
    END-IF.
STOP RUN.

```

JCL to execute the above COBOL program –

```

//SAMPLE JOB(TESTJCL,XXXXXX),CLASS = A,MSGCLASS = C
//STEP001 EXEC PGM = IKJEFT01
//STEPLIB DD DSN = MYDATA.URMI.DBRMLIB,DISP=SHR
//SYSPRINT DD SYSOUT = *
//SYSUDUMP DD SYSOUT = *
//SYSOUT DD SYSOUT = *
//SYSTSIN DD *
    DSN SYSTEM(SSID)
    RUN PROGRAM(HELLO) PLAN(PLANNAME) -
    END
/*

```

When you compile and execute the above program, it produces the following result –

Record Deleted Successfully

Cursors

Cursors are used to handle multiple row selections at a time. They are data structures that hold all the results of a query. They can be defined in the Working-Storage Section or the Procedure Division. Following are the operations associated with Cursor –

- Declare
- Open



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De

Cu Working-Storage Section or the Procedure Division.
Th ment which is a nonexecutable statement.

```
EXEC SQL
  DECLARE STUDCUR CURSOR FOR
  SELECT STUDENT-ID, STUDENT-NAME, STUDENT-ADDRESS FROM STUDENT
  WHERE STUDENT-ID >:WS-STUDENT-ID
END-EXEC.
```

Open

Before using a cursor, Open statement must be performed. The Open statement prepares the SELECT for execution.

```
EXEC SQL
  OPEN STUDCUR
END-EXEC.
```

Close

Close statement releases all the memory occupied by the cursor. It is mandatory to close a cursor before ending a program.

```
EXEC SQL
  CLOSE STUDCUR
END-EXEC.
```

Fetch

Fetch statement identifies the cursor and puts the value in the INTO clause. A Fetch statement is coded in loop as we get one row at a time.

```
EXEC SQL
  FETCH STUDCUR
  INTO :WS-STUDENT-ID, :WS-STUDENT-NAME, :WS-STUDENT-ADDRESS
```

The cursor is used to fetch all the records from the

DATA DIVISION.

WORKING-STORAGE SECTION.

EXEC SQL
INCLUDE SQLCA
END-EXEC.

EXEC SQL
INCLUDE STUDENT
END-EXEC.

EXEC SQL BEGIN DECLARE SECTION
END-EXEC.

01 WS-STUDENT-REC.

05 WS-STUDENT-ID PIC 9(4).

05 WS-STUDENT-NAME PIC X(25).

05 WS-STUDENT-ADDRESS X(50).

EXEC SQL END DECLARE SECTION
END-EXEC.

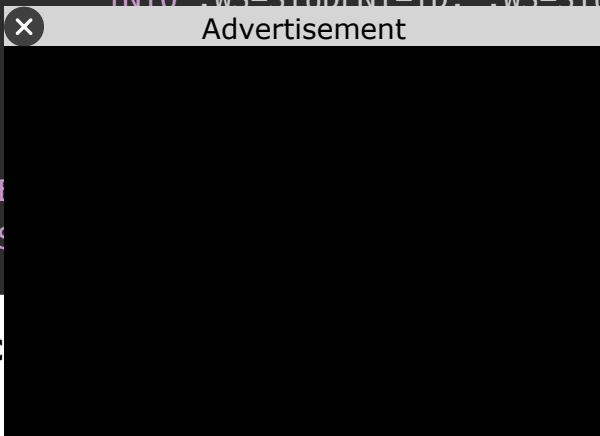
EXEC SQL
DECLARE STUDCUR CURSOR FOR
SELECT STUDENT-ID, STUDENT-NAME, STUDENT-ADDRESS FROM STUDENT
WHERE STUDENT-ID >:WS-STUDENT-ID
END-EXEC.

PROCEDURE DIVISION.

MOVE 1001 TO WS-STUDENT-ID.

PERFORM UNTIL SQLCODE = 100

EXEC SQL
FETCH STUDCUR
INTO :WS-STUDENT-ID, :WS-STUDENT-NAME, WS-STUDENT-ADDRESS



```
//SAMPLE JOB(TESTJCL,XXXXXX),CLASS = A,MSGCLASS = C
//STEP001 EXEC PGM=IKJEFT01
//STEPLIB DD DSN=MYDATA.URMI.DBRMLIB,DISP=SHR
//SYSPRINT DD SYSOUT=*
//SYSUDUMP DD SYSOUT=*
//SYSOUT DD SYSOUT=*
//SYSTSIN DD *
    DSN SYSTEM(SSID)
    RUN PROGRAM(HELLO) PLAN(PLANNAME) -
    END
/*
```

When you compile and execute the above program, it produces the following result –

1001 Mohtashim M.	Hyderabad
1002 Nishant Malik	Delhi
1003 Amitabh Bachan	Mumbai
1004 Chulbul Pandey	Lucknow

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