Workshop: Unlock your z/VSE data and applications for the mobile world

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1. Introduction

The z/VSE e-business connectors enable you to integrate your z/VSE system into an e-business world. You can have real-time access to z/VSE resources (like VSE/VSAM, VSE/POWER, DL/I, Librarian, VSE/ICCF, console) from remote platforms.

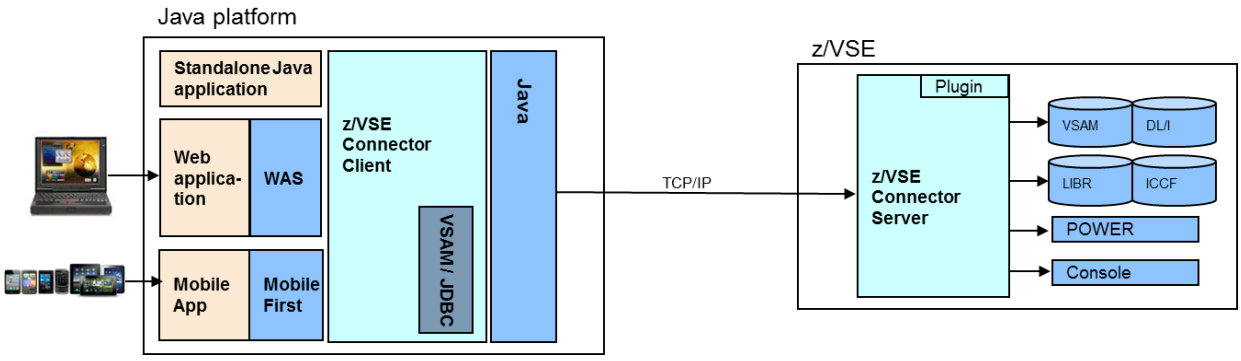
The Java-based connector is part of the z/VSE e-business connectors component and consists of two parts:

- The z/VSE Connector Client provides the z/VSE Java class library, online documentation and programming reference (JavaDoc), and many samples including Java source code for writing web applications like applets, servlets, Enterprise Java Beans (EJBs) as well as mobile applications using the IBM MobileFirst platform.

- The z/VSE Connector Server is running on z/VSE and implements native access methods to VSE/VSAM, Librarian, VSE/POWER, ICCF (read-only), DL/1, allowing you to submit jobs, and access the z/VSE operator console.

The z/VSE Connector Client provides several examples and extensive online documentation about the z/VSE connectors, 2-tier and 3-tier environments, and writing z/VSE-based web or mobile applications. See the z/VSE Navigator application for a ready-to-run tool, which makes use of this class library.

The z/VSE Connector components are delivered as part of the z/VSE system as WBOOKs in PRD2.PROD. They are also available on the z/VSE Homepage: http://ibm.com/zvse/downloads



The goal of this Lab is to guide you step by step how to unlock and access your resources in z/VSE from a Linux on z Systems environment.

For that we will:

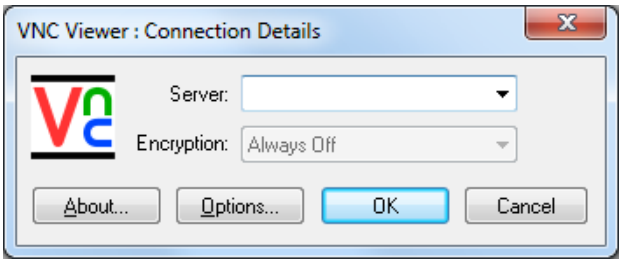
1. Install the z/VSE Connector client in Linux on z Systems
2. Access VSAM data from a Java program
3. Install and use VSE Navigator as graphical front-end
4. Show a demo with a MobileFirst App that accesses VSAM data

2. Software prerequisites on Linux on z Systems

2.1. Work with a graphical user interface on Linux

To install the z/VSE e-business Connectors it is recommended to use a graphical user interface to operate with Linux. That means a remote display system is required, which allows you to view a computing 'desktop' environment not only on the machine where it is running. Various X Servers can be used. VNCVIEWER is a client application with a similar functionality and is a client of the VNC server in Linux. VNC stands for Virtual Network Computing. It is used to display the X environment running on your Linux virtual machine. VNCVIEWER is different from having an X Server on your Workstation in that no state information is stored on the workstation, and it is platform independent.

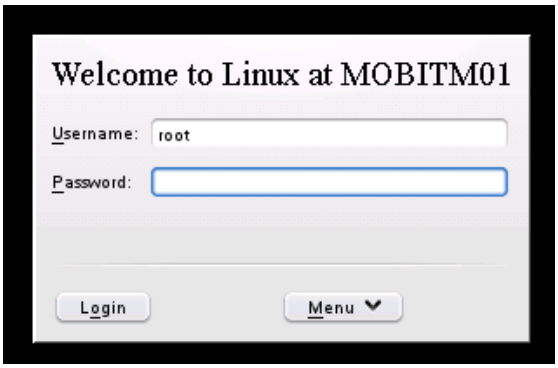
We have already installed the product on your workstation and created an icon on the desktop. If you **double click the icon on your desktop** you will receive a window similar to the following:



Enter the IP address of your Linux on z System machine and press "OK":

☐ **192.168.18.(192-206):1**

You will then see a logon screen similar to the following:



Enter the username and password:

☐ **root**
☐ **wluser1**

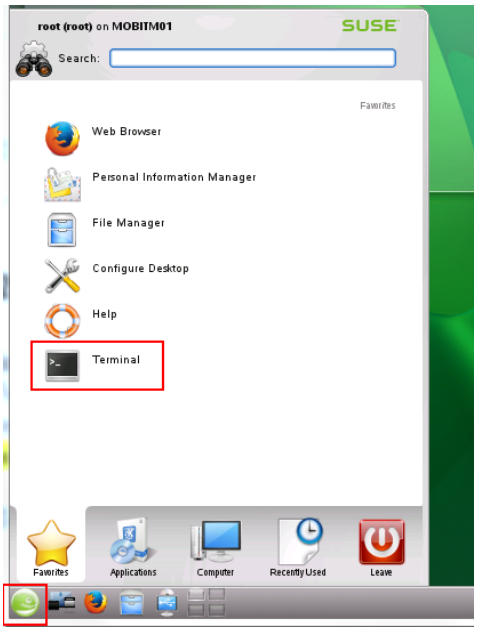
and press "**Login**". You should then see the Linux desktop.

2.2. Verify if a Java environment is installed

In order to install and use the z/VSE Connectors, a Java environment is required on the workstation. For this workshop a **Java Environment 1.7** is already installed on your Linux system. If you plan to develop Java applications, you will need the **Java Developer Kit (JDK).**

To verify if a Java environment is available, open a terminal window:

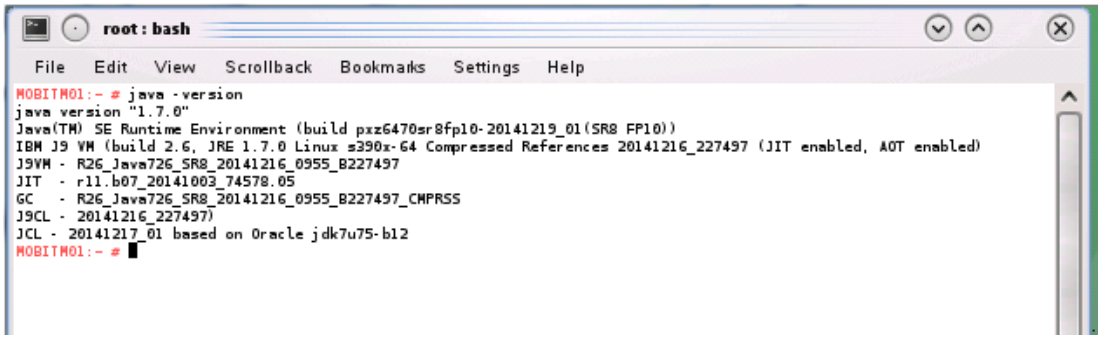
- ☐ **Click on the green Kickoff Application Launcher icon in the lower left corner of the Linux desktop**
- ☐ **Then click on "Terminal" to open a terminal window.**



In the terminal window enter

- ☐ **java –version**

You should see the Java version information similar to this:



3. Install and use the z/VSE Connector Client

3.1. Install the VSE Connector Client

The z/VSE Connector components are delivered as part of the z/VSE system as WBOOKs in PRD2.PROD. They are also available on the z/VSE Homepage: http://ibm.com/zvse/downloads

For this workshop we have already downloaded the VSE Connector Client and have stored it in directory **/install/conn-install**

You will find there the file **vsecon520_GA.zip**.

Open a terminal window and change into the **/install/conn-install** directory and then list the files:

- ☐ **cd /install/conn-install**
- ☐ **ls**

```
MOBITM01:~ # cd /install/conn-install/
MOBITM01:/install/conn-install # ls
vsecon520_GA.zip  vsenavi520.zip
MOBITM01:/install/conn-install #
```

Then unzip file **vsecon520_GA.zip** into **/root/conn-install/:**

- ☐ **unzip vsecon520_GA.zip –d /root/conn-install/**

```
MOBITM01:/install/conn-install # unzip vsecon520_GA.zip -d /root/conn-install/
Archive:  vsecon520_GA.zip
  inflating: /root/conn-install/setup.bat
  inflating: /root/conn-install/setup.cmd
  inflating: /root/conn-install/setup.jar
  inflating: /root/conn-install/setup.sh
MOBITM01:/install/conn-install #
```

Change into directory **/root/conn-install** and then list the files:

- ☐ **cd /root/conn-install**
- ☐ **ls**

```
MOBITM01:/install/conn-install # cd /root/conn-install/
MOBITM01:~/conn-install # ls
setup.bat  setup.cmd  setup.jar  setup.sh
MOBITM01:~/conn-install #
```

Files **setup.sh** is used to run the graphical installer for the VSE Connector Client. We have to change its mode to be executable (command **chmod +x setup.sh**):

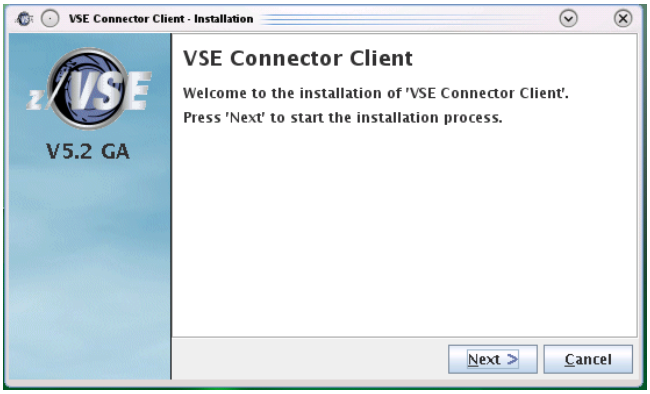
- ☐ **chmod +x setup.sh**

```
MOBITM01:~/conn-install # chmod +x setup.sh
MOBITM01:~/conn-install #
```

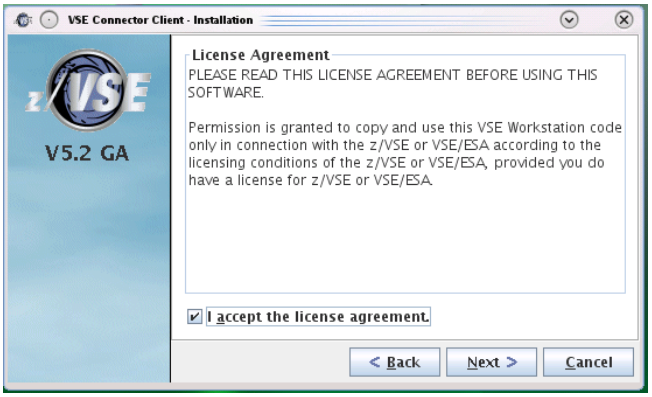
Execute **setup.sh** to start the graphical installer for the VSE Connector Client:

☐ **./setup.sh**

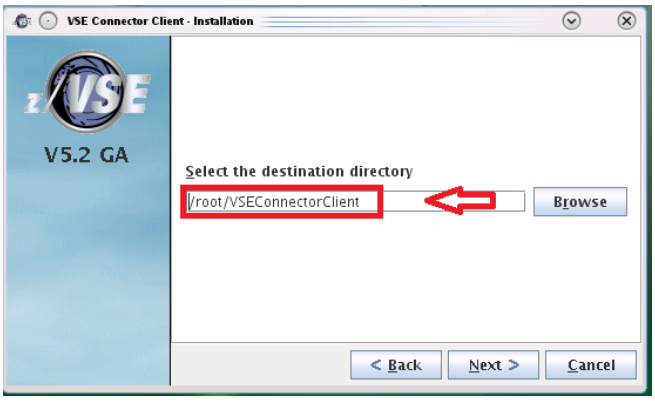
A series of windows will appear:



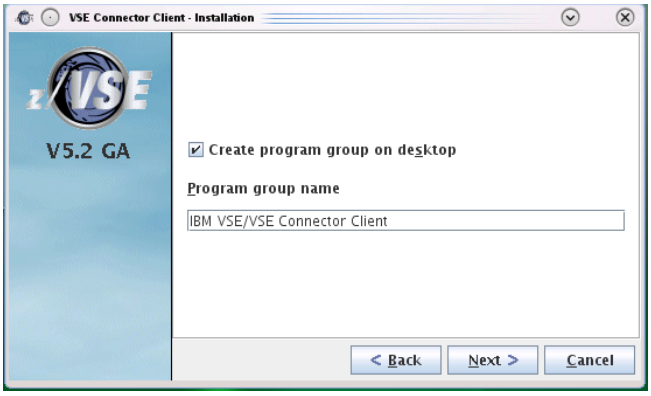
☐ Press "**Next**"



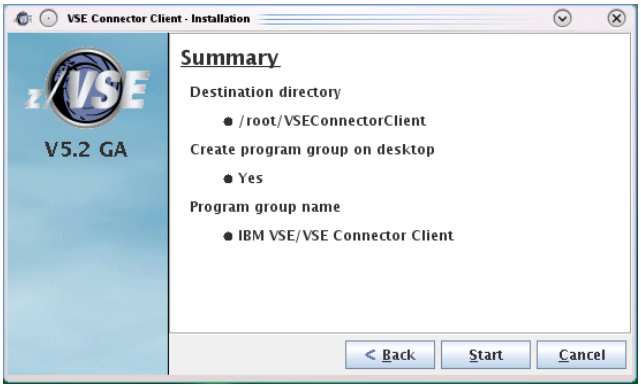
☐ Check the "**I accept the license agreement**" checkbox and press "**Next**"



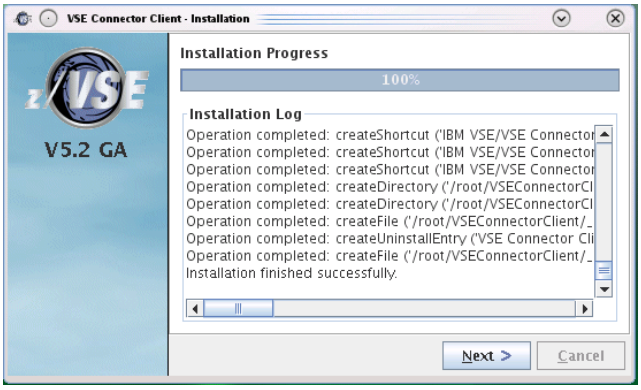
☐ Change the destination directory to **/root/VSEConnectorClient** and then press "**Next**".



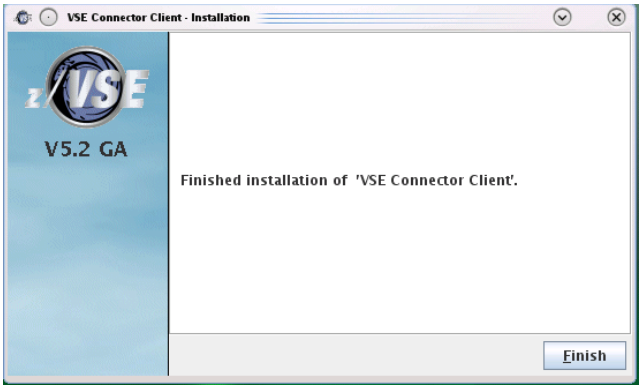
☐ You can leave the program group name as is and press "**Next**".



☐ Review the summary information and then press "**Start**".



☐ Check for successful installation and then press "**Next**".



☐ Press "**Finish**" to close the installer.

You have now sucessfully installed the VSE Connector Client.

3.2. Verify the CLASSPATH and VSECON environment variable

The installer has updated the **.bashrc** profile in the user's home directory (i.e. /root).

In a terminal window change to the home directory of root and display the .bashrc file:

☐ **cd /root**
☐ **cat .bashrc**

```
MOBITM01:~/conn-install/vsecon520_GA # cd /root
MOBITM01:~ # cat .bashrc
# START OF LINES ADDED BY INSTALLER
export VSECON="/root/VSEConnectorClient"
export CLASSPATH="$CLASSPATH:/root/VSEConnectorClient/VSEConnector.jar:/root/VSEConnectorClient/cci.jar:/root/VSEConnec
torClient/ibmjsse.jar:/root/VSEConnectorClient/ibmpkcs.jar"
# END OF LINES ADDED BY INSTALLER
MOBITM01:~ #
```

As you can see, the installer has added lines to export the environment variables CLASSPATH and VSECON.

Activate the updated .bashrc profile:

☐ **source ~/.bashrc**

With this the environment variables should now be available for the current terminal session as well as all newly started processes and terminals. You can check as follows:

☐ **echo $CLASSPATH**
☐ **echo $VSECON**

```
MOBITM01:~ # source ~/.bashrc
MOBITM01:~ # echo $CLASSPATH
:/root/VSEConnectorClient/VSEConnector.jar:/root/VSEConnectorClient/cci.jar:/root/VSEConnectorClient/ibmjsse.jar:/root/
VSEConnectorClient/ibmpkcs.jar
MOBITM01:~ # echo $VSECON
/root/VSEConnectorClient
MOBITM01:~ #
```

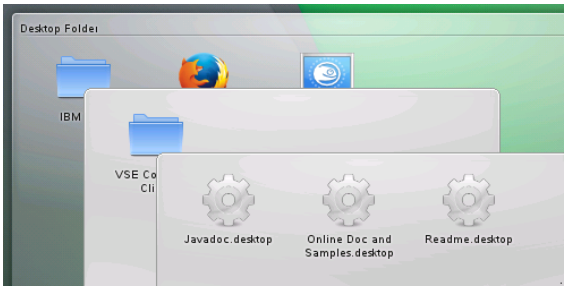
3.3. Review the z/VSE Connector Client documentation

The z/VSE Connector Client provides extensive documentation about the z/VSE connectors, 2-tier and 3-tier environments, and writing z/VSE-based web or mobile applications.

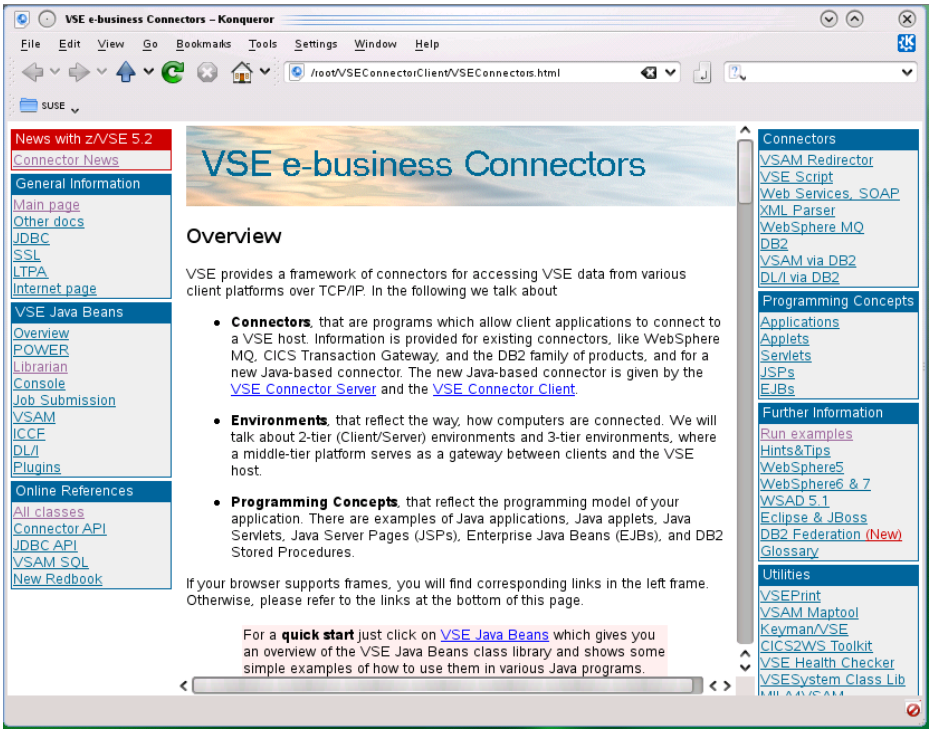
To open the documentation open file VSEConnectors.html (located in the installation directory /root/VSEConnectorClient) in a web browser (e.g. firefox).

Alternatively you can use the desktop icons that have been created by the installer:

- ☐ Move the mouse over the **IBM VSE** icon on your desktop
- ☐ A popup containing an icon named **VSE Connector Client** is shown. Move your mouse over that icon
- ☐ Another popup will open showing 3 icons. Click on the icon named **Online Doc and Samples.desktop**:



This will open a web browser showing the VSE Connector Client documentation:



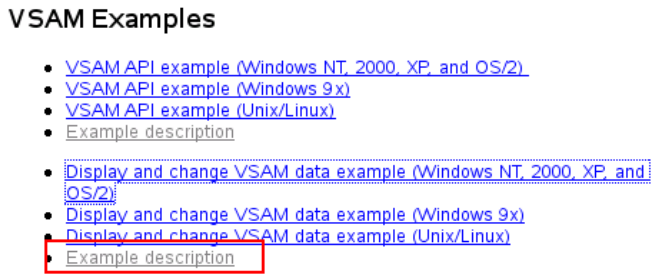
Feel free to navigate through the pages and explore the posibilities of the VSE Connectors class library.

3.4. Run an example to see the VSE Connectors in action

We will run the **VsamDisplayExample** which is provided as part of the VSE Connector Client installation in the samples subdirectory. The examples are provided in source code as well as in compiled versions.

You can learn more about this example by opening the VSE Connector Client documentation (see previous section):

- ☐ Click on **Run examples** in the right side under **Further Information**
- ☐ Scroll down to the **VSAM Examples** section. We will use the second VSAM example listed there: **Display and change VSAM data example**



- ☐ Click on **Example description** to navigate to the detailed description of this example and explore the description.

We will now run this example. We have already prepared the z/VSE system side for this workshop. We have already defined the VSAM cluster **FLIGHT.ORDERING.FLIGHTS** in catalog **VSESP.USER.CATALOG** and have defined the map **FLIGHTS_MAP.**

For details about how to create a mapping for a VSAM cluster please refer to chapter “

Appendix A: Mapping of a VSAM Record for remote access" on page 21.

To run the VsamDisplayExample, open a terminal window and change into the samples directory and then execute **VsamDisplayExample.sh** to start the example:

- ☐ **cd /root/VSEConnectorClient/samples**
- ☐ **./VsamDisplayExample.sh**

It will prompt you for the IP address of the z/VSE system, the VSE user-Id and the password.

- ☐ **192.168.18.4**
- ☐ **TExx** (**xx** is your team number)
- ☐ **teamxx** (**xx** is your team number)

The example now connects to the z/VSE system and lists the records contained in VSAM cluster FLIGHT.ORDERING.FLIGHTS using the map FLIGHTS_MAP. The output runs over several pages, so you may have to scroll up to see the beginning.

```
MOBITM01:~ # cd /root/VSEConnectorClient/samples/
MOBITM01:~/VSEConnectorClient/samples # ./VsamDisplayExample.sh
Please enter your VSE IP address:
192.168.18.4
Please enter your VSE user ID:
TE01
Please enter password:
team01
Creating connection and VSE system ...
Getting records from FLIGHT.ORDERING.FLIGHTS...
Records in file FLIGHT.ORDERING.FLIGHTS :
Record 0:
FLIGHT_NUMBER (Key) : 34
START : Munich
DESTINATION : Stuttgart
DEPARTURE : 17:10
ARRIVAL : 18:20
SEATS : 50
RESERVED : 23
PRICE : 120
AIRLINE : Lufthansa
Total record length in bytes: 86
------------------------------
```

At the end of the listing, it allowes you to add new flights into the VSAM cluster.

- ☐ **Enter the required information, see example below. Please use a unique flight number to avoid duplicate key errors. I.e. use your team number.**

```
------------------------------
Please enter a new flight number:
(Enter a negative value to quit)
0001
Please enter value for field START (Length = 20)
BINGHAMTON
Please enter value for field DESTINATION (Length = 20)
NEW YORK
Please enter value for field DEPARTURE (Length = 5)
10:30
Please enter value for field ARRIVAL (Length = 5)
11:30
Please enter value for field SEATS (Length = 4)
150
Please enter value for field RESERVED (Length = 4)
0
Please enter value for field PRICE (Length = 4)
200
Please enter value for field AIRLINE (Length = 20)
IBM Airline
New record added to cluster.
Please press ENTER to continue
```

You can run the example again to display the so far added flights. Since you all share the same VSAM cluster, you will also see the flights that have been added by the other teams.

4. Install and use the VSE Navigator

4.1. Install the VSE Navigator

The VSE Navigator tool can be downloaded from the z/VSE Homepage: http://ibm.com/zvse/downloads

For this workshop we have already downloaded the VSE Navigator and have stored it in directory **/install/conn-install**

You will find there the file **vsenavi520.zip**.

Open a terminal window and change into the **/install/conn-install** directory and then list the files:

- ☐ **cd /install/conn-install**
- ☐ **ls**

```
MOBITM01:~ # cd /install/conn-install/
MOBITM01:/install/conn-install # ls
vsecon520_GA.zip  vsenavi520.zip
MOBITM01:/install/conn-install #
```

Then unzip file **vsenavi520.zi**p into **/root/navi-install/**:

- ☐ **unzip vsenavi520.zip -d /root/navi-install/**

```
MOBITM01:/install/conn-install # unzip vsenavi520.zip -d /root/navi-install/
Archive:  vsenavi520.zip
  inflating: /root/navi-install/setup.bat
  inflating: /root/navi-install/setup.cmd
  inflating: /root/navi-install/setup.jar
  inflating: /root/navi-install/setup.sh
MOBITM01:/install/conn-install #
```

Change into directory **/root/navi-install** and then list the files:

- ☐ **cd /root/navi-install**
- ☐ **ls**

```
MOBITM01:/install/conn-install # cd /root/navi-install/
MOBITM01:~/navi-install # ls
setup.bat  setup.cmd  setup.jar  setup.sh
MOBITM01:~/navi-install #
```

Files **setup.sh** is used to run the graphical installer for the VSE Navigator. We have to change its mode to be executable (command **chmod +x setup.sh**).

- ☐ **chmod +x setup.sh**

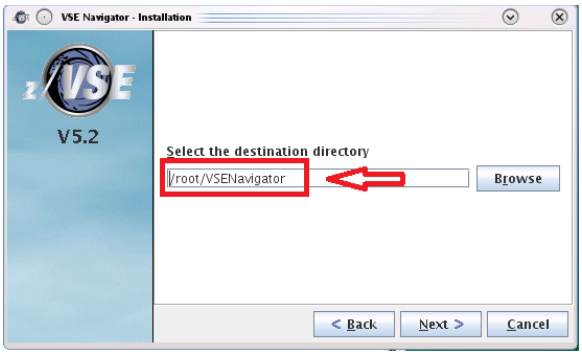
```
MOBITM01:~/navi-install # chmod +x setup.sh
MOBITM01:~/navi-install #
```

Execute **setup.sh** to start the graphical installer for the VSE Navigator:

- ☐ **./setup.sh**

A series of windows will appear, very similar to the installation of the VSE Connector Client in chapter 3.1 on page 6. Click through the installation panels, but make sure that you change the destination directory:

☐ **/root/VSENavigator**



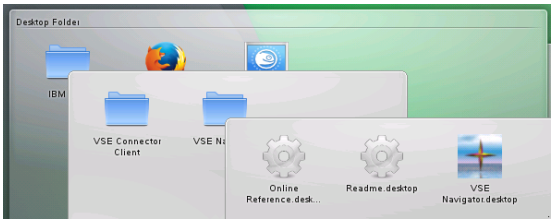
☐ Once the installer is finished, press "**Finish**" to close the installer.

You have now sucessfully installed the VSE Navigator.

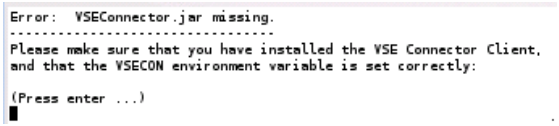
4.2. Run the VSE Navigator

To run the VSE Navigator either open a terminal window and change into directory **/root/VSENavigator** and then execute **./run.sh**, or use the desktop icons that have been created by the installer:

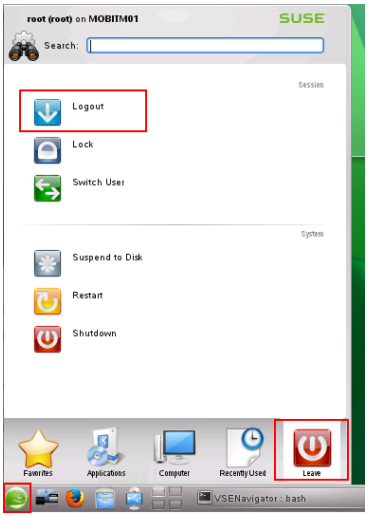
☐ Move the mouse over the **IBM VSE** icon on your desktop.
☐ A popup containing an icon named **VSE Navigator** is shown. Move your mouse over that icon.
☐ Another popup will open showing 2 icons. Click on the icon named **VSE Navigator.desktop**



In case you get an Error like the following, you must logout and logon from Linux so that the desktop environment also knows the environment variables set by the .bashrc profile.



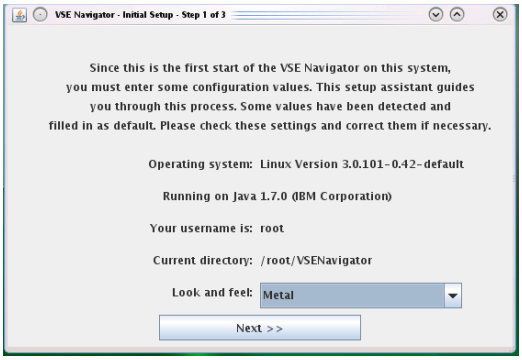
☐ To logout, click on the green Kickoff Application Launcher icon in the lower left corner of the Linux desktop
☐ then click on "**Leave**"
☐ then click on "**Logout**"
☐ Confirm the Logout on the next dialog box.



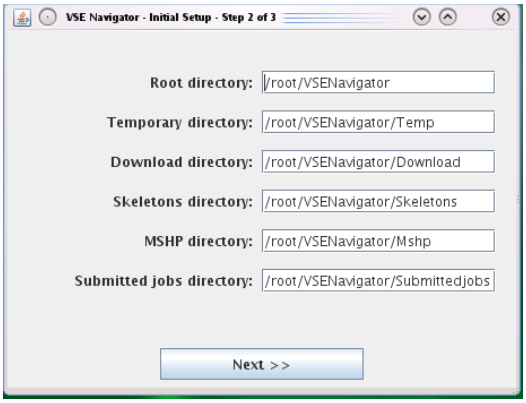
This will end your VNC session.

☐ **Reconnect using the VNC viewer as explained in chapter 2.1 on page 4.**

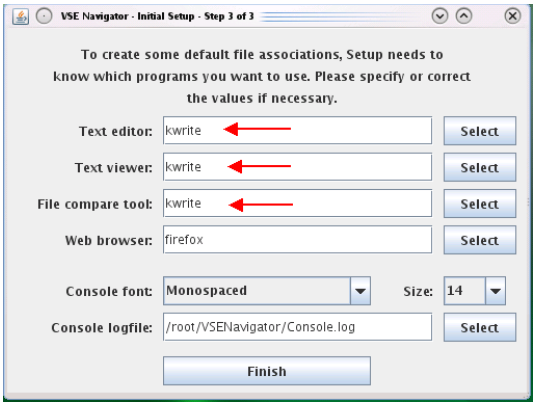
When you run the VSE Navigator the first time, a series of Initial Setup panels will appear. Carefully fill out or adapt the required settings as follows:



☐ You can keep the Metal look and feel and press "**Next** >>".

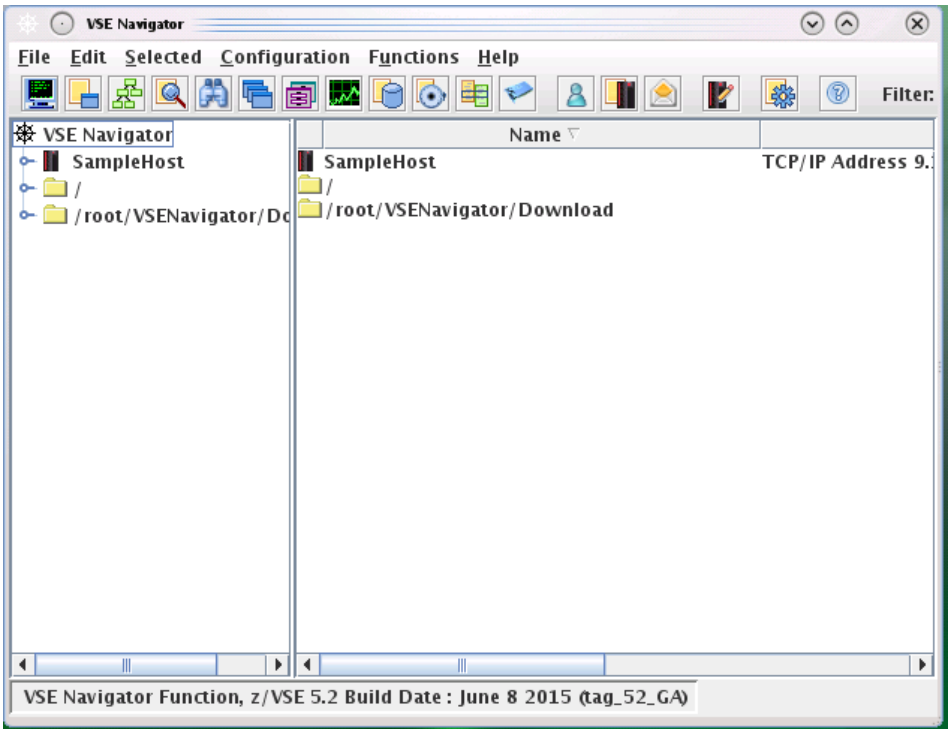


☐ You can keep the prefilled directories and press "**Next** >>".



- ☐ Change the Text editor, Text viewer and File copare tool and specify **kwrite**
- ☐ Then press "**Finish**"

An initial configuration is now created with the settings you just specified and the VSE Navigator will start up.

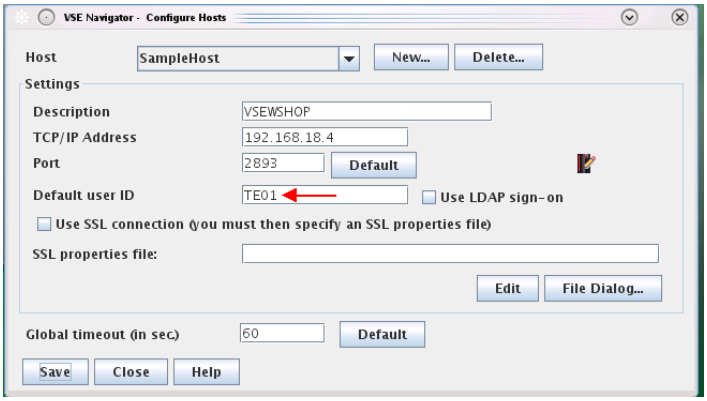


On the first startup, the "What's new" help page is also opened in the web browser. You may close the web browser.

4.3. Connect to the z/VSE System

In order to connect to the z/VSE System open the Host Configuration dialog.

☐ In the **menu bar**, select "**Configuration**" and then "**Hosts…**".

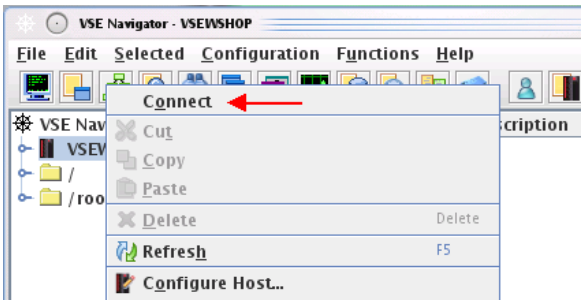


Either change the predefined "SampleHost" or create a new one by pressing the "New…" button.

☐ Enter **VSEWSHOP** for the name of the host.
☐ Enter **192.168.18.4** for the TCP/IP address of the host.
☐ The port **2893** can be left unchanged.
☐ Enter **TExx** for the Default user ID (**xx** is your team number).
☐ Then press "**Save**" and the "**Close**".

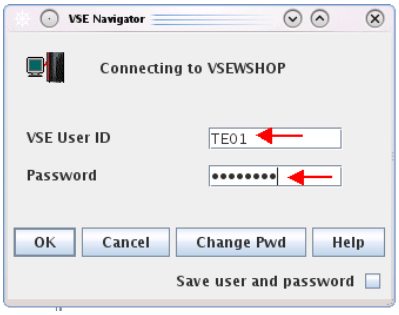
You should now see your host in the top left corner of the VSE Navigator window.

☐ Right click on the host and choose "**Connect**" in the popup menu.



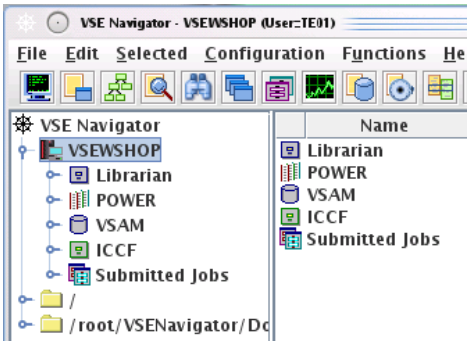
You will be prompted for your VSE user-ID and password.

☐ Enter **TExx** for the user ID (**xx** is your team number - should be already prefilled with what you have specified in the host configuration)
☐ Enter **teamxx** for the password (**xx** is your team number)
☐ Press "**OK**"



After a successful logon the host icon will now indicate that your are connmected.

☐ **Click on the twisty in front of the host to expand the tree.**

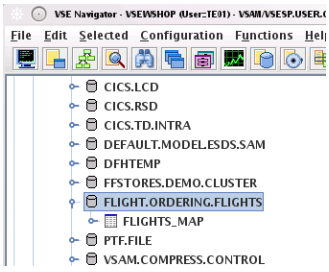


4.4. Display VSAM data using the VSE Navigator

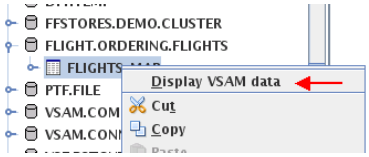
We will now display the contents of the FLIGHT.ORDERING.FLIGHTS cluster with VSE Navigator.

Expand the tree on the left pane of VSE Navigator until you see the clusters contained in VSAM catalog VSESP.USER.CATALOG.

☐ Expand the host (if not already done).
☐ Expand **VSAM**.
☐ Expand **VSESP.USER.CATALOG**.
☐ Scroll down until you see the cluster FLIGHT.ORDERING.FLIGHTS.
☐ Expand that cluster as well to see the MAPs:

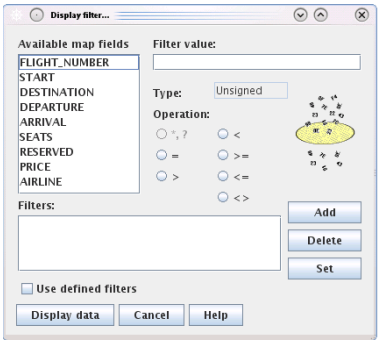


☐ Right-click the map **FLIGHTS_MAP** and select "**Display VSAM data**"



The next dialog allows you to specify a filter to display only those records that match the filter.
We will **not** specify a filter and display all records.

☐ Press "**Display data**" to continue.



You will now see a list of records on the right pane of the VSE Navigator window.

FLIGHT_NUMBER	START	DESTINATION	DEPARTURE	AI
34	Munich	Stuttgart	17:10	18
123	Atlanta	Los Angeles	14:00	18
284	Atlanta	Miami Beach	07:40	11
1234	Stuttgart	Atlanta	09:25	20
4711	New York	Atlanta	12:00	15

This is the same data that you displayed with the VsamDisplayExample in chapter 3.4 on page 11. You should also see those flights that you and your collegues have added to the cluster when running the example.

You may now explore additional functions of VSE Navigator.

Congratulations you have successfully finished this Workshop!

5. Summary

The following major steps are required to install the VSE Connector Client on a workstation:

1. **Install Java Runtime Environment (JRE) or Java Developer Kit (JDK)**
   Download from IBM or Oracle:
   http://www.ibm.com/developerworks/java/jdk/index.html
   http://www.oracle.com/technetwork/indexes/downloads/index.html#java

2. **Download the VSE Connector Client**
   WBOOK IESINCON.W from PRD2.PROD or
   http://www.ibm.com/systems/z/os/zvse/downloads/#vsecon

3. **Install the VSE Connector Client**
   Unzip the downloaded file.
   In a command line run setup.sh (Unix/Linux) or setup.bat (Windows).

4. **Download the VSE Navigator**
   http://www.ibm.com/systems/z/os/zvse/downloads/#navi

5. **Install the VSE Navigator**
   Unzip the downloaded file.
   In a command line run setup.sh (Unix/Linux) or setup.bat (Windows).

The steps to setup a Mobil First environment and develop a mobile application that accesses z/VSE data is described in more detail in the following whitepaper:
ftp://public.dhe.ibm.com/eserver/zseries/zos/vse/pdf3/GettingStartedWithMobileDevelopmentForVSE.pdf

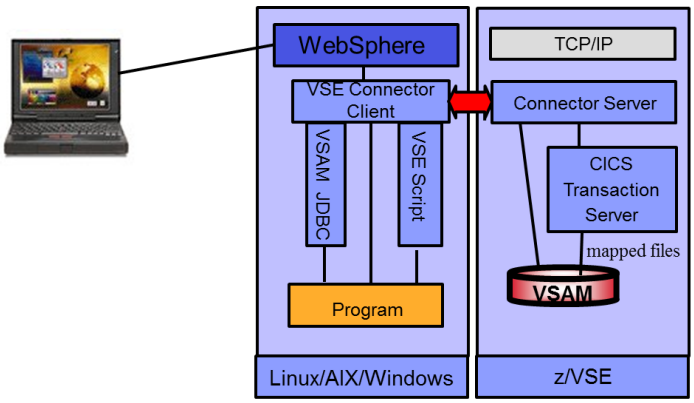
The example project used in this whitepaper can be downloaded here:
ftp://public.dhe.ibm.com/eserver/zseries/zos/vse/download/skvssampPrj.zip

Appendix A: Mapping of a VSAM Record for remote access

You can access VSAM data in z/VSE using the Java-based Connector in different ways:

- With the Java classes provided by VSE Connector Client
- With the VSAM JDBC driver provided as part of the VSE Connector Client
- Through the z/VSE Script Connector

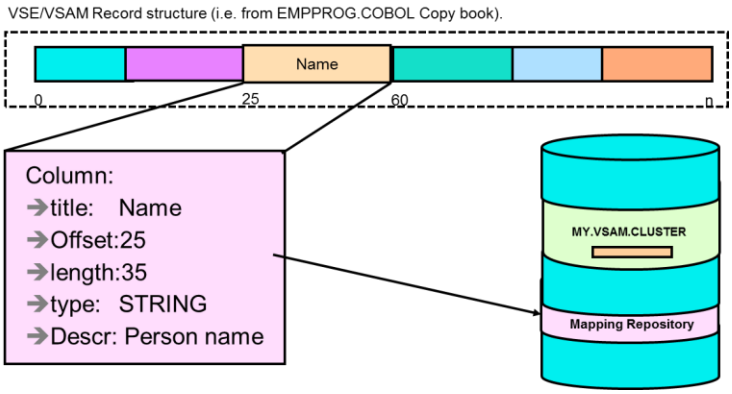
The access to a VSAM file can then be done **in batch** or via **CICS**. For batch, the VSE Connector Server running on the z/VSE system opens the VSAM file directly. If the VSAM file is already open by one or more CICS regions, you can alternatively access the VSAM files through a CICS system using the VSAM-via-CICS service. Here the VSAM file is opened by CICS, and the VSE Connector Server routes the access requests to CICS and lets it perform the access. This avoids sharing problems when the file is not defined as SHARE 4.



The z/VSE Connector Client provides the z/VSE Java class library, online documentation and programming reference (JavaDoc), and many samples including Java source code for writing web applications like applets, servlets, Enterprise Java Beans (EJBs) as well as mobile applications using the IBM MobileFirst platform.

For accessing VSAM data you must provide a mapping that defines the structure of a VSAM record for the access via the connectors. The mapping contains information about the fields that a records consists of and the field's attributes, such as offset within the record, length in bytes and the data type. The data type is important to allow the connectors to perform proper data translation (EBCDIC/ASCII, packed decimal, etc).

Typically record structures are defined in COBOL copybooks for your application programs.



Mapping characteristics:

- No changes to VSAM data
- Mapping information stored in a repository in a VSAM cluster (VSE.VSAM.MAPPING.DEFS)
- Possible data types:
  - String
  - Binary,
  - Signed integer number
  - Unsigned integer number
  - Packed decimal number
  - Zoned decimal numbers
- Multiple maps and views (subset of map fields) can be defined per VSAM cluster

The mapping of a VSAM cluster can be done using:

- IDCAMS RECMAP command on z/VSE
- VSE Navigator or a self-written Java program
- VSAM Maptool (http://www.ibm.com/systems/z/os/zvse/downloads/index.html#maptool)

The definition of a set of fields for a VSAM record is called the **map** (similar to a relational table definition). The elements of a map are **fields** or columns. A subset of the fields can be grouped in a **view**, were a view refers to columns of a map rather than having definitions of the fields itself. Multiple maps and views can be defined for a VSAM cluster.

Mapping for the VSAM cluster FLIGHT.ORDERING.FLIGHTS that is used in this workshop

The structure of the record is defined by the following COBOL copybook:

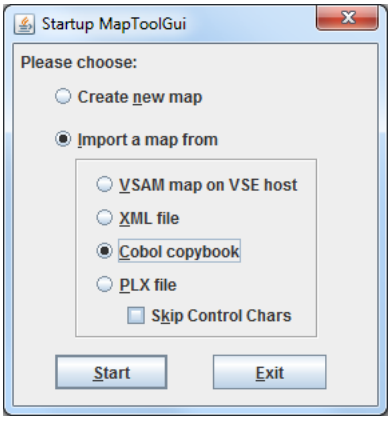
```
03 FLIGHTS-MAP.
   05 FLIGHTNUMBER       PIC 9(8)  COMP.
   05 START              PIC X(20).
   05 DESTINATION        PIC X(20).
   05 DEPARTURE          PIC X(5).
   05 ARRIVAL            PIC X(5).
   05 SEATS              PIC 9(8)  COMP.
   05 RESERVED           PIC 9999.
   05 PRICE              PIC 9(6)  COMP-3.
   05 AIRLINE            PIC X(20).
```

This results in the following mapping:

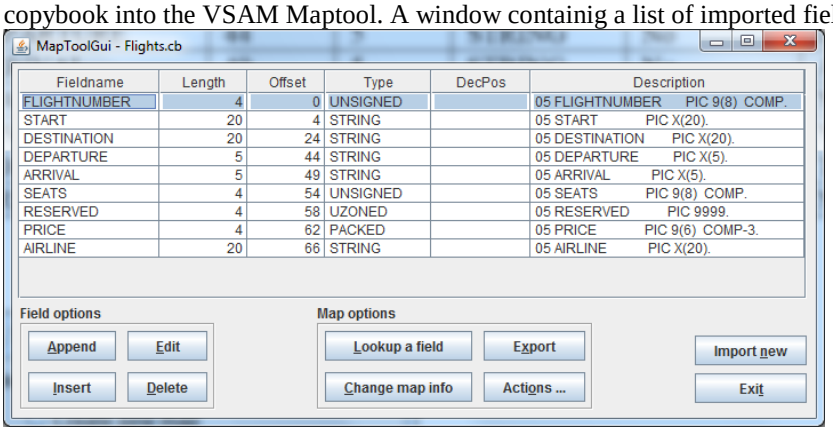
Field name	Offset	Length	Type	VSAM-Key	Description
FLIGHT_NUMBER	0	4	UNSIGNED	Yes	Flight number
START	4	20	STRING	No	Departure city/airport
DESTINATION	24	20	STRING	No	Destination city/airport
DEPARTURE	44	5	STRING	No	Departure time (hh:mm)
ARRIVAL	49	5	STRING	No	Arrival time (hh:mm)
SEATS	54	4	UNSIGNED	No	Number of seats in total
RESERVED	58	4	UZONED	No	Number of reserved seats
PRICE	62	4	PACKED	No	Ticket price
AIRLINE	66	20	STRING	No	Name of the airline

Download the VSAM Maptool from
http://www.ibm.com/systems/z/os/zvse/downloads/index.html#maptool and install it (works similar to the VSE Connector Client installation performed in Chapter 3.1 on page 6).

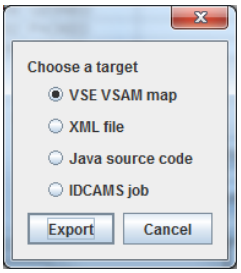
Then start it (either using the desktop icons, or by executing run.sh in the installation directory of VSAM Maptool). You will see the following dialog box:



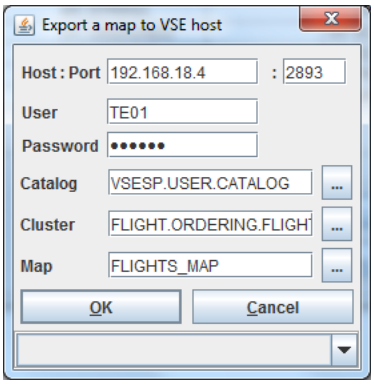
Choose "**Import a map from**" and "**Cobol copybook**" and press the "**Start**" button.
A file chooser dialog will appear where you choose the copybook file (e.g. Flights.cb). This will import the copybook into the VSAM Maptool. A window containig a list of imported fields is shown:



Verify the field definition. In order to store the map into the mapping repository on z/VSE, press "**Export**".



Choose "**VSE VSAM map**" and press the "**Export**" button.



Enter the required information (IP, port, user ID and password) together with the VSAM catalog and cluster names as well as the name of the MAP that is to be created. Then press "**OK**" to store the mapping information into the specigied map.

In order to access the file through a CICS system, choose the appropriate catalog name, such as **#VSAM.#CICS.DBDCCICS**.