

# z/VSE Connectors Update

with Practical Example:  
How to trigger processes on distributed systems

Ingo Franzki, IBM



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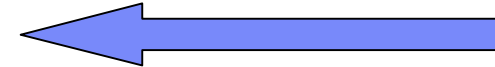
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## Agenda

### § **z/VSE V5.1 + PTFs Connector Enhancements**

- z/VSE Database Call Level Interface



### § **z/VSE V5.1 Connector Enhancements**

- VSE Script Connector: SYSIPT Variables Support
- VSE Script Connector: New functions
- VSE Script Connector: Logging of script input and output
- VSAM Redirector: MapperConfigGUI Enhancements
- VSE Connector Client & Server: LDAP signon support
- VSE Connector Client & Server: LIBR DATA=YES

### § **Practical Example: How to trigger processes on distributed systems**

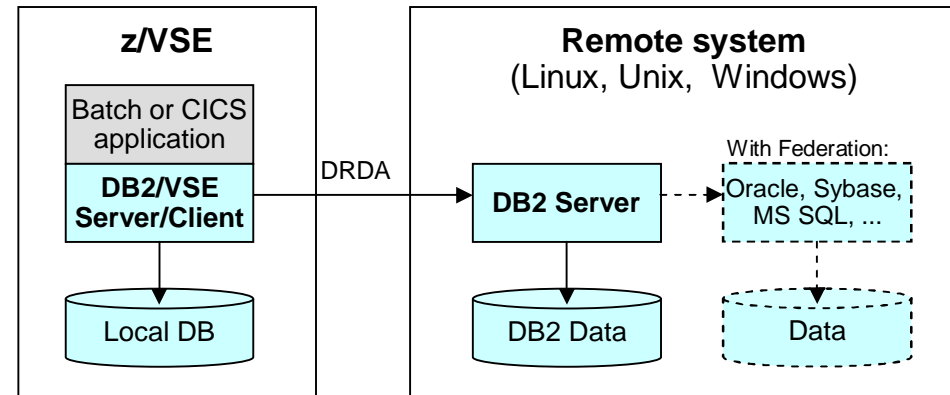
## Options for using Databases with z/VSE applications

### § 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



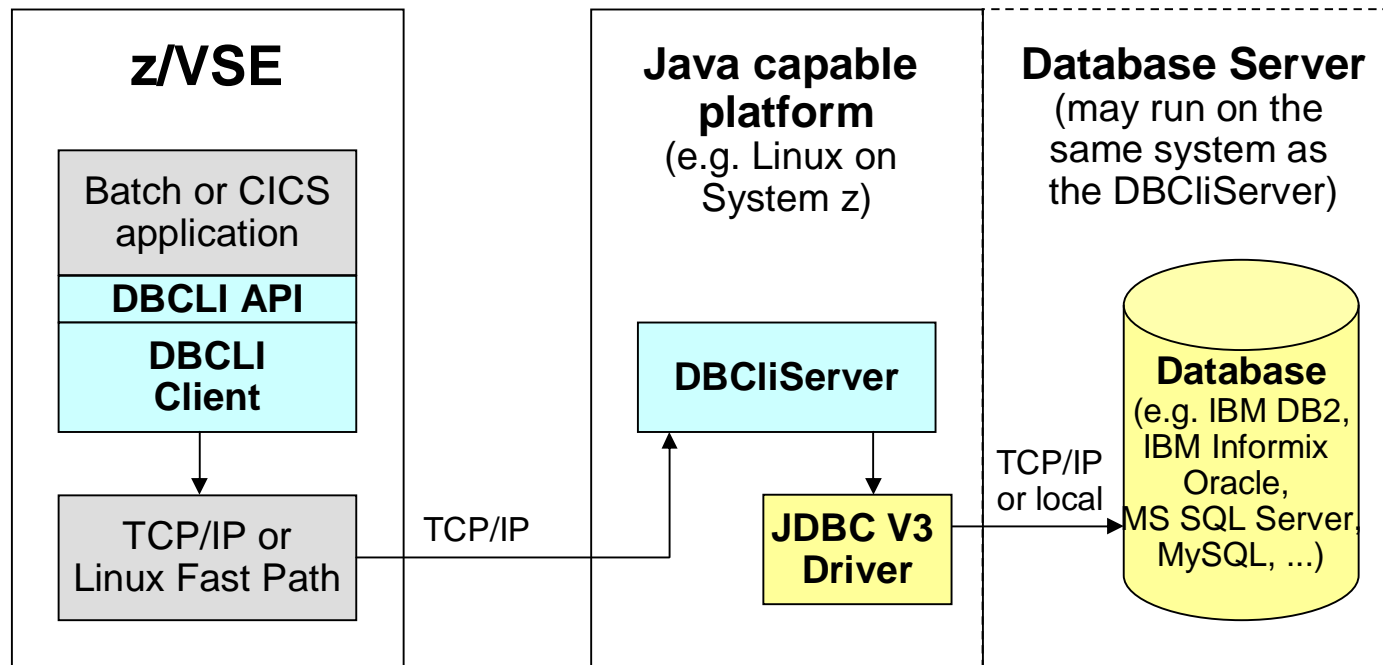
## z/VSE V5.1 + PTFs: z/VSE Database Call Level Interface (DBCLI)

§ **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**



## z/VSE V5.1 + PTFs: z/VSE Database Call Level Interface (DBCLI)

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

- Call interface for use with COBOL, PL/1, Assembler, C and REXX
- Can be used in Batch 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

### § Additional enhancement announced:

- Connection Pooling



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

- But it provides similar functions
- The API is similar to the ODBC programming interface

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

## z/VSE V5.1 + PTFs: z/VSE Database Call Level Interface (DBCLI)



```

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
  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
*
* 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.
*
  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
  
```

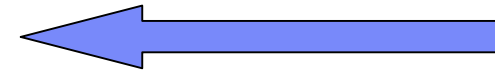
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- VSE Connector Client & Server: LIBR DATA=YES



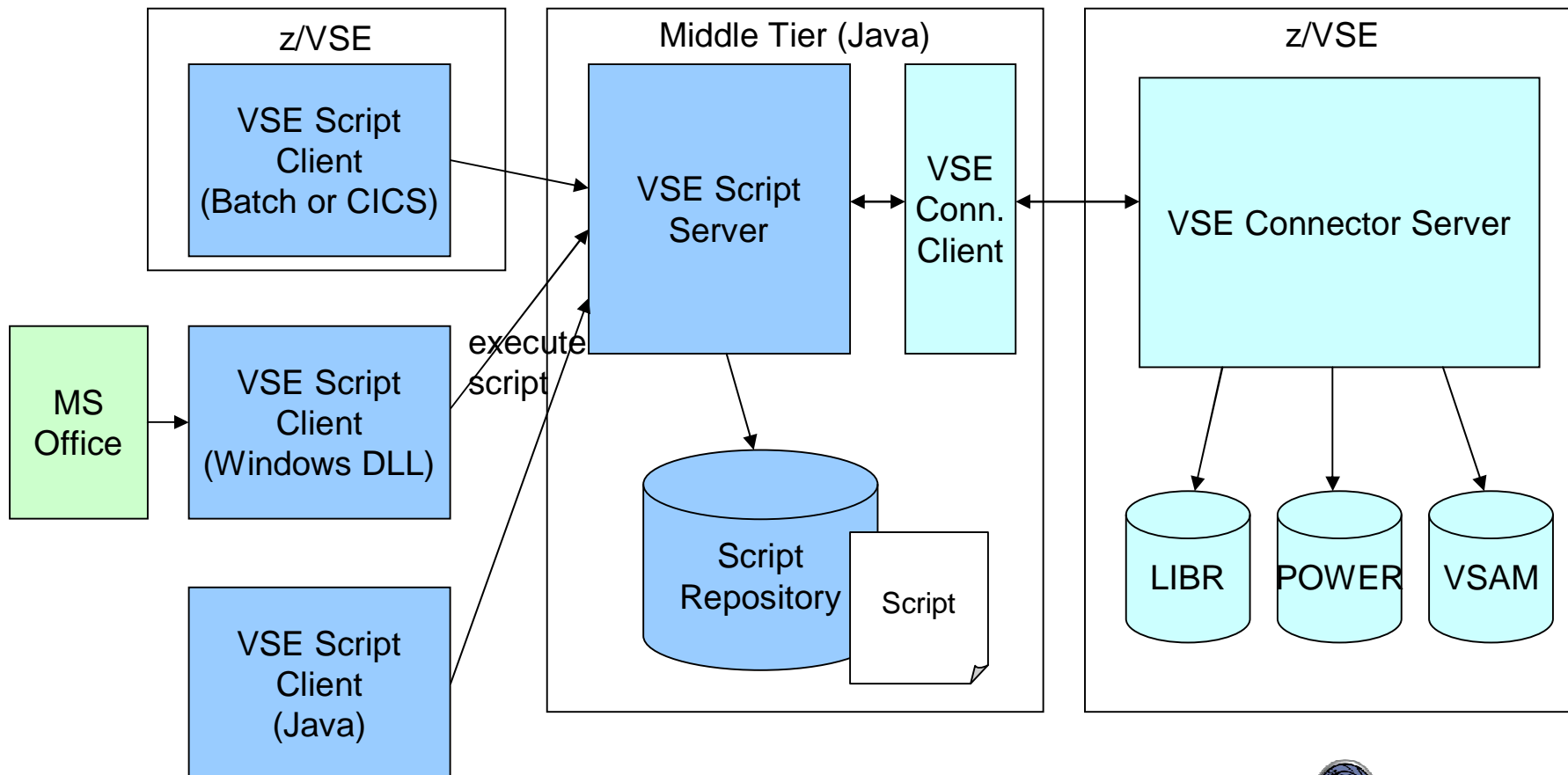
### § **New and updated Tools**



## z/VSE V5.1: VSE Script Connector Overview

§ Part of the z/VSE Connectors since z/VSE V3.1

§ Allows remote access to z/VSE resources and data from non-Java platforms



## z/VSE V5.1: VSE Script Connector: SYSIPT Variables Support

§ The **SYSIPT** variables support extends the VSE Script BATCH client programs by adding support for **symbolic variables**

§ Customers can assign the variables dynamically in JCL before they invoke the VSE Script batch client

§ **Usage examples:**

§ Feed in data from previous job steps

§ Centralize often used settings, such as IP address

§ **Example: sets the target host and the script to execute using variables:**

```
* $$ JOB JNM=START, DISP=L, CLASS=A
// JOB START
// LIBDEF *, SEARCH=(PRD1. BASE, PRD2. SCEEBASE, PRD2. DBASE)
// SETPARM DESTIP=' 10. 31. 0. 1'
// SETPARM SCRIPT=' testscript. src'
// SETPARM HELLO=' HELLO '
// SETPARM WORLD=' WORLD'
// EXEC IESSCBAT, PARM=' CODEPAGE=CP1047 SHOWERROR=YES SYMBOLS=YES'
&DESTIP: 4711
&SCRIPT
Script input ...
&HELLO&WORLD. !
/*
/&
* $$ EOJ
```

## z/VSE V5.1: VSE Script Connector: SYSIPT Variables Support

§ The support must be enabled by setting the new PARMS parameter **SYMBOLS=YES**

- The default for this new parameter is SYMBOLS=NO to ensure backward compatibility.

§ The defined format of the variables specified in SYSIPT will be the **same format** that is described in “System Control Statements” manual, **Job Controls 'Symbolic Parameters'** chapter, available here:

[http://publibz.boulder.ibm.com/cgi-bin/bookmgr\\_OS390/BOOKS/IESSOE51/3.7?SHELF=IESVSE71&DT=20090403085040](http://publibz.boulder.ibm.com/cgi-bin/bookmgr_OS390/BOOKS/IESSOE51/3.7?SHELF=IESVSE71&DT=20090403085040)

- A symbolic variable starts with '&'
- When a '&' is needed in the input, write it as '&&'
- Symbolic variable name contains of characters [0-9][A-Z] (yes, uppercase!) (this is not checked by the library, but the symbol would be not found)
- Any other character beside [0-9][A-Z] marks the end of the current symbol
- A '.' after the symbol name marks the end of the symbol without printing a character, for example '&SYMBOL.ALL' where SYMBOL='HELLO' will result in 'HELLOALL' without a '.'
- The maximum final line length is not limited

§ A symbolic variable can be defined in JCL using

```
// SETPARM [SYSTEM] VARIABLE='VALUE'
```



## z/VSE V5.1: VSE Script Connector: New functions

### § New LIBR functions

- List libraries, sub libraries, members
- Create/delete sub library
- Copy/move member
- Delete/rename member
- Download member (binary and text)
- Upload member (binary and text)
- Put member on POWER queue
- Get member from POWER queue

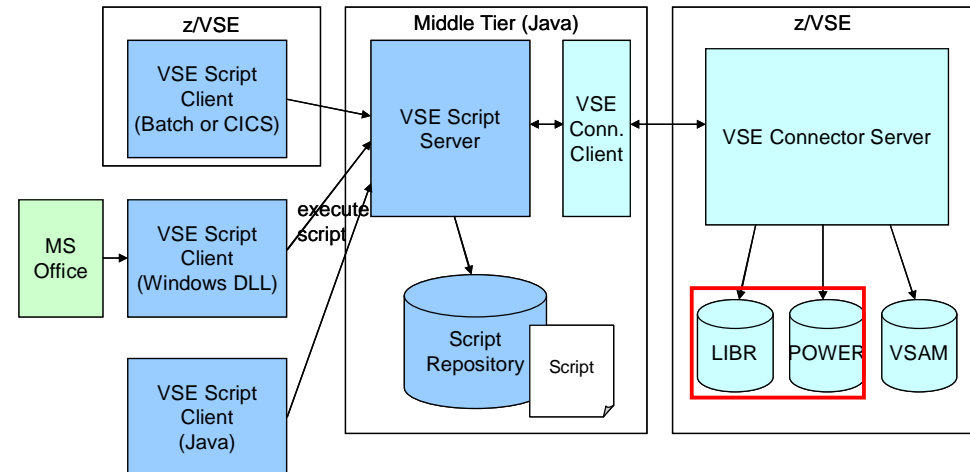
### § New POWER functions

- Get entry in binary
- Put entry in binary

### § Codepage related functions

- Convert a string to binary and vice versa, using a specific codepage
- Write/read a local file in binary

à Support for Binary data and Codepage tools allow to use VSE Script Connector with Double Byte Characters Set (DBCS) and Unicode data



## z/VSE V5.1: VSE Script Connector: Logging of script input/output

§ The VSE Script Server now optionally prints all input and output data into the server log

– This new feature can be used for audit purposes

§ The logging can be enabled using the new optional configuration parameters

– `logscriptinputparams`

– `logscriptoutput`

§ Additionally a script function was added to print directly into the server log:

– `PRINTLOG()`

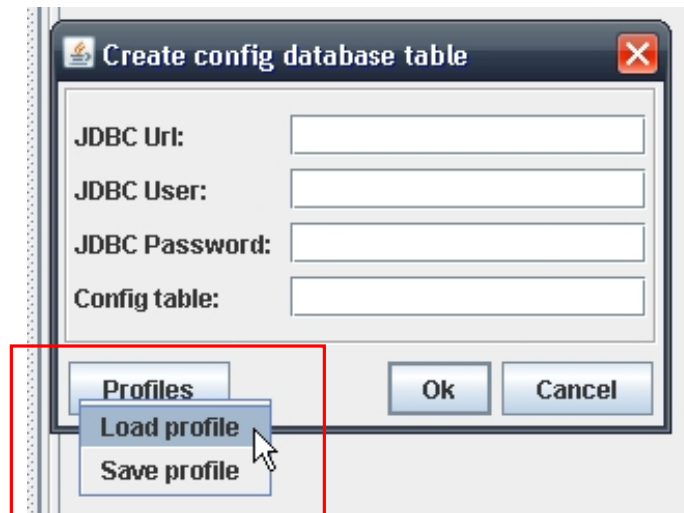
§ This function can be exploited by user scripts to print audit-relevant messages to the server log

```
04.11.2010 08:56:30 (8) - Client connection request from 127.0.0.1
04.11.2010 08:56:30 (11) - Client has been accepted.
04.11.2010 08:56:30 (11) - Connection has been accepted from 127.0.0.1
04.11.2010 08:56:30 (11) - Using default system codepage.
04.11.2010 08:56:30 (11) - Executing script 'samples/qosub.src'
04.11.2010 08:56:30 (11) - Script receives 3 input parameter(s):
04.11.2010 08:56:30 (11) -   argv[1]='2'
04.11.2010 08:56:30 (11) -   argv[2]='test'
04.11.2010 08:56:30 (11) -   argv[3]='parameters'
04.11.2010 08:56:30 (11) - Script output follows:
04.11.2010 08:56:30 (11) - 'start'
04.11.2010 08:56:30 (11) - 'sub'
04.11.2010 08:56:30 (11) - 'end'
04.11.2010 08:56:30 (11) - PRINTLOG: 'New log output'
04.11.2010 08:56:30 (11) - Connection has been terminated from 127.0.0.1
04.11.2010 08:56:30 (11) - Client has been disconnected.
```

## z/VSE V5.1: VSAM Redirector: MapperConfigGUI Enhancements

### § MapperConfigGui is part of VSE VSAM Redirectors DBHandler

- The MapperConfigGui now allows to **save profiles** which contain the information needed to access a database target
- You don't have to enter them again and again when switching between different JDBC targets, e.g. a test database system and the production database system
- For security reasons the password is never saved in the profile



# z/VSE V5.1: VSE Connector Client & Server: LDAP signon support

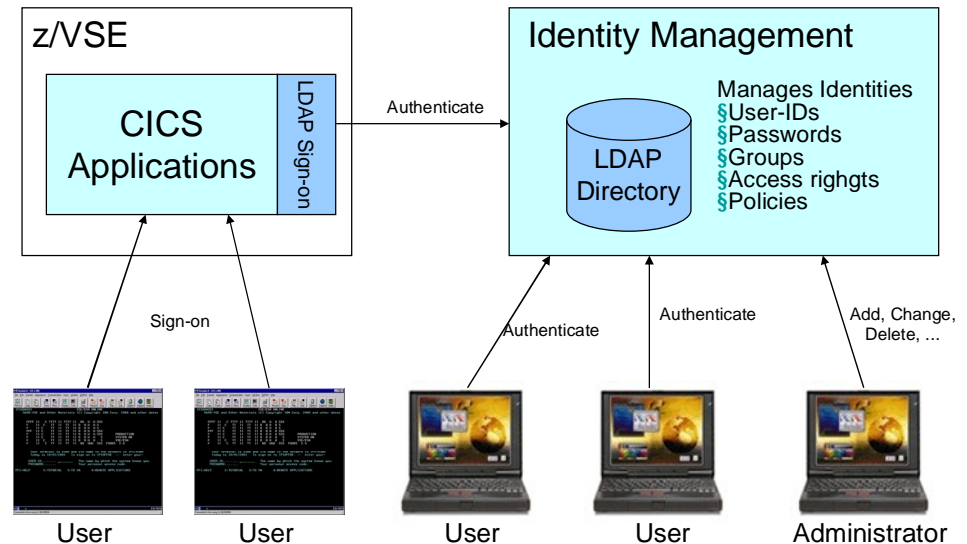
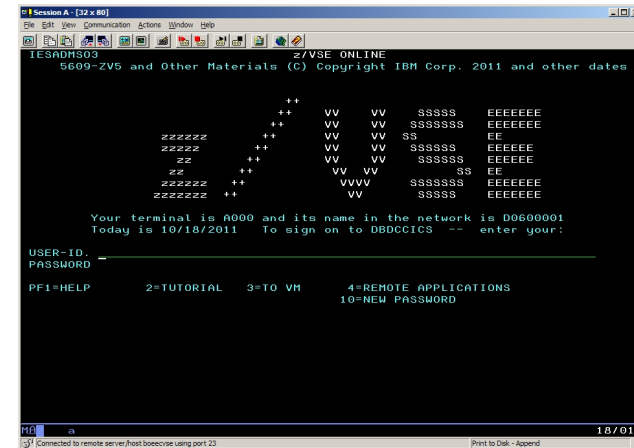
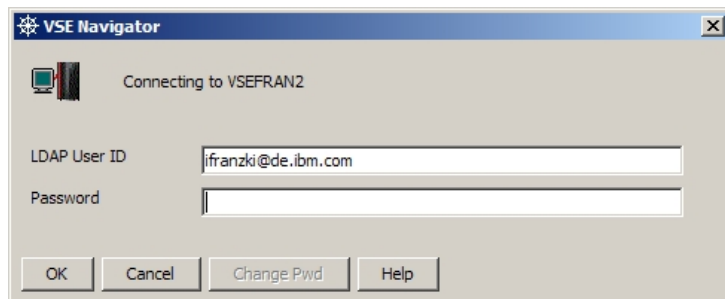
## § z/VSE V4.2 added support for LDAP Signon

- Authenticate against a corporate wide Identity Management System (using LDAP)
- Single Signon/Simplified Signon by using the same user-ID and password
- User-ID & passwords up to 64 characters

## § z/VSE V5.1 adds LDAP signon support for the VSE Connector Client & Server

- A Java based application can now use the same corporate user-ID and password as for IUI signon

Example: VSE Navigator



## z/VSE V5.1: VSE Connector Client & Server: LIBR DATA=YES

### § VSE Connector Client & Server supports access to LIBR members since VSE/ESA 2.5

- Download LIBR members
- Upload LIBR members

### § Also access of .PROC members (procedures) is possible

### § Procedures may be cataloged with the DATA=YES attribute, if they contain SYSIPT data

```
// EXEC LIBR
ACCESS S=lib.sublib
CATALOG member.type DATA=YES
....
/*
```

### § Prior to z/VSE V5.1, any members created by the VSE Connector Server used DATA=NO

- You could damage an procedure that was previously cataloged with DATA=YES

### § Since z/VSE V5.1, the VSE Connector Client & Server support the DATA=YES attribute

- You can store a member with DATA=YES
- Use method `VSELibraryMember.setSYSIPTDataInProcedure(boolean sysiptdata)`

### § Example: VSE Navigator

- Double-click on a member to edit it
- Member automatically retains its DATA=YES attribute



## Agenda

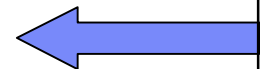
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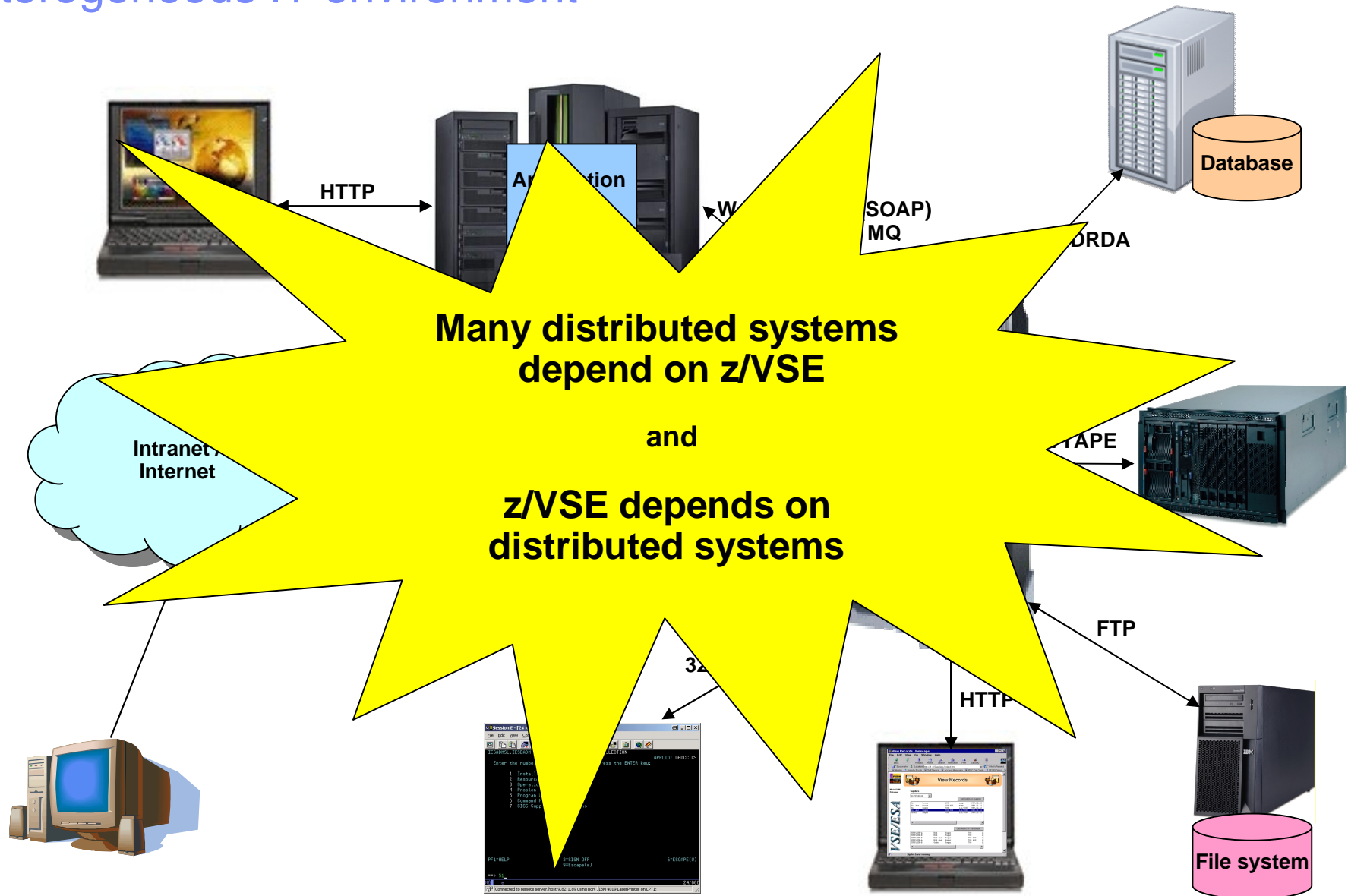
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### § **Practical Example: How to trigger processes on distributed systems**



# Heterogeneous IT environment



## Distributed systems trigger actions on z/VSE

### § Submit a Job into z/VSE

- Using FTP into Reader
- SubmitJob Java Program
- ANT based automation

### § Issue Console commands

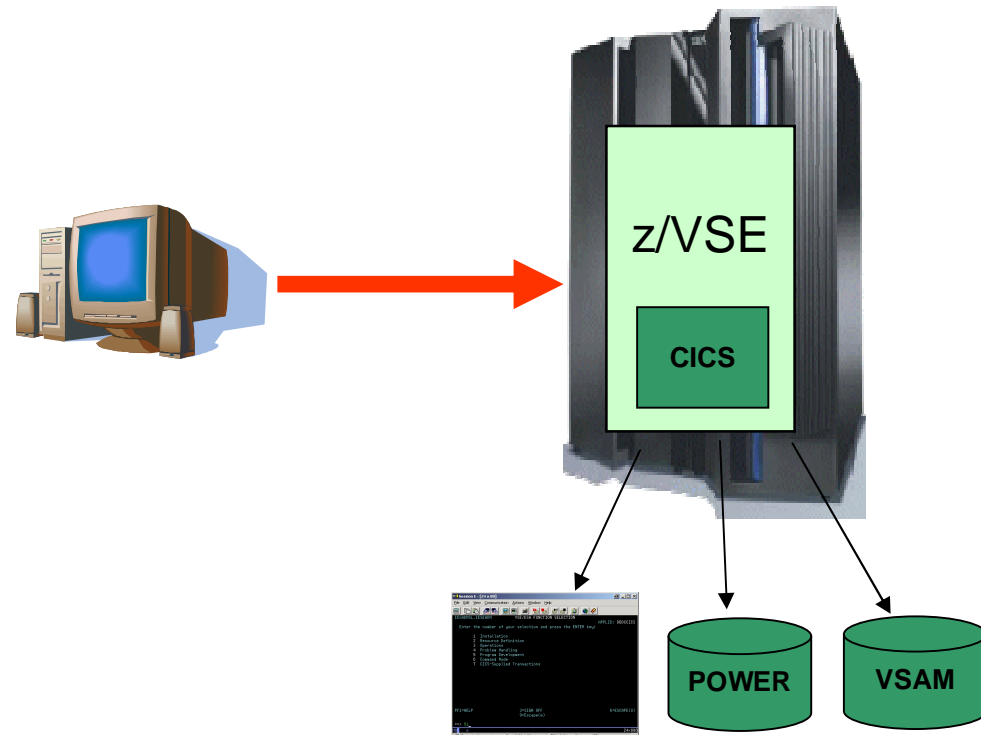
- IssueCommands Java Program

### § Trigger programs running on z/VSE

- Web Services (SOAP)
- WebSphere MQ
- CICS Transaction Gateway

### § Upload data to z/VSE for processing

- FTP into VSAM
- Connectors



## z/VSE triggers actions on distributed systems

### § Execute processes on distributed

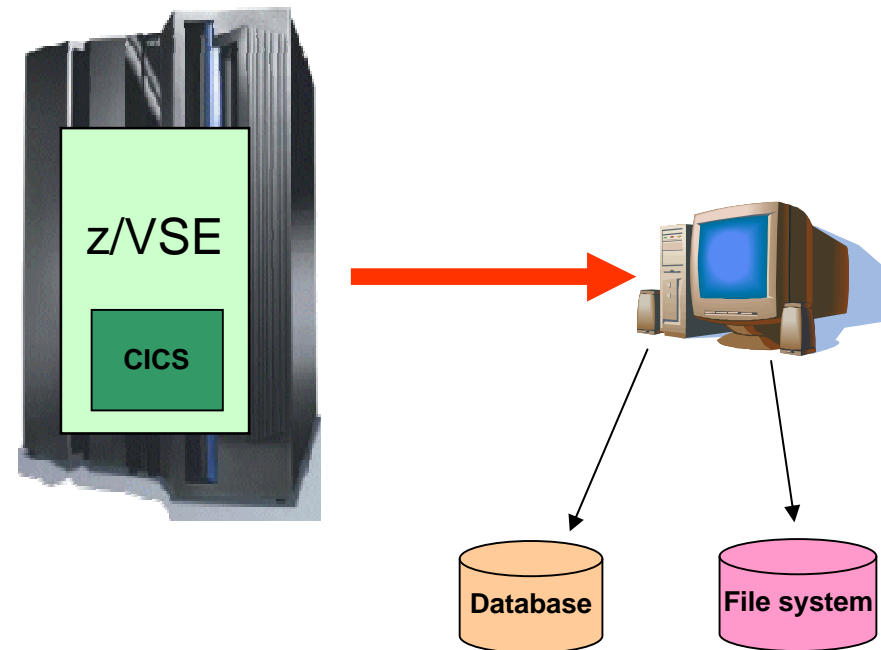
- REXEC (Remote Exec)
- VSE Script

### § Trigger programs running on distributed

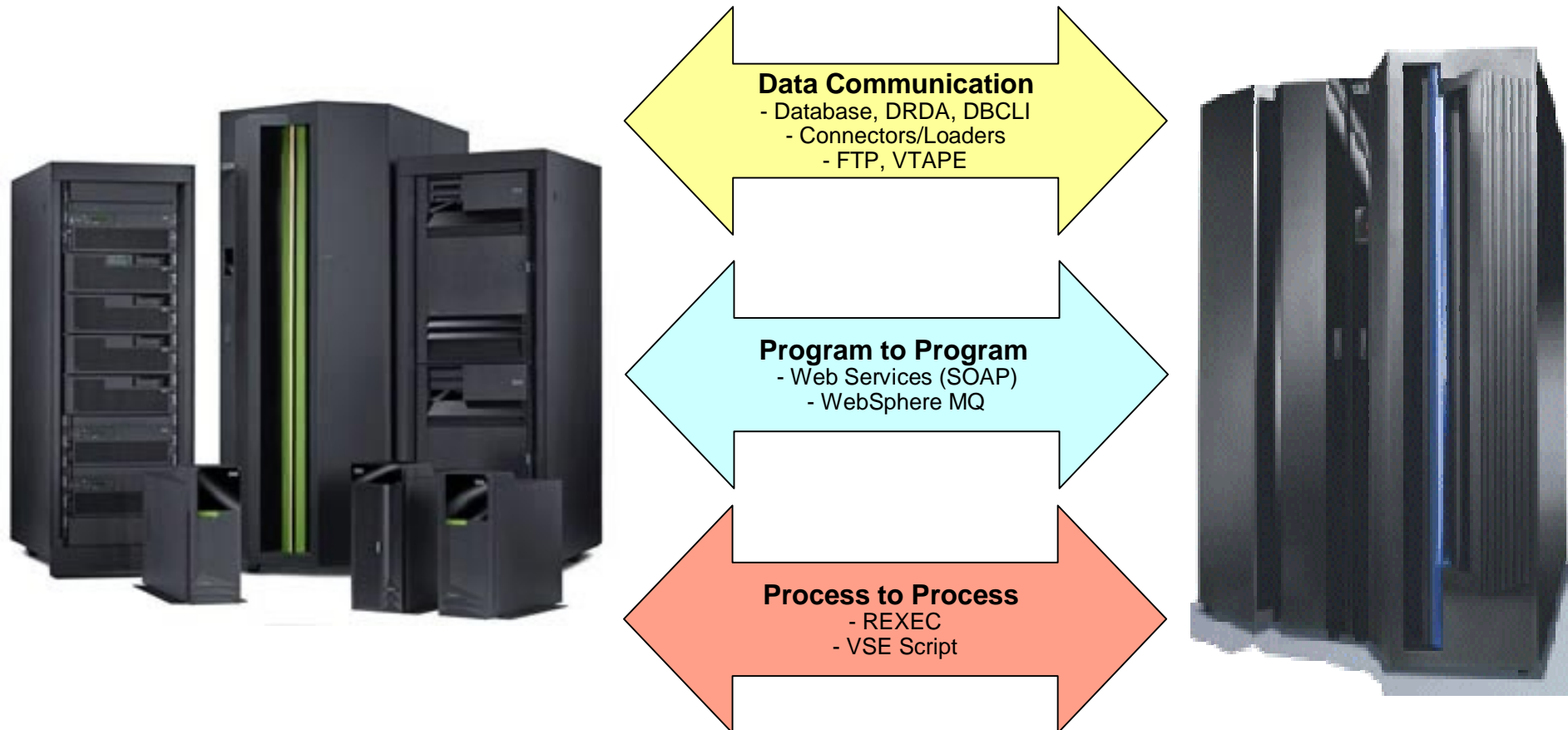
- Web Services (SOAP)
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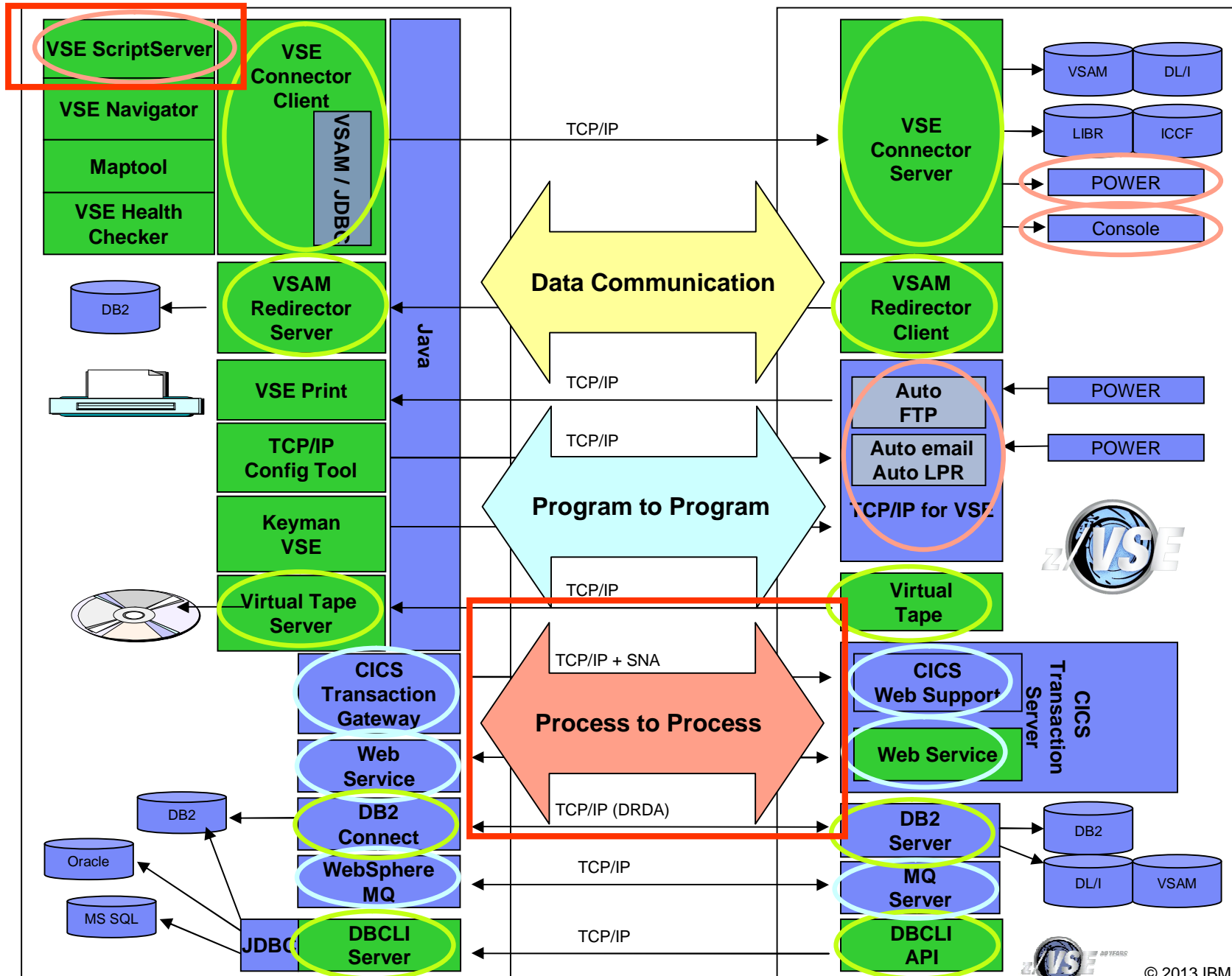
### § Send data for further processing

- FTP
- Connectors
- VSAM Redirector
- VTAPE

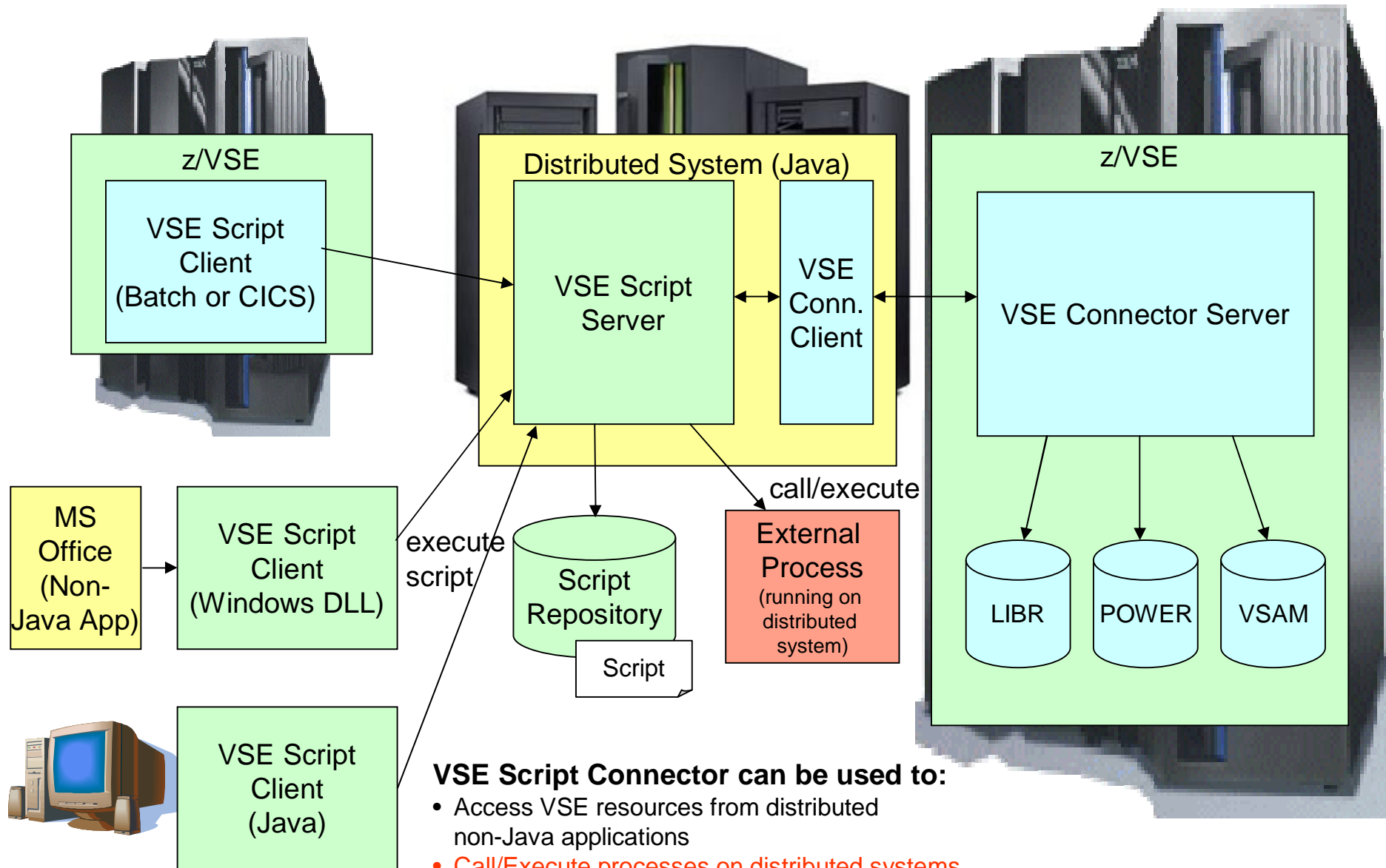


## Different types of communication





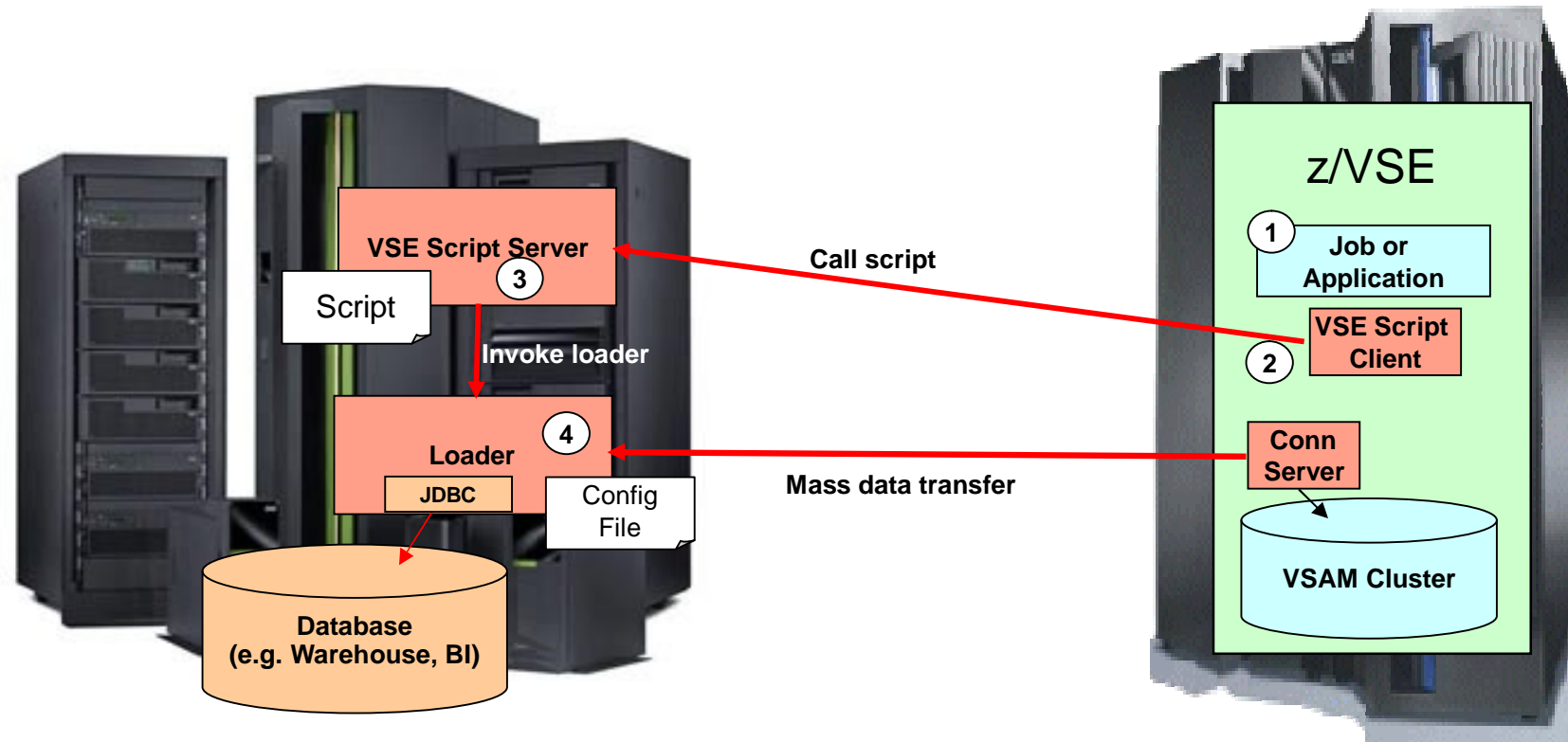
# VSE Script Connector



**VSE Script Connector can be used to:**

- Access VSE resources from distributed non-Java applications
- Call/Execute processes on distributed systems from z/VSE applications or Jobs

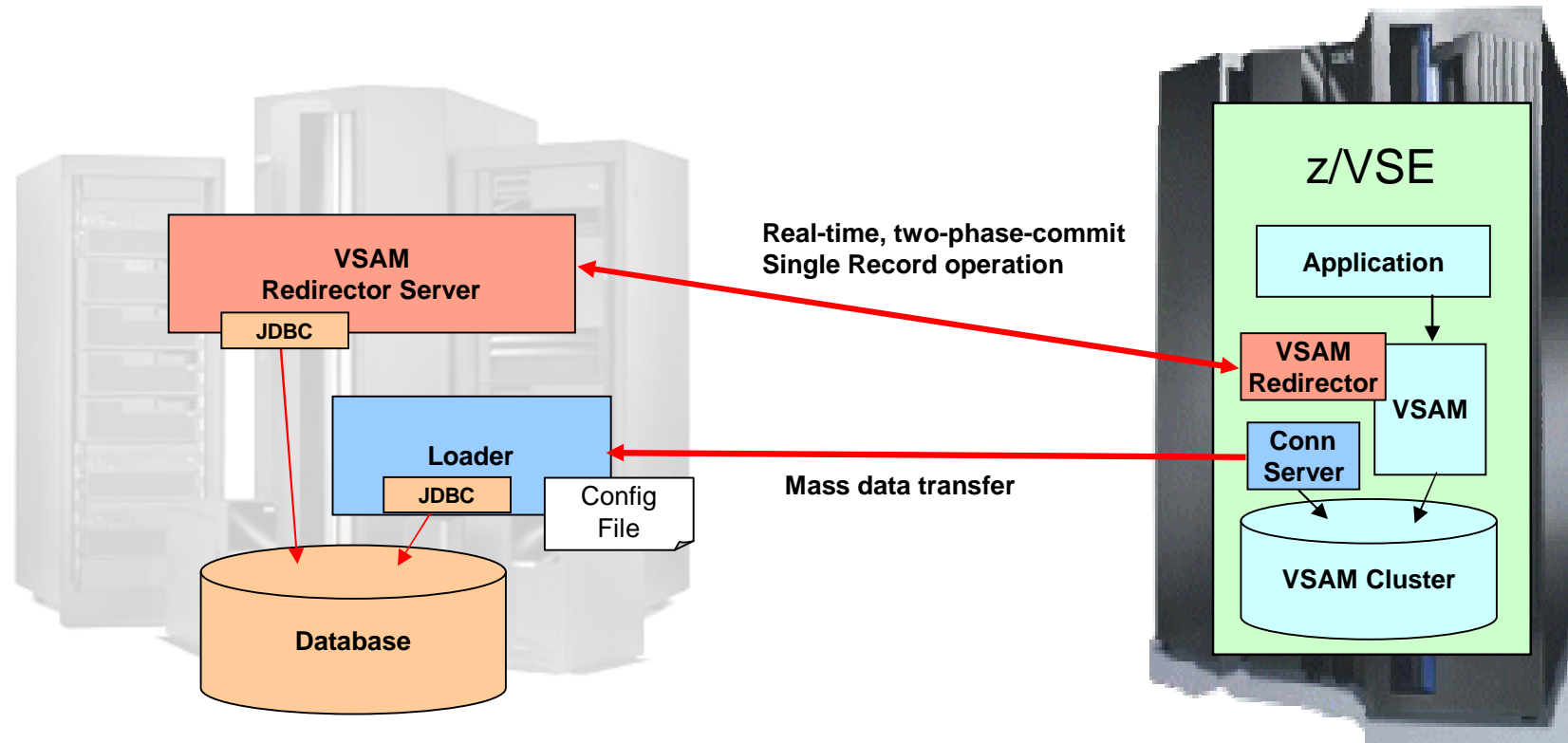
## Example: Call VSAM Loader from a z/VSE Job using VSE Script



- § Job or Application running on z/VSE
  - Uses VSE Script Client to call a script on distributed server
- § Script invokes the VSAM Loader process
  - To load records from a VSAM Cluster into a Database
- § z/VSE gets back all feedback and output from the script execution



## VSAM Redirector and Loaders



### § VSAM Redirector

- Continuous real-time update
- Capture changed records in a Delta File

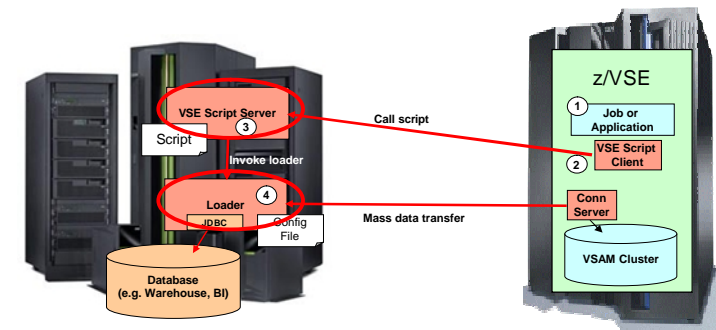
### § Loaders can be used for

- Initial loading of a table
- Resynchronization
- Incremental loading with Delta Loader

## Step by step: Prepare the environment

### § Install involved components

- VSE Connector Server and Batch/CICS VSE Script Clients are part of the z/VSE base installation
- Download and install the VSE Connector Client, VSE Script Server and the VSAM Redirector Server/Loader on the Java system
  - Tip: change the offered target directory name and remove the blanks, this avoids the need to escape the directory name later
- All downloads are available on the z/VSE homepage
  - <http://www.ibm.com/systems/z/os/zvse/downloads/>
- The VSE Script Server must be started and keep running



### § Make sure that the z/VSE host can connect via TCP/IP to the Java system

### § Check that the JDBC driver for your database system is installed on the Java system

- Usually the JDBC driver is part of the database system installation
- If not, a web search will reveal an official download location
- The JDBC driver JAR file must be referenced in the CLASSPATH

### § Know the JDBC URL that points to the target database on the database system

- Details and examples can be found in the VSAM Redirector documentation

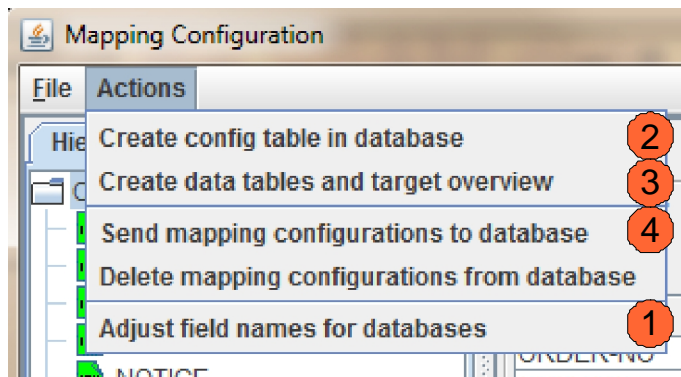
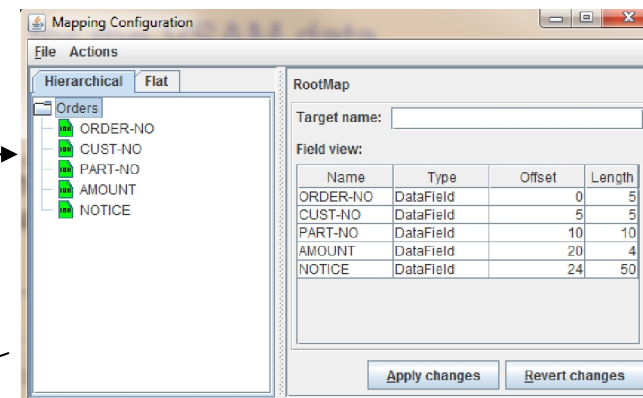
## Step by step: Create a mapping for the VSAM data

We are going to use the new VSAM Redirector DBHandler, so we can use the MapperConfigGui to create a data mapping for the fields in the VSAM cluster

```

01  ORDERS.
03  ORDER-NO  PIC 9(9)  COMP-3.
03  CUST-NO   PIC 9(9)  COMP-3.
03  PART-NO   PIC X(10) .
03  AMOUNT    PIC 9(9)  COMP.
03  NOTICE   PIC X(50) .
  
```

Import



- 1) Change all field names to be SQL compliant
- 2) Create a database table to store mapping configurations (use the table name ORDERS\_CONFIG)
- 3) Create all data tables (the map has the name ORDERS, so the database table will also have this name)
- 4) Store the mapping configuration in the config table (use the configuration name ORDERS)

## Step by step: Prepare a VSAM Redirector Loader configuration

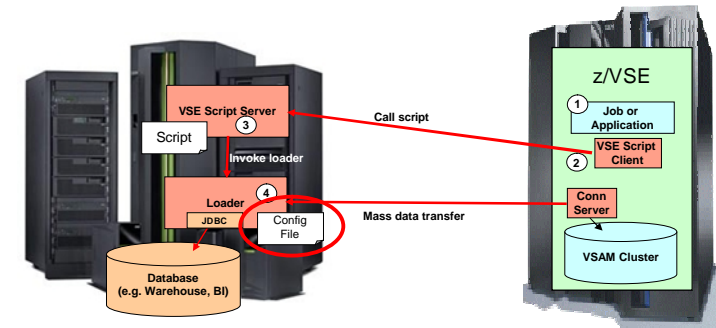
§ Edit a new file in a data directory and name it `load_orders.cfg`

§ The Loader will connect to the VSE Connector Server running on the z/VSE host, specify:

- z/VSE host name and user/password of a z/VSE user-ID
- Name of the VSAM catalog and cluster that is to be loaded

§ For each VSAM record the Loader invokes a VSAM Redirector handler, specify:

- The handler to use, DBHandler in our case
- The handler specific configuration in 1 single line (this is the same kind of configuration you would define when you redirect a VSAM Cluster)
- In the OPTIONS we define that we want to connect to the ORDERSDB database system, use the ORDERS\_CONFIG configuration table and the configuration named ORDERS that we created with the MapperConfigGui

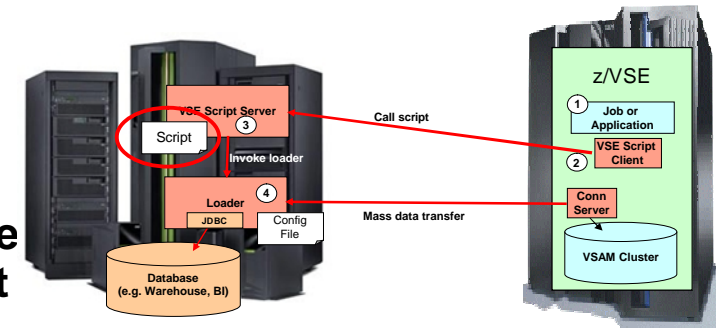


**load\_orders.cfg**

```
VSEHOST = vsehost.domain.com
VSEUSER = FRED
VSEPASSWORD = the9ties
LDAPSIGNON = NO
VSAMCATALOG = VSESP.USER.CATALOG
VSAMCLUSTER = MY.ORDERS.CLUSTER

HANDLER = com.ibm.vse.dbhandler.DBHandler
OPTIONS = "dburl=jdbc:db2:ORDERSDB;configtable=ORDERS_CONFIG;
          configname=ORDERS;dbuser=dbuser;dbpassword=db4data"
```

## Step by step: Prepare a VSE Script script to invoke the VSAM Redirector Loader



§ Edit a new file in the scripts sub-directory that is located within the VSE Script installation directory and name it `call_runloader.scr`

§ The script will be invoked by the z/VSE VSE Script client and will receive one parameter:

- The path to the Redirector Loader configuration file `load_orders.cfg`

§ The script will start the `runloader.sh` shell script to run the Redirector Loader

§ When the Loader indicates an error then a non-zero return code is signaled to the z/VSE VSE Script client

- This value will also be the JCL return code of the client

`call_runloader.scr`

```
// Script: call_runloader.scr
int rc;

// Ensure that a configuration was specified
// Note: the ARGV array variable contains all parameters from caller
arraySize(&ARGV, &rc);
if (rc == 0) do;
    println("Error: No loader configuration was specified.");
    exit(8);
endif;

// Call the command and wait for completion
string outLines;
call("/opt/IBM/VSEVSAMRedirectorServer/runloader.sh", &ARGV, &outLines, &rc);

if (rc != 0) do;
    string errorMsg;
    getlasterrmsg(&errorMsg);
    println("Ready, rc=", rc, " err=", errorMsg);
    exit(rc);
endif;
```

## Step by step: Create a z/VSE job that executes the VSE Script Batch Client

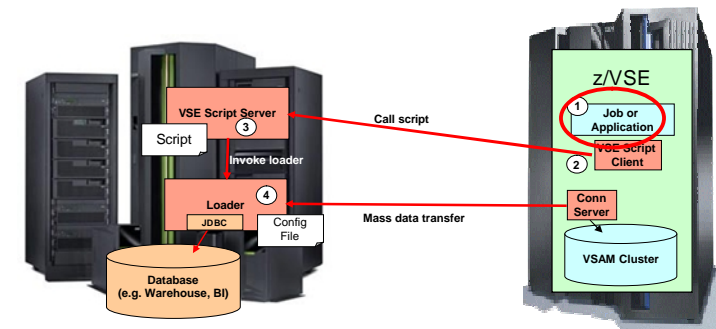
### § This sample job just invokes the Loader

- In practice this invocation would take place for after a previous job step that filled the VSAM cluster with data

### § The job's SYSIPT input contains:

- The IP or hostname of the VSE Script Server to which a connection is to be made (in the first line)
- The name of the script that is to be invoked (in the second line)
- The parameter to be passed to the script (in the third line)

```
* $$ JOB JNM=RUNLOAD,DISP=D,CLASS=A
// JOB RUNLOAD INVOKE RUNLOADER
// LIBDEF *,SEARCH=(PRD1.BASE,PRD2.SCEEBASE,PRD2.DBASE)
// EXEC IESSCBAT,PARM='CODEPAGE=Cp1047 SHOWERROR=yes'
10.0.0.1
call_runloader.src
/home/loader/load_orders.cfg
/&
* $$ EOJ
```



## Step by step: Launch it!

### § Submit the job and see the records flying from the VSAM cluster into the database ...

```

-- Redirector Loader (build 029) --
<snip>
Oct 13, 2012 9:33:11 AM - [RedirLoader] *** Initializing ***
Oct 13, 2012 9:33:11 AM - [RedirLoader] Connect to VSE host...
Oct 13, 2012 9:33:11 AM - [RedirLoader] ... connected to VSE host.
Oct 13, 2012 9:33:11 AM - [RedirLoader] Init cluster ...
Oct 13, 2012 9:33:12 AM - [RedirLoader] ... cluster initialized.
Oct 13, 2012 9:33:12 AM - [RedirLoader] Init handler ...
Oct 13, 2012 9:33:12 AM - [RedirLoader] ... handler initialized.
Oct 13, 2012 9:33:12 AM - [RedirLoader] Using 1 insert thread(s).
Oct 13, 2012 9:33:12 AM - [RedirLoader] *** Starting load process ***
Oct 13, 2012 9:33:15 AM - [RedirLoader] *****
Oct 13, 2012 9:33:15 AM - [RedirLoader] *** VSEConnector transfer finished ***
Oct 13, 2012 9:33:15 AM - [RedirLoader] *****
Oct 13, 2012 9:33:15 AM - [RedirLoader] Waiting for threads to finish...
Oct 13, 2012 9:33:15 AM - [RedirLoader] *** InserterThread 1 finished ***
Oct 13, 2012 9:33:15 AM - [RedirLoader] All threads finished.
Oct 13, 2012 9:33:15 AM - [RedirLoader] Closing Cluster.
Oct 13, 2012 9:33:15 AM - [RedirLoader]
Oct 13, 2012 9:33:15 AM - [RedirLoader] -----
Oct 13, 2012 9:33:15 AM - [RedirLoader] Load process finished.
Oct 13, 2012 9:33:15 AM - [RedirLoader]
Oct 13, 2012 9:33:15 AM - [RedirLoader] Inserted records: 1,501
Oct 13, 2012 9:33:15 AM - [RedirLoader]
Oct 13, 2012 9:33:15 AM - [RedirLoader] Duplicate records: 0
Oct 13, 2012 9:33:15 AM - [RedirLoader] Other errors: 0
Oct 13, 2012 9:33:15 AM - [RedirLoader]
Oct 13, 2012 9:33:15 AM - [RedirLoader] Overall duration: 3 seconds
Oct 13, 2012 9:33:15 AM - [RedirLoader] Overall speed: 459 records/second
Oct 13, 2012 9:33:15 AM - [RedirLoader]
Oct 13, 2012 9:33:15 AM - [RedirLoader] Transfer duration: 1 seconds
Oct 13, 2012 9:33:15 AM - [RedirLoader] Transfer speed: 1,977 records/second
Oct 13, 2012 9:33:15 AM - [RedirLoader] -----

```

## Step by step: Avoid common pitfalls

### § Correct older versions of runloader.sh / runloader.bat

- The runloader shell script in the Redirector installation directory must contain a statement that changes into the directory where the shell script is located
- Older versions miss this line and the line must be added
- Linux: Windows:

```
#!/bin/sh
# -----
# Startup file for RedirLoader
# -----
cd `dirname $0`
if [ -e "$JAVA_HOME/bin/java" ]; then
<snip>
```

```
Rem -----
Rem Startup file for RedirLoader
Rem -----
@ECHO OFF
SETLOCAL
cd %~dp0
SET JAVA_EXEC=java.exe
<snip>
```

### § The z/VSE host can't connect to the VSEScript Server?

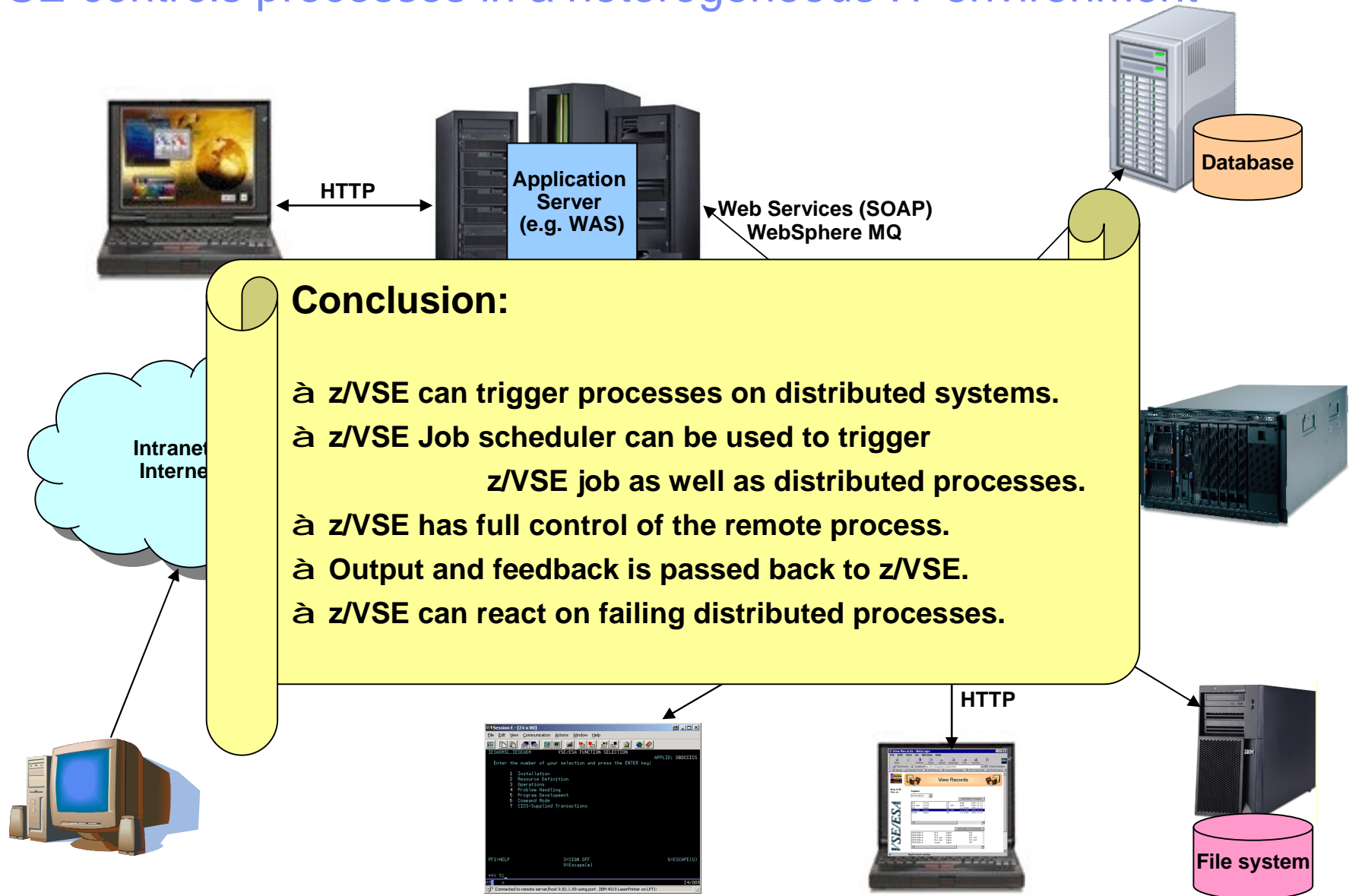
- Check the firewall settings!

### § The Redirector Loader shows error messages about missing JAR files?

- Check that the VSECON environment variable is set and points to the VSE Connector Client directory!



# z/VSE controls processes in a heterogeneous IT environment



## Questions ?



THANK YOU