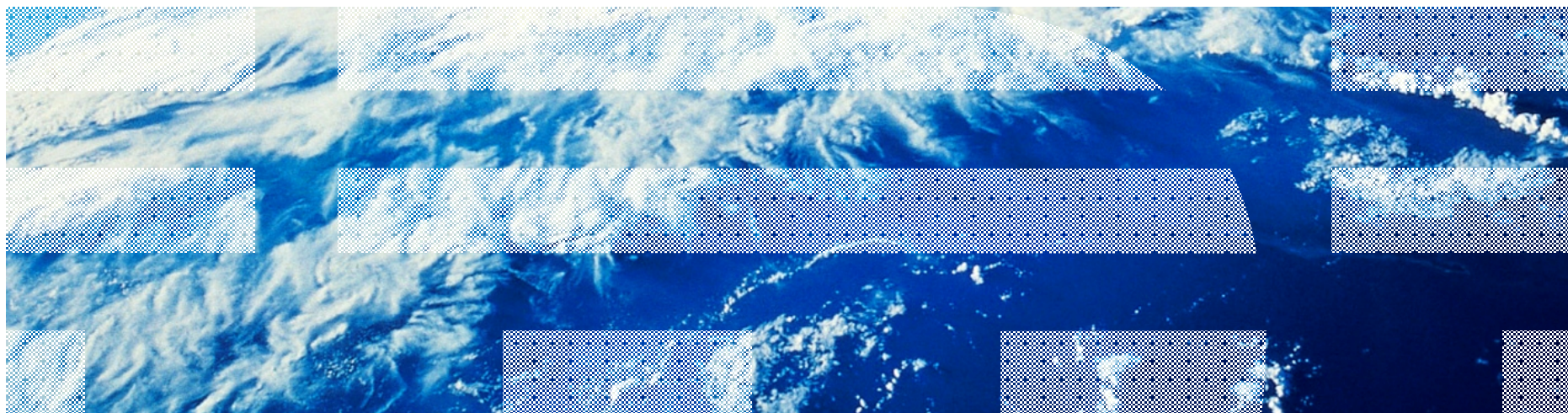


# The New z/VSE Database Connector (DBCLI)

Ingo Franzki

[ifranzki@de.ibm.com](mailto:ifranzki@de.ibm.com)



## Trademarks

**The following are trademarks of the International Business Machines Corporation in the United States, other countries, or both.**

Not all common law marks used by IBM are listed on this page. Failure of a mark to appear does not mean that IBM does not use the mark nor does it mean that the product is not actively marketed or is not significant within its relevant market.

Those trademarks followed by ® are registered trademarks of IBM in the United States; all others are trademarks or common law marks of IBM in the United States.

For a complete list of IBM Trademarks, see [www.ibm.com/legal/copytrade.shtml](http://www.ibm.com/legal/copytrade.shtml):

\*, AS/400®, e business(logo)®, DBE, ESCO, eServer, FICON, IBM®, IBM (logo)®, iSeries®, MVS, OS/390®, pSeries®, RS/6000®, S/30, VM/ESA®, VSE/ESA, WebSphere®, xSeries®, z/OS®, zSeries®, z/VM®, System i, System i5, System p, System p5, System x, System z, System z9®, BladeCenter®

**The following are trademarks or registered trademarks of other companies.**

Adobe, the Adobe logo, PostScript, and the PostScript logo are either registered trademarks or trademarks of Adobe Systems Incorporated in the United States, and/or other countries.

Cell Broadband Engine is a trademark of Sony Computer Entertainment, Inc. in the United States, other countries, or both and is used under license therefrom.

Java and all Java-based trademarks are trademarks of Sun Microsystems, Inc. in the United States, other countries, or both.

Microsoft, Windows, Windows NT, and the Windows logo are trademarks of Microsoft Corporation in the United States, other countries, or both.

Intel, Intel logo, Intel Inside, Intel Inside logo, Intel Centrino, Intel Centrino logo, Celeron, Intel Xeon, Intel SpeedStep, Itanium, and Pentium are trademarks or registered trademarks of Intel Corporation or its subsidiaries in the United States and other countries.

UNIX is a registered trademark of The Open Group in the United States and other countries.

Linux is a registered trademark of Linus Torvalds in the United States, other countries, or both.

ITIL is a registered trademark, and a registered community trademark of the Office of Government Commerce, and is registered in the U.S. Patent and Trademark Office.

IT Infrastructure Library is a registered trademark of the Central Computer and Telecommunications Agency, which is now part of the Office of Government Commerce.

\* All other products may be trademarks or registered trademarks of their respective companies.

### Notes:

Performance is in Internal Throughput Rate (ITR) ratio based on measurements and projections using standard IBM benchmarks in a controlled environment. The actual throughput that any user will experience will vary depending upon considerations such as the amount of multiprogramming in the user's job stream, the I/O configuration, the storage configuration, and the workload processed. Therefore, no assurance can be given that an individual user will achieve throughput improvements equivalent to the performance ratios stated here.

IBM hardware products are manufactured from new parts, or new and serviceable used parts. Regardless, our warranty terms apply.

All customer examples cited or described in this presentation are presented as illustrations of the manner in which some customers have used IBM products and the results they may have achieved. Actual environmental costs and performance characteristics will vary depending on individual customer configurations and conditions.

This publication was produced in the United States. IBM may not offer the products, services or features discussed in this document in other countries, and the information may be subject to change without notice. Consult your local IBM business contact for information on the product or services available in your area.

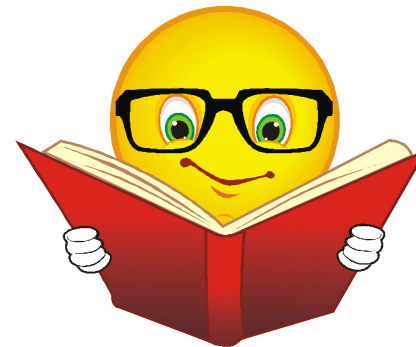
All statements regarding IBM's future direction and intent are subject to change or withdrawal without notice, and represent goals and objectives only.

Information about non-IBM products is obtained from the manufacturers of those products or their published announcements. IBM has not tested those products and cannot confirm the performance, compatibility, or any other claims related to non-IBM products. Questions on the capabilities of non-IBM products should be addressed to the suppliers of those products.

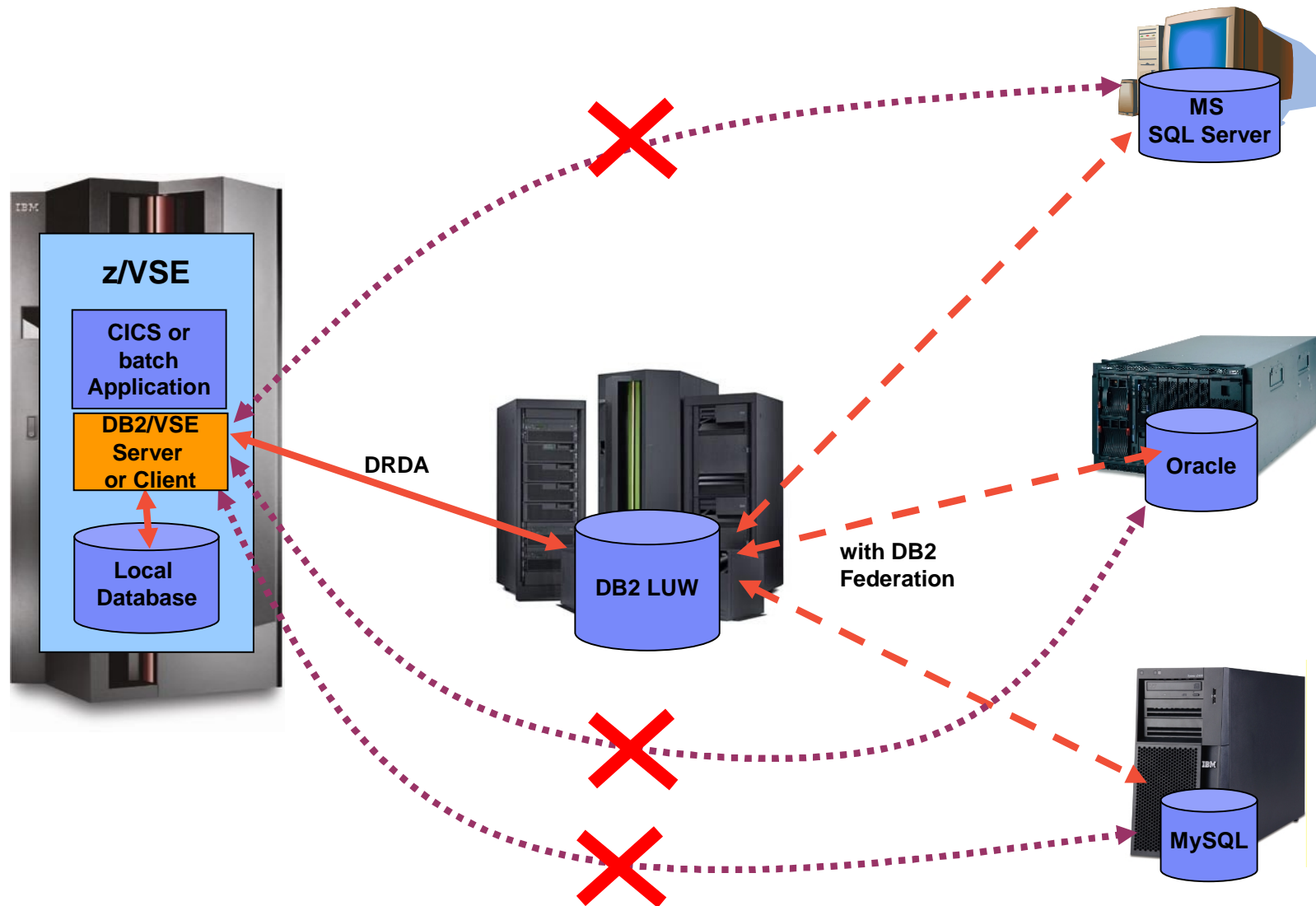
Prices subject to change without notice. Contact your IBM representative or Business Partner for the most current pricing in your geography.

## Agenda

- § Options for using Databases with z/VSE applications
- § z/VSE Database Call Level Interface (DBCLI)
- § DBCLI Concepts
- § COBOL Example
- § Hints & Tips
- § Summary



# z/VSE applications accessing Databases



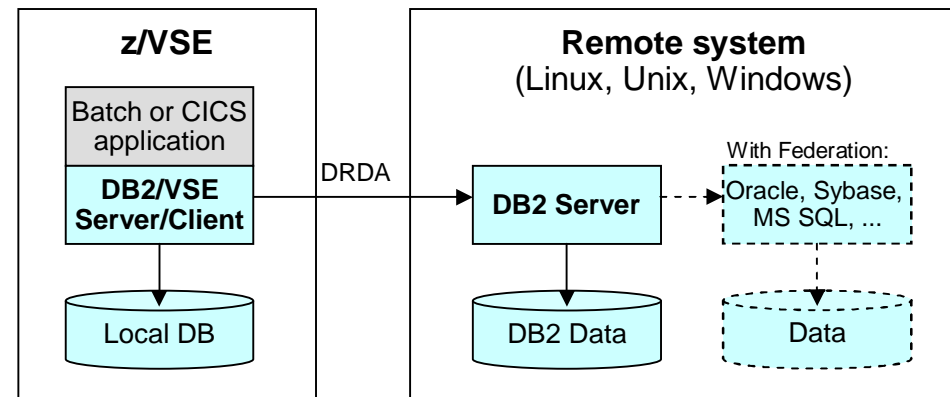
## Options for using Databases with z/VSE applications

### § DB2/VSE or DB2/VM Server

- Local database residing in z/VSE or z/VM
- Lacks support of modern SQL functionality
- Only quite old SQL level supported

### § DB2/VSE Client Edition

- Remote database (on Linux, Windows, Unix)
- Communication via DRDA protocol
- Same old SQL level supported as DB2/VSE Server
- Can not use modern SQL functionality provided by DB2 LUW
- Can only access remote DB2 databases
  - Other databases (e.g. MS SQL Server, Oracle, etc) can only be accessed through IBM InfoSphere Federation Server



### § VSAM Redirector

- Primarily used to keep Databases in sync with VSAM data
- Also allows migration from VSAM to database

### § **New:** z/VSE Database Call Level Interface

- Allows z/VSE applications to access a relational database on any suitable database server
  - IBM DB2, IBM Informix, Oracle, MS SQL Server, MySQL, etc.
- Utilize advanced database functions and use SQL statements provided by modern database products



## New: z/VSE Database Call Level Interface (DBCLI)



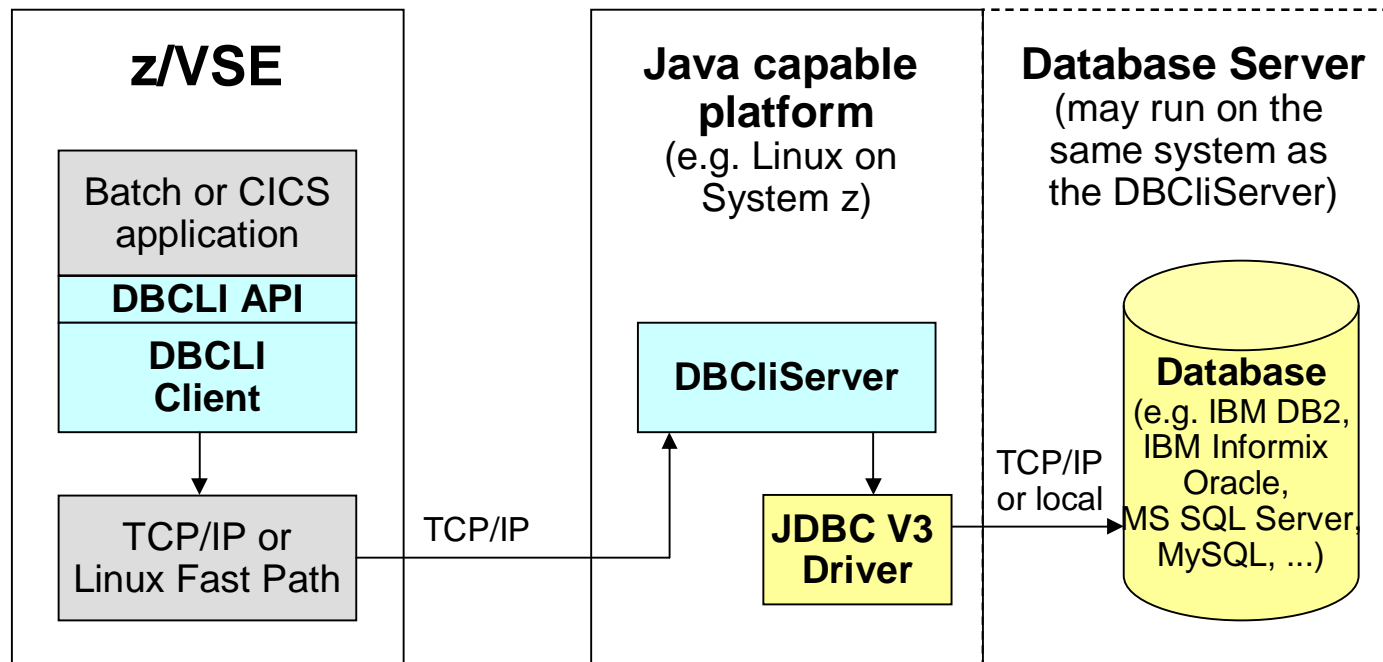
§ **Allows z/VSE applications to access a relational database on any suitable database server**

– IBM DB2, IBM Informix, Oracle, MS SQL Server, MySQL, etc.

à The database product must provide a **JDBC driver that supports JDBC V3.0** or later

à **Utilize advanced database functions and use SQL statements provided by modern database products**

Requires z/VSE 5.1 plus PTFs (UK78892 and UK78893)



## New: z/VSE Database Call Level Interface (DBCLI)

### § The z/VSE Database Call Level Interface (DBCLI) provides a **programming interface (API)**

- Call interface for use with **COBOL**, **PL/1**, **Assembler**, **C** and **REXX**
- Can be used in **Batch** applications as well as in **CICS TS** applications
- Supports LE enabled as well as non-LE environments (Assembler, REXX)

### § It provides callable functions for

- **Initializing** and **Terminating** the API Environment
- **Connecting** and **Disconnecting** to/from the DBCLI Server and the Database
- **Executing** SQL Statements
- Retrieving **query results** through cursors
- Handling of **Logical Units of Work (Transactions)**
- Retrieving **Database Meta Data**



### § DBCLI can only support what the underlying Database supports



## New: z/VSE Database Call Level Interface (DBCLI)

§ **The DBCLI API is not compatible with DB2/VSE's EXEC DB2 preprocessor interface**

- It provides similar functions and concepts
- The API is similar to the **ODBC programming interface** known from distributed platforms (ODBC = Open Data Base Connectivity)

§ **No preprocessor is needed, instead you code the **CALL statements** directly in your program**

§ **A **COBOL example** is provided to show how DBCLI can be used in your applications**

§ **Documentation** is provided in the updated manual  
“z/VSE V5R1 e-business Connectors User's Guide” - SC34-2629-01

- Chapter 9 and 22
- Available on z/VSE web page: <http://ibm.com/zvse/documentation/#conn>



## Using the DBCLI API in your applications

### § Using DBCLI in COBOL:

- The COBOL copybook IESDBCOB contains common declarations

```
CALL 'IESDBCLI' USING FUNCTION ENV-HANDLE parm1 parm2 ... parmN RETCODE.
```

### § Using DBCLI in PL/I

- The PL/I copybook IESDBPL1 contains common declarations

```
CALL IESDBCLI (FUNCTION, ENV_HANDLE, parm1, parm2, ..., parmN, RETCODE);
```

### § Using DBCLI in C

- The C header file IESDBC.h contains common declarations

```
IESDBCLI (function, &env_handle, &parm1, &parm2, ..., &parmN, &retcode);
```

### § Using DBCLI in Assembler

- The Assembler macro IESDBASM contains common declarations

```
CALL IESDBCLI, (FUNCTION, ENV_HANDLE, parm1, parm2, ..., parmN, RETCODE), VL
```

- The following register conventions apply:

- Register 0, 1, 14, and 15 are used by the interface and must be, if necessary, saved prior to invocation
- Register 13 must point to a 72-byte save area provided by the caller

### § Using DBCLI in REXX

```
ADDRESS LINKPGM "IESDBCLA FUNCTION ENV_HANDLE parm1 parm2 ... parmN RETCODE"
```

- All parameters must be initialized with a value of the appropriate length before calling the DBCLI API. This is especially true for output parameters.
- Fullword binary variables must be initialized to contain 4 bytes (for example, VARIABLE = D2C(0,4) )
- Since the variable is expected to contain a value in binary representation, you must convert the value from the REXX string representation into the binary representation and vice versa using the REXX functions C2S and D2C



## DBCLI Concepts: Initializing and terminating the environment

When using the API provided by the DBCLI client, you must:

§ **Initialize** the API environment by calling the **INITENV** function before calling any other function

- The INITENV function allocates an **environment handle** that you must pass to all subsequent functions
- You can have only one active environment at a time in your program

§ **Terminate** the API environment (at the end of your program) by calling the **TERMENV** function

- The TERMENV function frees all resources allocated by the DBCLI code
- The TERMENV function will also close any "left over" connections or statements
- After the TERMENV function, the environment handle is no longer valid

§ **You can set and get various attributes on the environment level**

- You do so by calling the **SETENVATTR** or **GETENVATTR** function



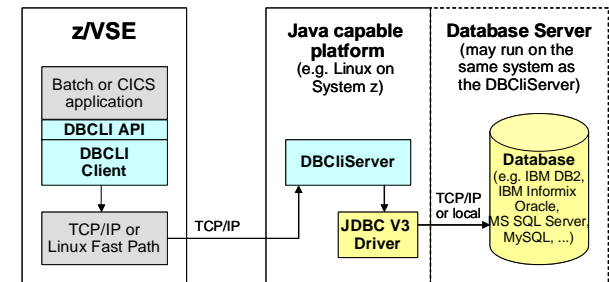
## DBCLI Concepts: Connecting to the DBCLI Server and Database

**To access a Database, you must connect to the DBCLI server and the Vendor database**

§ You connect to the DBCLI server (DBCLiServer) and the database by calling the **CONNECT** function

§ You must supply the:

- IP address or hostname of DBCLiServer
- Alias name of the database or the JDBC URL to which you wish to connect
- User-ID and Password to authenticate with the database



§ The **CONNECT** function allocates a **connection handle** that you must pass to all subsequent functions that require a connection

- You can have multiple connections to the same or different DBCLI servers and databases at a time
- Each connection is represented by its own connection handle

§ When you are finished working with a database, you must disconnect from the database and the DBCLI server (DBCLiServer) by calling the **DISCONNECT** function

- The DISCONNECT function frees the connection handle and all left over statements (if any) that you have allocated using this connection

## DBCLI Concepts: Logical Units of Work (Transactions)



**Per default, a connection operates in transaction mode:**

§ Any database updates that you perform are contained in a **logical unit of work**

§ You can **end a logical unit of work** by calling the COMMIT or ROLLBACK functions:

- The **COMMIT** function commits all changes done since the beginning of the logical unit of work and starts a new logical unit of work
- The **ROLLBACK** function rolls back (reverts) all changes since the beginning of the logical unit of work or up to a savepoint

§ Usually, you should **explicitly call the COMMIT function at the end of the program.**

§ If you do not call the COMMIT function, DBCLI Server will **automatically commit** all changes

- **if you gracefully close the connection** by calling the **DISCONNECT** function

§ If the **connection is dropped** (for example, because the program abends), the DBCLI server **rolls back all changes** done since the beginning of the last logical unit of work

§ You can set a connection into **auto-commit mode**

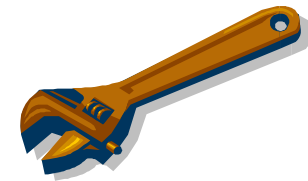
- In auto-commit mode, every SQL statement is treated as **its own logical unit of work** and is **committed automatically** when the statement execution is complete.
  - Therefore, you do not have to call the COMMIT or ROLLBACK functions.
- You set a connection into auto-commit mode by calling the **SETCONNATTR** function to set the **CONNATTR-AUTO-COMMIT** attribute to TRUE

## DBCLI Concepts: Preparing SQL Statements

**In order to execute an SQL statement, you must first prepare the SQL statement**

§ During preparation, the database will **pre-compile the SQL statement** and create an **access plan** for the statement

- The access plan is kept as long as the statement exists
- You can then **execute** the statement **as many times** as you want



§ The **PREPARESTatement** function prepares an SQL statement for execution

- It allocates a **statement handle** that represents the statement
- An application can have multiple prepared statements at a time

§ The **PREPARECALL** function prepares a **stored procedure call** statement for execution

§ SQL statements may contain **parameters** that are **evaluated at execution time**

- Parameters are marked by a **question mark (?)** within the SQL statement
- The parameters are **numbered in order of appearance**, starting with 1

§ After preparing, the application can **bind host variables to the parameters** using the **BINDPARAMETER** function

- When the statement is later **executed**, the **content of the host variables is used** and sent to the database.

## DBCLI Concepts: Statement Parameters and Parameter Markers

### SQL statements may contain parameters that are evaluated at execution time

- § Parameters are marked by a **question mark (?)** within the SQL statement
- § The parameters are **numbered in order of appearance**, starting with 1
- § Parameters can be used for INPUT, OUTPUT or both

```
SELECT * FROM EMPLOYEE WHERE EMPNO>? AND SALARY>?
```

Parameter 1

Parameter 2



à Above statement has 2 parameters

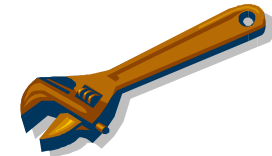
§ When using DB2/VSE preprocessor, above statement would look like:

```
– SELECT * FROM EMPLOYEE WHERE EMPNO>:empno AND SALARY>:salary
```

- § The application **binds host variables to the parameters** using the **BINDPARAMETER** function
  - When the statement is later executed, the **content of the host variables is used** and sent to the database
  - You also specify the **data type** and **length** of the variable with the BINDPARAMETER call
  - You do not need to re-bind the parameters when executing the statement a second time

§ You can use the **GETNUMPARAMETERS** and **GETPARAMETERINFO** functions to obtain detailed information about the statement parameters

## DBCLI Concepts: Executing statements



**To execute a statement, you must call the EXECUTE function**

- § If the statement was an SQL **update statement**, you can retrieve the number of rows updated using the **GETUPDATECOUNT** function or the **UPDATE-COUNT** parameter at the EXECUTE function
- § If the statement was a SQL **query statement**, you can **use a cursor** to retrieve (fetch) the result rows and columns
  - A statement can provide multiple results (mostly stored procedures)
  - To retrieve the additional results you must call the **GETMORERESULTS** function
  - The GETMORERESULTS function will move to the next available cursor or update count
- § If the statement was a stored procedure call, **output parameters** are updated with the data passed back by the stored procedure
- § When you no longer need a statement, you must close it by calling the **CLOSESTATEMENT** function:
  - The CLOSESTATEMENT function frees the statement handle and closes all cursors (if any) that may still be open from the last statement execution
- § The statement handle is no longer valid after the CLOSESTATEMENT function

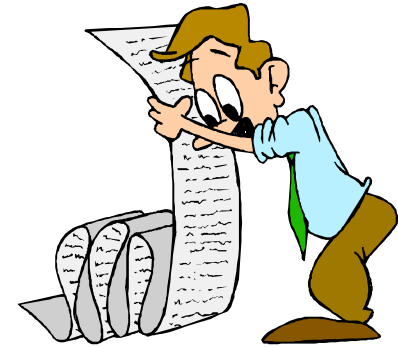


## DBCLI Concepts: Result sets and Cursors

The execution on an **SQL query** returns a result in form of a **cursor**

§ A cursor allows you to retrieve (fetch) the result rows and columns

- You can use the **GETNUMCOLUMNS** and **GETCOLUMNINFO** functions to obtain detailed information about the cursor's columns
- The **columns are numbered** in order of appearance, starting at 1



§ To fetch the result rows using the cursor, you must first **bind host variables to the columns** of interest

- You bind host variables to the columns of interest by calling the **BINDCOLUMN** function
- If the **FETCH** function is called later on, the host variables will be updated with the contents of the column in the row that has been fetched

§ Per default, the **FETCH** function processes the cursor **from the beginning to the end**

- You may **reposition with a cursor**
  - Providing the database supports this and you have created the statement using the appropriate type (**CURSOR-TYPE-SCROLL-INSENSITIVE** or **CURSOR-TYPE-SCROLL-SENSITIVE**)

§ Repositioning can be performed using either the:

- **FETCH** function with operations **FETCH-PREVIOUS**, **FETCH-FIRST**, **FETCH-LAST**, **FETCH-ABSOLUTE** or **FETCH-RELATIVE**.
- **SETPOS** function

## DBCLI Concepts: Database Meta Data

**The DBCLI interface allows you to retrieve meta data from the database**

§ This includes functions to get a **list of tables**, indexes, keys, **columns of a table**, and so on

§ This information is typically stored in system catalog tables in the database.

- You can also execute regular SELECT statements against the system catalog tables, but this requires that you know which database system and vendor you are using
- System catalog tables are vendor- and database-specific

§ The DBCLI interface provides a **set of database independent functions** to retrieve meta data information.

- These functions are prefixed with 'DB'
- The function DBTABLES for example retrieves a list of tables available in the database



§ Please note that some databases may not support all of the meta data functions

DBBESTROWIDENT  
 DBCATALOGS  
 DBCOLUMNPRIV  
 DBCOLUMNS  
 DBCROSSREFERENCE  
 DBEXPORTEDKEYS  
 DBIMPORTEDKEYS  
 DBINDEXINFO  
 DBPRIMARYKEYS  
 DBPROCEDURECOLS

DBPROCEDURES  
 DBSCHEMAS  
 DBSUPERTABLES  
 DBSUPERTYPES  
 DBTABLEPRIV  
 DBTABLES  
 DBTABLETYPES  
 DBTYPEINFO  
 DBUDTS  
 DBVERSIONCOLS

## COBOL Example

```
PROCEDURE DIVISION.  
MAIN-PROGRAM.  
    DISPLAY 'COBSAMPL STARTED'.  
*  
* Perform the INITENV call  
*  
    MOVE 'SOCKET00' TO TCPNAME.  
    MOVE 'EZASOH99' TO ADSNAME.  
    CALL 'IESDBCLI' USING FUNC-INITENV ENV-HANDLE  
        TCPNAME ADSNAME RETCODE.  
    DISPLAY 'RETCODE OF INITENV IS ' RETCODE.  
    IF RETCODE > EOK THEN  
        PERFORM CHECK-ERROR  
    END-IF.
```

← Initialize the environment

## COBOL Example

```
PROCEDURE DIVISION.  
MAIN-PROGRAM.  
    DISPLAY 'COBSAMPL STARTED'.  
*  
* * Connect to the DBCLI server and the database  
*  
    MOVE '9.152.2.70' TO SERVER.  
    MOVE 10 TO SERVER-LEN.  
    MOVE 16178 TO PORT.  
    MOVE 'SAMPLE' TO DBNAME.  
    MOVE 6 TO DBNAME-LEN.  
    MOVE 'dbuserid' TO USERID.  
    MOVE 8 TO USERID-LEN.  
    MOVE 'password' TO PASSWD.  
    MOVE 8 TO PASSWD-LEN.  
    CALL 'IESDBCLI' USING FUNC-CONNECT ENV-HANDLE CON-HANDLE  
        SERVER SERVER-LEN PORT DBNAME DBNAME-LEN  
        USERID USERID-LEN PASSWD PASSWD-LEN  
        RETCODE.  
    DISPLAY 'RETCODE OF CONNECT IS ' RETCODE.  
    IF RETCODE > EOK THEN  
        PERFORM CHECK-ERROR  
    END-IF.
```

IP or hostname of  
DBCLI Server

Database alias name  
User-ID & Password

Connect to the  
DBCLI Server  
and the Database

## COBOL Example

```
PROCEDURE DIVISION.  
MAIN-PROGRAM.  
    DISPLAY 'COBSAMPL STARTED'.  
*  
* * Connect to the DBCLI server and the database  
*  
    MOVE '9.152.2.70' TO SERVER.  
    MOVE 10 TO SERVER-LEN.  
    MOVE 16178 TO PORT.  
    MOVE 'SAMPLE' TO DBNAME.  
    MOVE 6 TO DBNAME-LEN.  
*  
* Prepare an SQL statement for later execution  
*  
    MOVE 'SELECT * FROM EMPLOYEE WHERE EMPNO>? AND SALARY>?'  
      TO SQL.  
    MOVE LENGTH OF SQL TO SQL-LEN.  
    CALL 'IESDBCLI' USING FUNC-PREPARESTATEMENT ENV-HANDLE  
      CON-HANDLE STMT-HANDLE SQL SQL-LEN  
      CURSOR-TYPE-SCROLL-INSENSITIVE CURSOR-CONCUR-READ-ONLY  
      HOLD-CURSORS-OVER-COMMIT RETCODE.  
    DISPLAY 'RETCODE OF PREPARESTATEMENT IS ' RETCODE.  
    IF RETCODE > EOK THEN  
        PERFORM CHECK-ERROR  
    END-IF.
```

SQL Statement  
Containing Parameter  
Markers ('?')

Prepare an  
SQL Statement  
for later execution

## COBOL Example

```
PROCEDURE DIVISION.  
MAIN-PROGRAM.  
    DISPLAY 'COBSAMPL STARTED'.  
*  
* * Connect to the DBCLI server and the database  
*  
    MOVE '9.152.2.70' TO SERVER.  
    MOVE 10 TO SERVER-LEN.  
    MOVE 16178 TO PORT.  
    MOVE 'SAMPLE' TO DBNAME.  
    MOVE 6 TO DBNAME-LEN.  
*  
* Prepare an SQL statement for later execution  
*  
* Bind the EMPNO host variable (Text) to parameter 1.  
* Here we specify the optional codepage parameter to  
* send the text data in the desired codepage.  
*  
    MOVE 1 TO PARM-IDX.  
    MOVE LENGTH OF EMPNO TO EMPNO-LEN.  
    MOVE 'CP1047' TO CODEPAGE.  
    MOVE LENGTH OF CODEPAGE TO CODEPAGE-LEN.  
    CALL 'IESDBCLI' USING FUNC-BINDPARAMETER ENV-HANDLE  
        STMT-HANDLE PARM-IDX NATIVE-TYPE-STRING  
        EMPNO EMPNO-LEN EMPNO-IND  
        CODEPAGE CODEPAGE-LEN RETCODE.  
    DISPLAY 'RETCODE OF BINDPARAMETER IS ' RETCODE.  
    IF RETCODE > EOK THEN  
        PERFORM CHECK-ERROR  
    END-IF.
```

Bind host variable  
“EMPNO”  
to parameter  
number 1  
as STRING

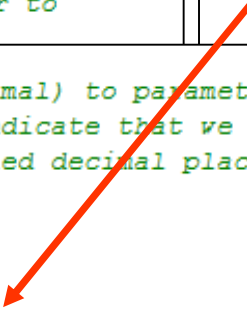
## COBOL Example

```

PROCEDURE DIVISION.
MAIN-PROGRAM.
  DISPLAY 'COBSAMPL STARTED'.
*
*
* * Connect to the DBCLI server and the database
*
  MOVE '9.152.2.70' TO SERVER.
  MOVE 10 TO SERVER-LEN.
  MOVE 16178 TO PORT.
  MOVE 'SAMPLE' TO DBNAME.
  MOVE 6 TO DBNAME-LEN.
*
* Prepare SQL statement for later execution
*
* Bind the EMPNO host variable (Text) to parameter 1.
* Here we specify the optional codepage parameter to
* send the text data in the desired codepage.
*
* Bind the SALARY host variable (packed decimal) to parameter 2.
* Here we specify the decpos parameter to indicate that we
* want to send the numeric data with 2 implied decimal places.
*
  MOVE 2 TO PARM-IDX.
  MOVE LENGTH OF SALARY TO SALARY-LEN.
  MOVE 2 TO DECPOS.
  CALL 'IESDBCLI' USING FUNC-BINDPARAMETER ENV-HANDLE
    STMT-HANDLE PARM-IDX NATIVE-TYPE-PACKED-SIGNED
    SALARY SALARY-LEN SALARY-IND
    DECPOS RETCODE.
  DISPLAY 'RETCODE OF BINDPARAMETER IS ' RETCODE.
  IF RETCODE > EOK THEN
    PERFORM CHECK-ERROR
  END-IF.

```

Bind host variable  
“SALARY”  
to parameter  
number 2  
as PACKED decimal





# COBOL Example

Assign values

```

PROCEDURE DIVISION.
MAIN-PROGRAM.
    DISPLAY 'COBSAMPL STARTED'.
*
*
* * Connect to the DBCLI server and th
*
    MOVE '9.152.2.70' TO SERVER.
    MOVE 10 TO SERVER-LEN.
    MOVE 16178 TO PORT.
    MOVE 'SAMPLE' TO DBNAME.
    MOVE 6 TO DBNAME-LEN.
*
* Prepare SQL statement for
*
* Bind the EMPNO host variab
* Here we specify the optio
* send the text data in the
*
* Bind the SALARY host
* Here we specify the d
* want to send the nume
*
    MOVE 2 TO PARM-IDX
    MOVE LENGTH OF SALARY TO SALARY-LEN.
    MOVE 2 TO DECPOS.
    CALL 'IESDBCLI' USING FUNC-BINDPARAMETER ENV-HANDLE
        STMT-HANDLE PARM-IDX NATIVE-TYPE-PACKED-SIGNED
        SALARY SALARY-LEN SALARY-IND
        DECPOS RETCODE.
    DISPLAY 'RETCODE OF BINDPARAMETER IS ' RETCODE.
    IF RETCODE > EOK THEN
        PERFORM CHECK-ERROR
    END-IF.
*
* Set the host variables values and corresponding indicator
* variables:
*
    MOVE '000030' TO EMPNO.
    MOVE INDICATE-NOTNULL TO EMPNO-IND.
    MOVE 01000.00 TO SALARY.
    MOVE INDICATE-NOTNULL TO SALARY-IND.
*
* Execute the statement. This will use the values of the
* host variables for the parameters.
*
    CALL 'IESDBCLI' USING FUNC-EXECUTE ENV-HANDLE
        STMT-HANDLE RETCODE.
    IF RETCODE > EOK THEN
        PERFORM CHECK-ERROR
    END-IF.
    DISPLAY 'RETCODE OF EXECUTE IS ' RETCODE.
    IF RETCODE > EOK THEN
        PERFORM CHECK-ERROR
    END-IF.
    
```

Execute the statement

# COBOL Example

```

PROCEDURE DIVISION.
MAIN-PROGRAM.
    DISPLAY 'COBSAMPL STARTED'.
*
*
* * Connect to the DBCLI server and th
*
    MOVE '9.152.2.70' TO SERVER.
    MOVE 10 TO SERVER-LEN.
    MOVE 16178 TO PORT.
    MOVE 'SAMPLE' TO DBNAME.
    MOVE 6 TO DBNAME-LEN.
*
* Pre
*
* Bind the EMPNO host variab
* Here we specify the optio
* send the text data in the
*
* Bind the SALARY host
* Here we specify the d
* want to send the nume
*
    MOVE 2 TO PARM-IDX
    MOVE LENGTH OF SALARY TO SALARY-LEN.
    MOVE 2 TO DECPOS.
    CALL 'IESDBCLI' USING FUNC-BINDPARAMETER ENV-HANDLE
        STMT-HANDLE PARM-IDX NATIVE-TYPE-PACKED-SIGNED
        SALARY SALARY-LEN SALARY-IND
        DECPOS RETCODE.
    DISPLAY 'RETCODE OF BINDPARAMETER IS ' RETCODE.
    IF RETCODE > EOK THEN
        PERFORM CHECK-ERROR
    END-IF.
*
* Set the host variables values and coresponding indicator
* variables:
*
* Bind host variable FIRSTNAME (text) to the column 2.
* Here we do not specify the codepage parameter so we
* receive the text data in the default codepage.
*
    MOVE 2 TO COL-IDX.
    MOVE LENGTH OF FIRSTNAME TO FIRSTNAME-LEN.
    CALL 'IESDBCLI' USING FUNC-BINDCOLUMN ENV-HANDLE
        STMT-HANDLE COL-IDX NATIVE-TYPE-STRING
        FIRSTNAME FIRSTNAME-LEN FIRSTNAME-IND
        RETCODE.
    DISPLAY 'RETCODE OF BINDCOLUMN IS ' RETCODE.
    IF RETCODE > EOK THEN
        PERFORM CHECK-ERROR
    END-IF.
    IF RETCODE > EOK THEN
        PERFORM CHECK-ERROR
    END-IF.
    
```

Bind host variable "FIRSTNAME" to result set column number 2

## COBOL Example

```

PROCEDURE DIVISION.
MAIN-PROGRAM.
    DISPLAY 'COBSAMPL STARTED'.
*
*
* * Connect to the DBCLI server and th
*
    MOVE '9.152.2.70' TO SERVER.
    MOVE 10 TO SERVER-LEN.
    MOVE 16178 TO PORT.
*
*
* * Bind the EMPNO host variab
* * Here we specify the optio
* * send the text data in the
*
* * Bind the SALARY host
* * Here we specify the d
* * want to send the nume
*
    MOVE 2 TO PARM-IDX
    MOVE LENGTH OF SALARY TO
    MOVE 2 TO DECPOS.
    CALL 'IESDBCLI' USING FUNC
    STMT-HANDLE PARM-IDX
    SALARY SALARY-LEN SA
    DECPOS RETCODE.
    DISPLAY 'RETCODE OF BINDE
    IF RETCODE > EOK THEN
        PERFORM CHECK-ERROR
    END-IF.
*
* * Set the host variables values and coresponding indicator
* * variables:
*
* * Bind host variable FIRSTNAME (text) to the column 2.
* He
* re
* * Fetch all available rows and display the data.
* * Since columns may be NULL we check the indicator variables.
* * FETCH without an operation argument means FETCH NEXT.
* E
*
    PERFORM WITH TEST AFTER UNTIL RETCODE > EOK
    CALL 'IESDBCLI' USING FUNC-FETCH ENV-HANDLE
    STMT-HANDLE RETCODE
    DISPLAY 'RETCODE OF FETCH IS ' RETCODE
    IF RETCODE > EOK AND RETCODE NOT = ENOMOREDATA THEN
        PERFORM CHECK-ERROR
    END-IF
    IF RETCODE = EOK THEN
        DISPLAY 'ROW DATA INFO FOR ROW NUMBER ' ROW-NUMBER
        IF EMPNO-IND = INDICATE-NULL THEN
            DISPLAY ' EMPNO IS NULL'
        ELSE
            DISPLAY ' EMPNO IS ' EMPNO
        END-IF
        IF FIRSTNAME-IND = INDICATE-NULL THEN
            DISPLAY ' FIRSTNAME IS NULL'
        ELSE
            DISPLAY ' FIRSTNAME IS ' FIRSTNAME
        END-IF
    END-IF

```

Fetch all rows

## Hints & Tips

### § The DBCLI code is **CICS-aware**

- If running under CICS, any memory allocations are performed using EXEC CICS GETMAIN instead of using the GETVIS macro



### § When using the DBCLI API in CICS transactions while CICS operates with storage protection, **all programs using the DBCLI API need to be defined with EXECKEY(CICS)**

- This is also true for those programs that link to these programs
- TASKDATAKEY(CICS) for the transaction definition is NOT required.

### § When using the DBCLI API in CICS transactions, the **EZA "task-related-user-exit" (TRUE) has to be activated** before these transactions can be run

- For details on how to activate this TRUE, refer to "CICS Considerations for the EZA Interfaces" in the z/VSE TCP/IP Support, SC34-2640

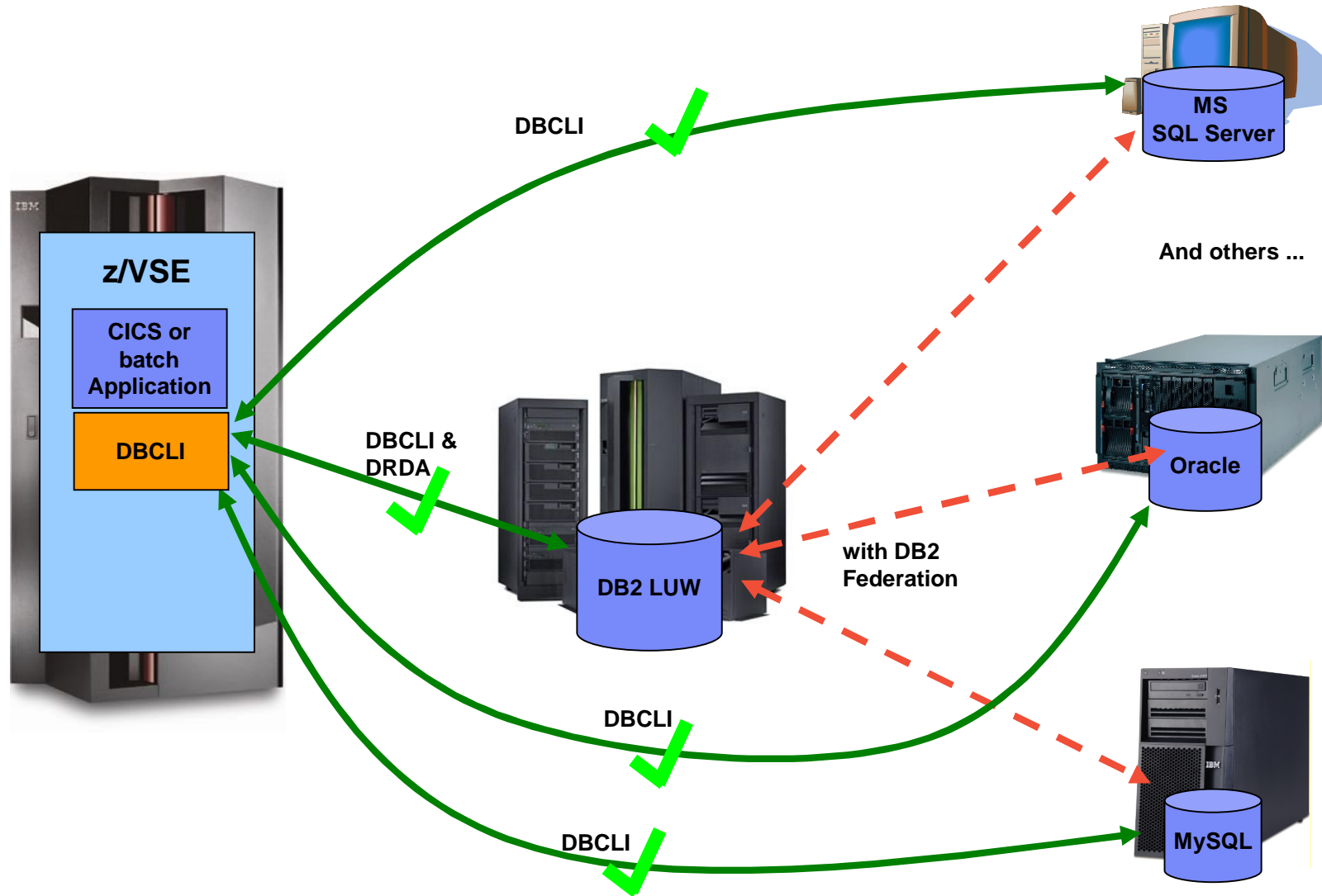
### § Most JDBC drivers will only accept **pure SQL statements**

- They will not accept SQL preprocessor statements that are used for DB2 Server for VSE applications

### § The call to the IESDBCLI function must be a **static CALL** in COBOL

- Do not use the DYNAM compiler option

# z/VSE applications accessing Databases



## Questions ?



### Mark your calendar:

#### **IBM System z Technical University**

Las Vegas, NV, USA

October 1-5, 2012

Caesars Palace



#### **European GSE/IBM**

**Technical University for**

**z/VSE, z/VM and Linux on System z**

Mainz, Germany

October 22-24, 2012

<http://ibm.com/vse/events/>