

VSE/ESA 2.6 as client

VSAM Redirector

Virtual Tape Support

z/VM, VSE, and Linux on zSeries Tech Conference
Miami Beach - Oct 7 - 10th



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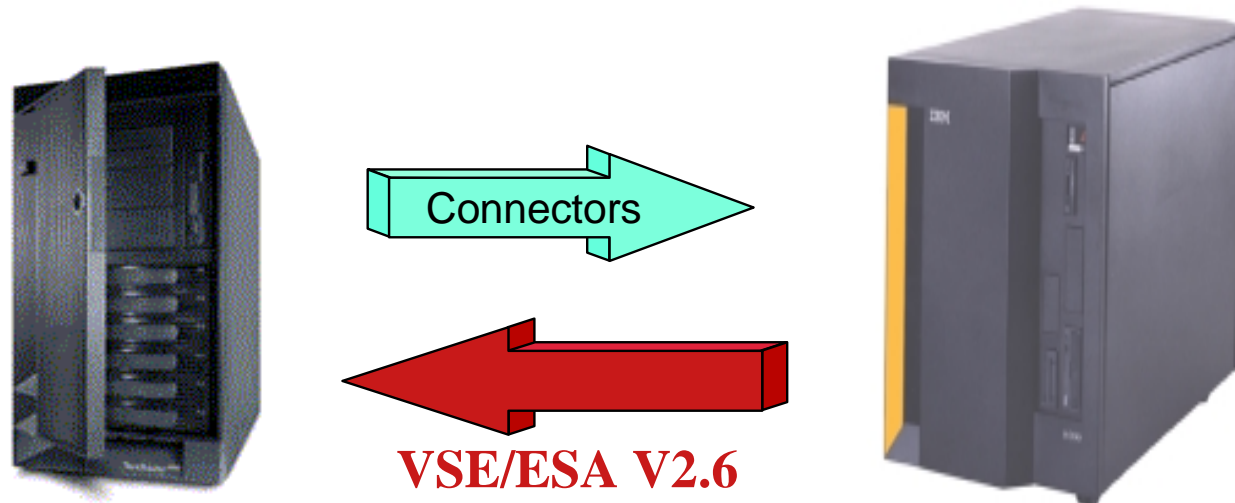
VSE/ESA and its connections.

VSE/ESA V2.5/2.6 - VSE as server

- ▶ remote access to VSE data
 - ▶ e-business connectors

VSE/ESA V2.6 - VSE as a client

- ▶ **VSE access to remote data**
 - ▶ **VSAM redirector**
 - ▶ **Virtual tape**



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VSE/ESA 2.6

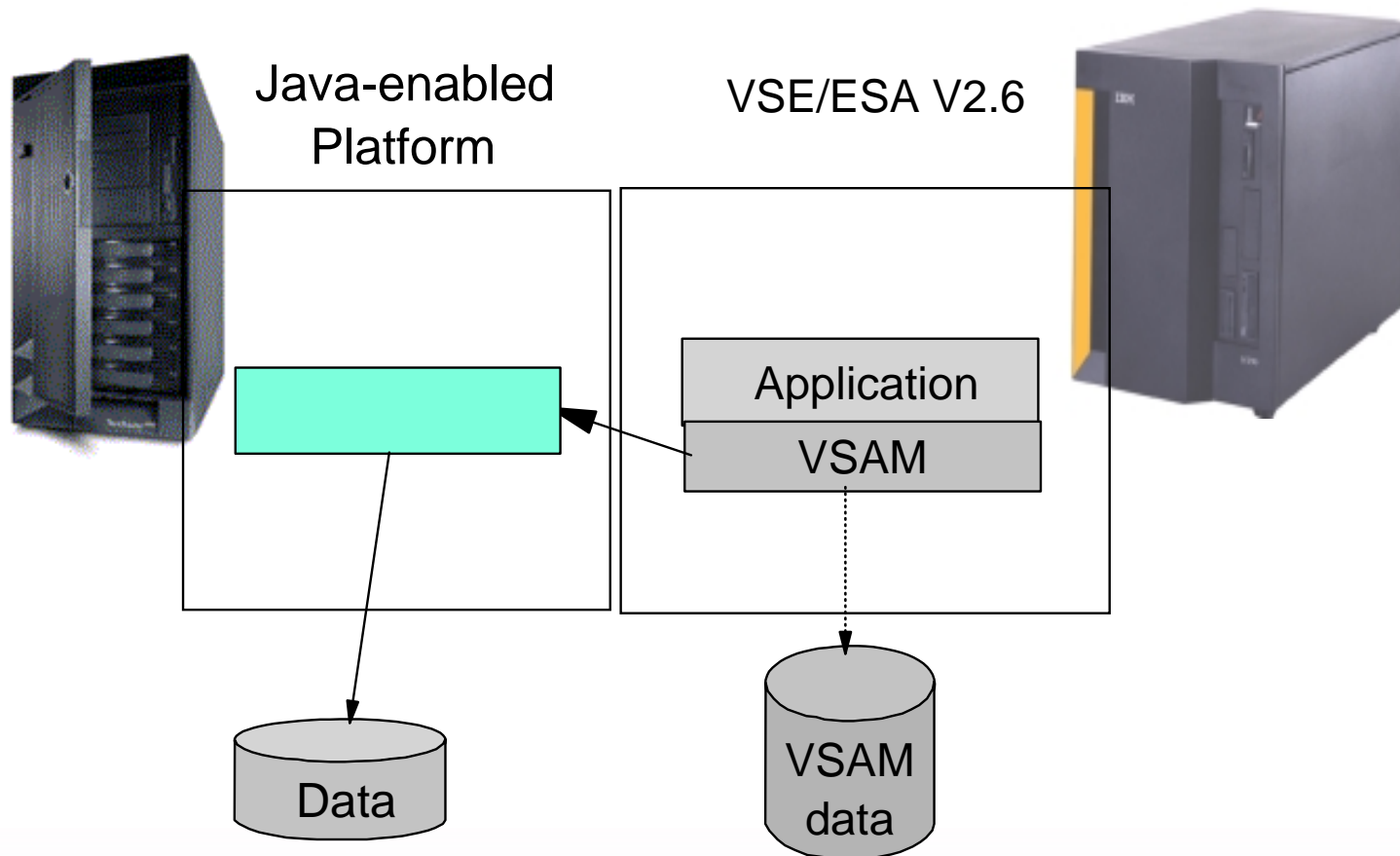
VSE/VSAM Redirector

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VSE/VSAM Redirector

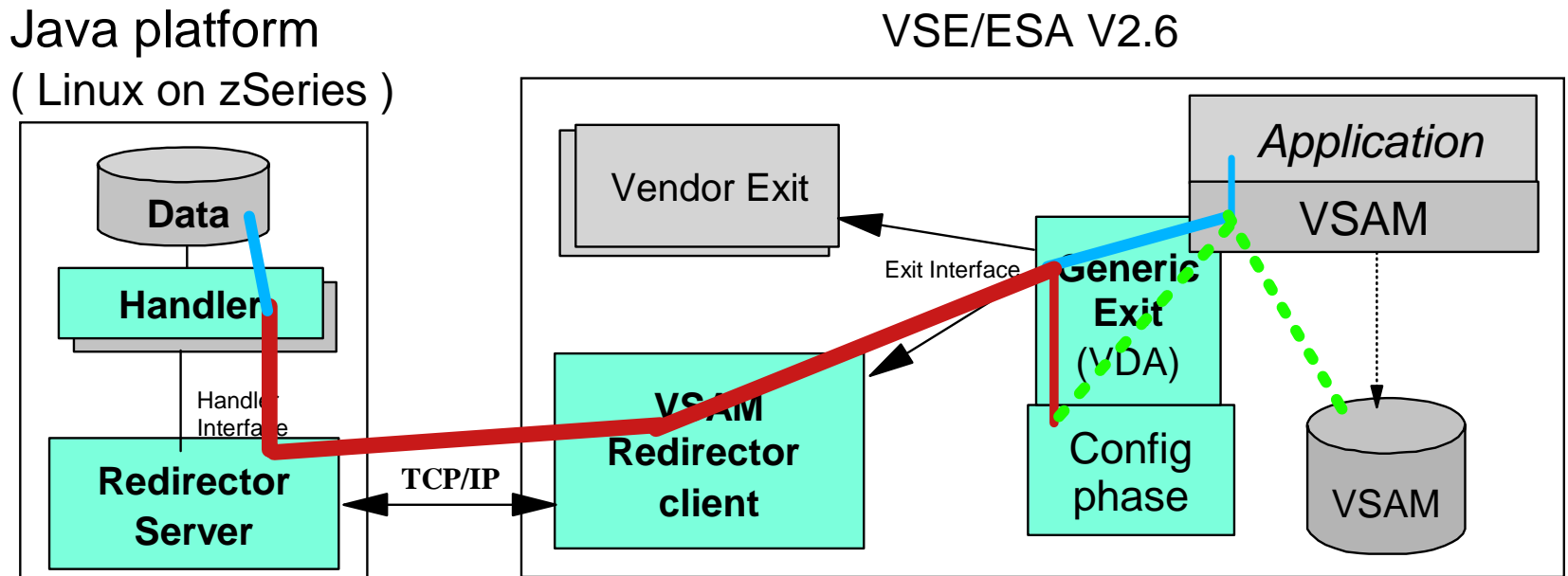
A mechanism for VSE programs working with VSAM data:

- gain transparent access to remote data
- using different file systems
- without any changes to VSE programs



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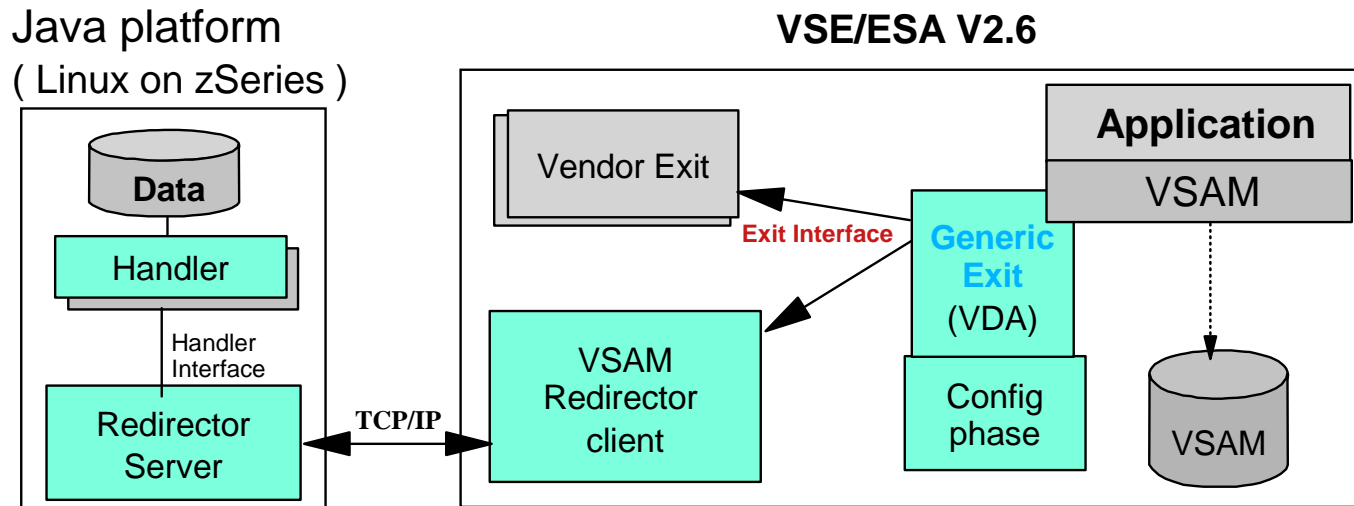
VSE/VSAM Redirector - functional view



- Redirector Components:
 - Generic Exit is based on VSAM Data Access Exit (VDA)
 - Config phase - redirection properties
 - Redirector client
 - Redirector server
 - Handler

VSE/VSAM Redirector - Components

Generic Exit

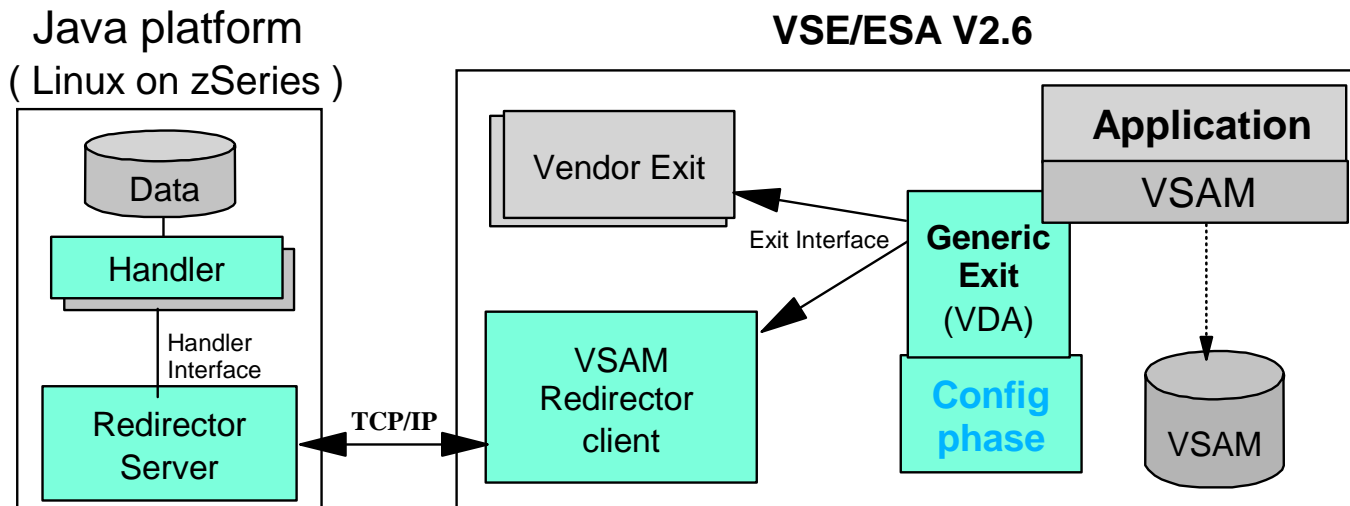


► Generic Exit

- based on VSAM Data Access Exit (VDA) IKQVEX01
- VSAM requests will be intercepted (i.e. OPEN,CLOSE,GET,PUT,POINT...)
- The exit is called twice for each VSAM request.
 - before request execution
 - after request finished
- RC=0 from exit, normal VSAM processing continues
- RC=4 from exit, skip all physical VSAM access, return to caller with RC=0
- Config phase is used for decisions of further processing
- Open (documented) **Exit interface**
- To use Generic exit, no changes to VSAM programs are required.

VSE/VSAM Redirector - Components

Configuration phase



- ▶ **Config phase**
- ▶ contains parameters for the processing decision
 - ▶ cluster and catalog name
 - ▶ VSAM file should or not be redirected
 - ▶ destination specification like IP address, PORT, handler,
 - ▶ option string containing i.e. database name, userid, password
- ▶ skeleton in ICCF Library 59 (SKRDCFG) is provided
- ▶ allows integration of existing VDA Exit phases

Information in Configuration phase

- ▶ **CATALOG**= VSAM catalog name for the file to be redirected. (wildcard allowed)
(**CLUSTER**=* - required)
 - NOTE:** If the master catalog is redirected, you might not be able to startup your VSE/ESA system!
- ▶ **CATDD** = The label name of the catalog. If you enter a different value than the default ('*'), both the CATALOG and CATDD will be used for checking if the file is to be redirected
- ▶ **CLUSTER**= VSAM cluster name.(wildcard allowed).
- ▶ **CLUDD** = The label name of the catalog. If you enter a different value than the default ('*'), both the CATALOG and CATDD will be used for checking if the file is to be redirected
- ▶ **PART** = The partition ID (for example F4) of the partition from which redirection is only possible. The default value is PART='*'.
 - ▶ **NOPART** = The partition ID (for example F4) of the partition from which redirection is not possible. The default is that all partitions are available for redirection.
- ▶ **EXIT**= Name of the exit phase or 'IESREDIR'.
 - ▶ **EXIT**=phasename - the phase with this name will be invoked (integration of VDA exit)
 - ▶ **EXIT**='IESREDIR' - the redirector client will be invoked with additional parameters

Information in Configuration phase

- ▶ **OWNER**= Name of the primary VSAM data owner (VSAM or REDIRECTOR)
 - ▶ **OWNER = REDIRECTOR** - No VSAM access is done for this VSAM cluster, all requests will be redirected
 - ▶ **OWNER = VSAM**: Dual processing occurs (both VSAM processing and redirecting requests are done)
- ▶ Options for both OWNER modes:
- ▶ **IP**= IP address VSAM Redirector Server to handle the requests
- ▶ **PORT**= (optional, default is 2387) Port number the VSAM Redirector Server
Standard port is 2387 which is assigned by the Internet Assigned Numbers Authority (IANA).
- ▶ **HANDLER**= Name of the Java class to be started, which represents the request handler
- ▶ **OPTIONS**= A string with arbitrary, options.
- ▶ Options for OWNER=VSAM:
- ▶ **IGNOREERROR**= NO|YES (opt, default NO) If set to YES, no error is set if redirector server is unreachable.
- ▶ **PUTREQONLY**= NO|YES (opt, default is NO). If set to YES, only INSERT, UPDATE and DELETE requests are redirected. (useful for synchronisation purposes, excluding the requests POINT and GET).

Configuration phase

Catalog	Cluster	Exit	Owner	IP	Port	handler-name	option-string
MY.USER.CAT	MY.VSAM.FILE	IESREDIR	VSAM	10.0.0.1	4711	DB2Handler	user=xxx,pw=xxx,...
MY.USER.CAT	MY.RD.FILE	IESREDIR	REDIR	9.164.155.2	4711	DB2Handlernam	user=xxx,pw=xxx,...
VSESP.U.CAT	TEST.CLUST2	VENDOREX		n/a n/a		n/a n/a	n/a

```

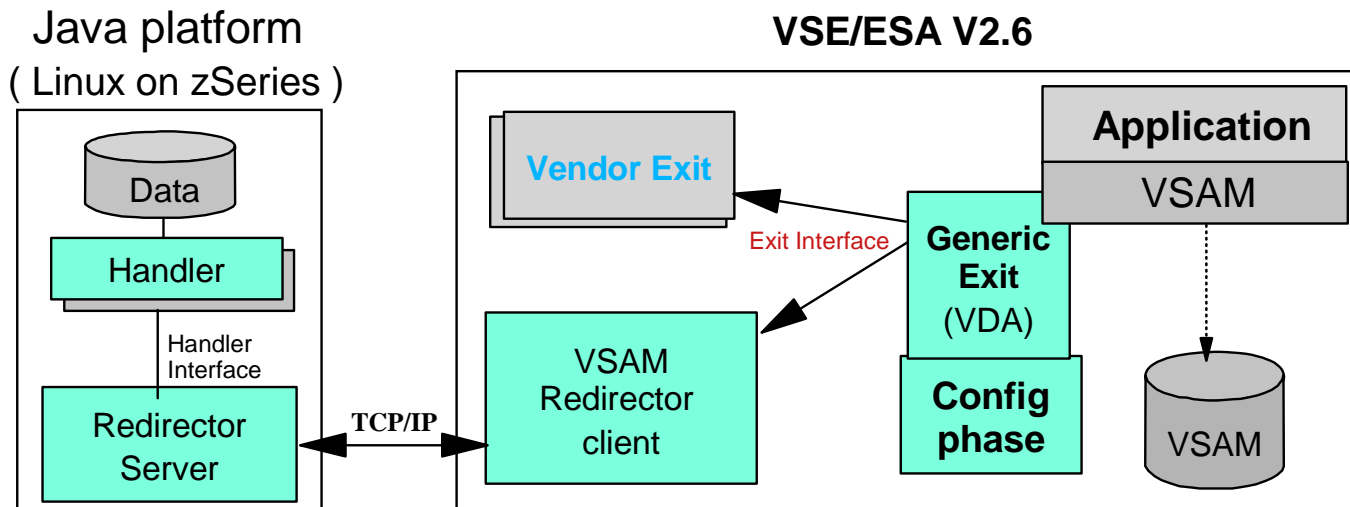
* $$ JOB JNM=SKRDCFG,CLASS=A,DISP=D
// JOB SKRDCFG GENERATES REDIRECTOR CONFIG PHASE
* *****
* STEP 1: ASSEMBLE AND LINK THE CONFIG TABLE *
* *****

.....
*
IESRDENT CATALOG='MY.USER.CAT',
CLUSTER='MY.VSAM.FILE',
EXIT='IESREDIR',
OWNER=VSAM,
IP='10.0.0.1',
HANDLER='com.ibm.vse.db2handler.DB2Handler',
OPTIONS='db2url=jdbc:db2:redir;db2user=hugo;
db2password=hugospw;db2table=mydata'
*
IESRDENT CATALOG='VSESP.U.CAT',
CLUSTER='TEST.CLUST2',
EXIT='VENDOREX'
*
END
/*
.....

```

VSE/VSAM Redirector - Components

Vendor Exit



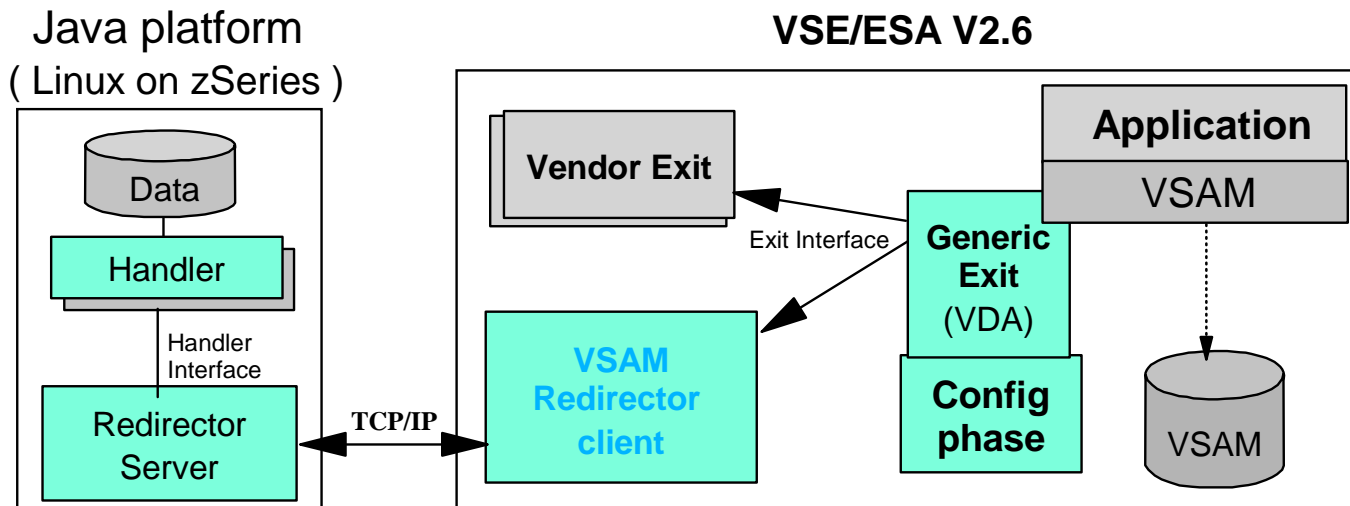
► Vendor Exit

- user (vendor) written phase for data collection/transformation
- has to comply with the documented **Exit Interface**

Note: No chaining of Vendor Exit with VSAM Redirector client supported

VSE/VSAM Redirector - Components

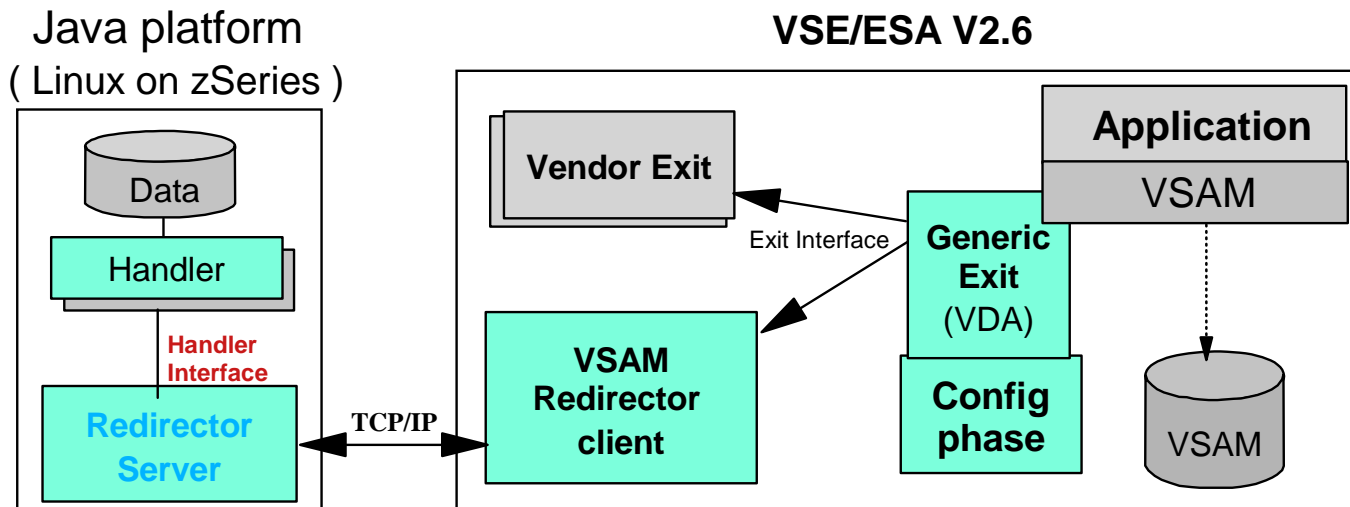
VSAM Redirector client



- ▶ **VSAM Redirector client**
 - ▶ running on VSE/ESA 2.6 in user's program partition
 - ▶ component implemented as reentrant SVA phase
 - ▶ responsible for TCP/IP connection/session handling with Redirector server

VSE/VSAM Redirector - Components

Redirector server



- ▶ **VSAM Redirector server**
 - ▶ implementation: 100% Java
 - ▶ command line interface to interact with server (start/stop/status)
 - ▶ Open **Handler Interface**
 - ▶ responsible for TCP/IP connection with Redirector client
 - ▶ responsible for data translations (EBCDIC - specified Code Page)
 - ▶ configured via [VSAMRedirectorServer.properties](#) file
 - ▶ calls the handler for data processing (OPEN,...,CLOSE method)
 - ▶ generates (translates) error messages for VSAM

VSE/VSAM Redirector - Components

Redirector server (configuration)

- ▶ `VSAMRedirectorServer.properties` file used to configure Redirector server
 - ▶ `messages` = on|off
 - ▶ on: print server messages
 - ▶ off: quiet mode, messages will not be shown
 - ▶ `listenport` = portnumber
 - ▶ TCP/IP portnumber on which the server listens
 - ▶ `maxconnections` = number
 - ▶ number of maximum parallel connections allowed, from clients
 - ▶ `codepagetranslator` = `com.ibm.vse.server.DefaultTranslator`
 - ▶ the codepage translator class to be used to convert Strings from EBCDIC into ASCII and back (`get` method from `VSAMRequestInfo.class`)
 - ▶ `tracelevel` = number (currently 0 - 2)

Note: Individual translators can be written and implemented via VSAM Redirector properties file (`codepagetranslator`).

VSE/VSAM Redirector - Components

Redirector server (translator)

- ▶ Redirector server has 'data translation' functions implemented in the VSAMRequestInfo.class
- ▶ [VSAMRequestInfo.class](#) contains methods to get and set data areas in the communication area. 'offset' plus 'length' of the record area and these methods are used to transform the data into:
 - ▶ [String](#)
 - ▶ [Number \(Signed/Unsigned\)](#)
 - ▶ [Packed Decimal](#)
 - ▶ [Binary bytes](#)

These methods (see Javadoc) are called from [handler](#) if necessary.

VSE/VSAM Redirector - Components

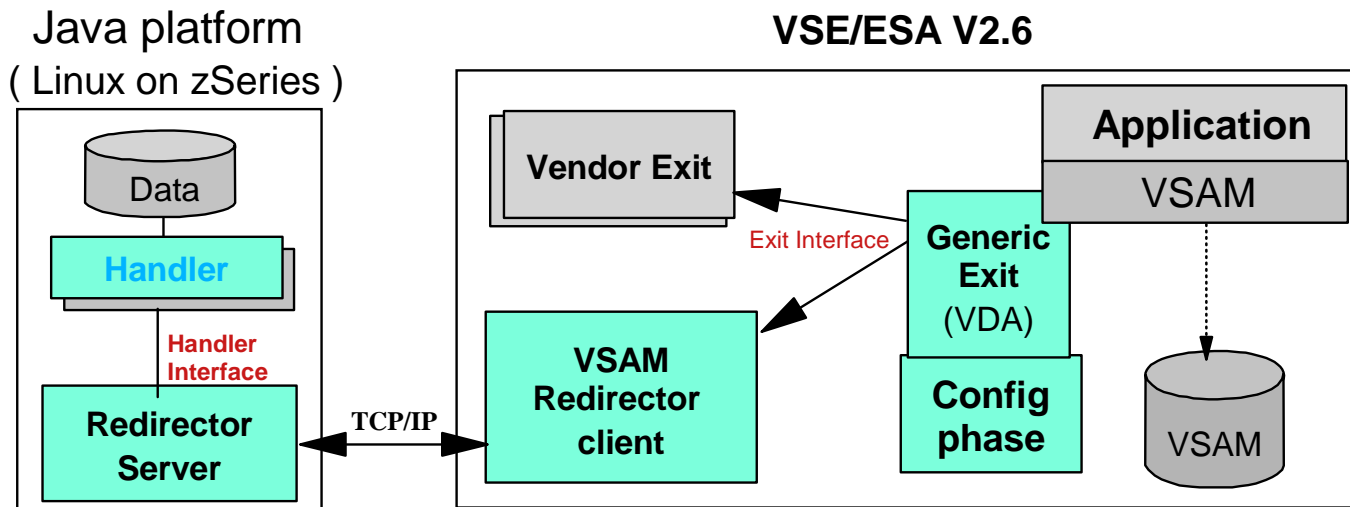
Redirector server (commands)

The following commands are available at the server console:

- ▶ **status** - shows the status of the server
- ▶ **stop x | all** - stop client with number 'x' (show in status) or stop all clients
- ▶ **quit** - stop all clients and exit server

VSE/VSAM Redirector - Components

Handler



► Handler

- file system specific
- must reside in the directory of Redirector server
- sample implementations: 100% Java
- multiple handlers per system possible
- **Handler interface** allows individual handler for proprietary/standard file systems and platforms
- VSE/ESA 2.6 contains a sample implementation for a relational handler (DB2) and an HTML handler

VSE/VSAM Redirector - Components

Handler - internals

Redirection of VSAM data into other data formats (relational database, flat file, and so on), transparent to existing applications, **requires some VSAM behavior logic** in the request handler. Therefore positioning and error-reporting logic must be part of the request handler.

The required case methods to handle are :

OPEN requests

CLOSE requests

Record requests, (**GET, PUT (UPDATE+INSERT), ENDRQ, POINT**)

VSE/VSAM Redirector - Installation

Overview

VSE/VSAM Redirector Parts (included in VSE/ESA 2.6):

- ▶ **Generic Exit: IKQVEX01.PHASE**
- ▶ **Redirector client: IESREDIR.PHASE**
- ▶ **Redirector Config Phase: IESRDCFG.PHASE**
- ▶ **Redirector server and Sample handlers**
 - java code shipped as member IESVSMRD.W in PRD1.BASE

VSE/VSAM Redirector enabling Considerations:

VSE/VSAM Redirector is based upon the existing VSAM Data Access (VDA) exit. The VDA exit is represented by the restricted phase name IKQVEX01.PHASE, shipped as dummy phase within VSE/ESA in library IJSYSRS.SYSLIB.

This phase could be replaced by customer to implement their own 'VDA exit phase' with the same name IKQVEX01.PHASE

Generic exit is shipped as replacement of the (dummy) VDA exit phase and allows imbedding of existing customer VDA exit phases via Redirector Config phase.

To avoid over-writing any existing phases, all phases that belong to the VSAM Redirector Client are shipped in library PRD1.BASE.

VSE/VSAM Redirector - Installation

Setup

Enable VSE/VSAM Redirector on VSE/ESA:

- ▶ **Customize the Configuration Phase (SKRDCFG in Lib 59)**
- ▶ **Decide Upon Your Redirection Mode**
- ▶ **Enable the VSAM Redirector Client on VSE/ESA**
- ▶ **Enable the VSAM Redirector server on a Java-enabled platform**
- ▶ **Transfer Your VSAM Data (Optional)**

Installation, Customisation

Enable the VSAM Redirector Generic Exit and Client on VSE/ESA

Skeleton SKRDCFG in Library 59 helps to configure the VSAM Redirector Client.

- ▶ Assemble/link the member IESRDCFG.PHASE
- ▶ catalog IESRDCFG.PHASE into library PRD2.CONFIG.
- ▶ Load the IESRDCFG.PHASE into the SVA (optional).
- ▶ Copy IESVEX01.PHASE to PRD2.CONFIG with the name IKQVEX01.PHASE, to activate the exit phase.
- ▶ Load the IKQVEX01.PHASE into the SVA (optional).

Enable the VSAM Redirector server on a Java-enabled platform

The VSAM Redirector server is shipped within VSE/ESA 2.6 in Library PRD1.BASE as file IESVSMRD.W

- ▶ download the member to a Java enabled platform
- ▶ rename it to install.class
- ▶ install redirector Server with command: *java install*
- ▶ the online documentation (HTML) will also be installed

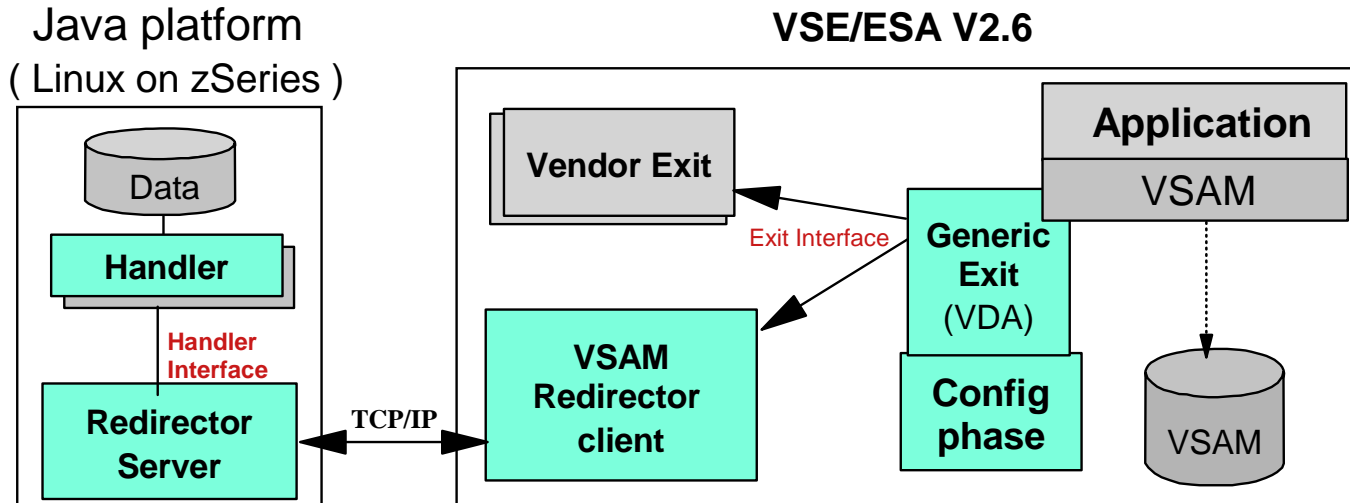
Note:

- 1) Redirected VSAM cluster must be defined and have a dummy record.
- 2) Exits cannot be chained if any one of these exits has OWNER= REDIRECTOR.

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VSE/VSAM Redirector

Working with remote data



Working With Data Residing On Another Platform OWNER=REDIRECTOR

No VSAM access any more (after OPEN).

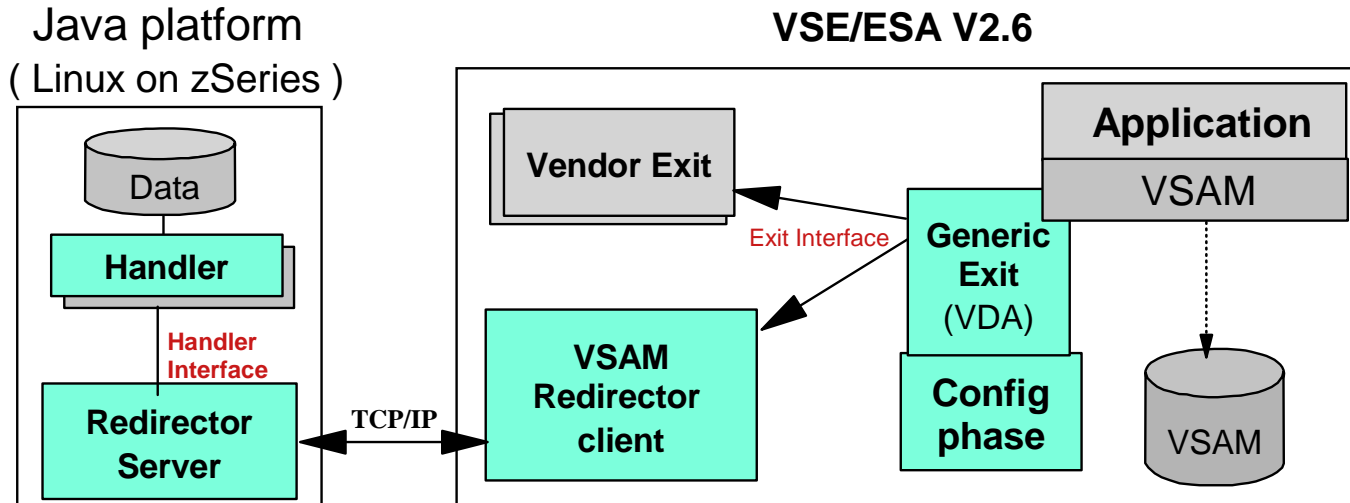
All requests are redirected to VSAM Redirector Client, which then connects to the VSAM Redirector Server. The VSAM Redirector Server then performs the request via the respective handler.

Note:

- 1.The redirected VSAM file must exist and have at least one dummy record.
- 2.You cannot chain exits if any one of these exits has OWNER set to REDIRECTOR.

VSE/VSAM Redirector

Synchronisation



Synchronizing existing VSAM data with a remote file system(OWNER=VSAM)

The programs perform a VSAM access and redirected access.

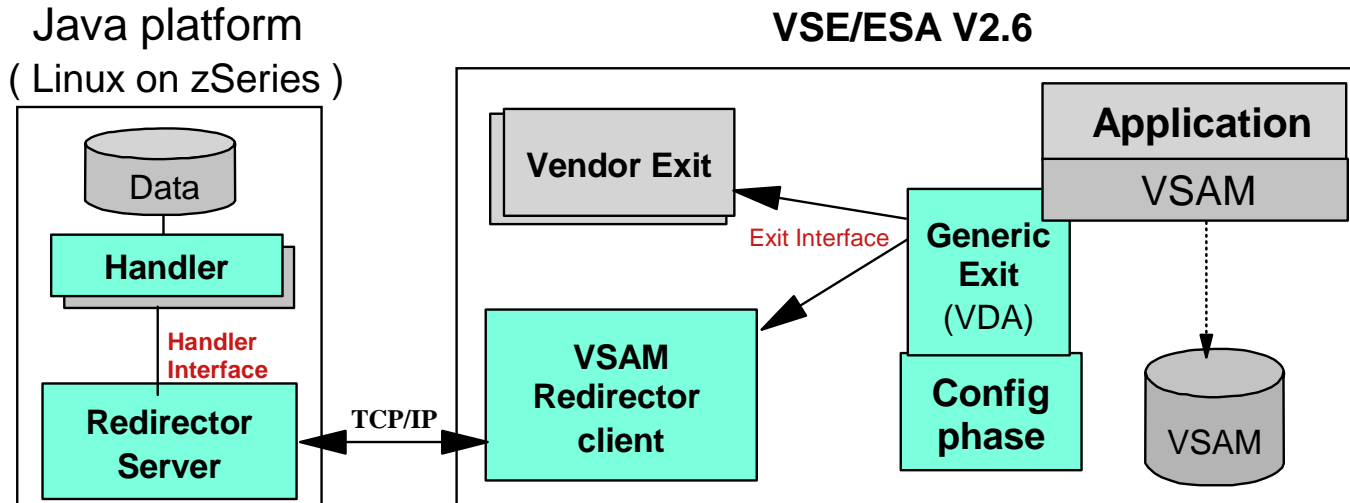
Each VSAM request causes two invocations of VSAM Redirector Client, giving the chance to commit or rollback depending on VSAM request completion.

Note:

PUTREQONLY=YES allows to make changes only simultaneously on 2 sides, READs are done from VSAM.

VSE/VSAM Redirector

Migration



Define a VSAM cluster as the target for the redirection / transfer process. In the Redirector configuration phase, the VSAM cluster must have OWNER=REDIRECTOR.

Copy the data into the redirected VSAM cluster, using the IDCAMS REPRO utility. After completion of this action, your data will be stored on the target Java platform's file system.

Customer - Benefits

- ▶ **VSE access to** various remote file systems without changing the programs
 - ▶ OWNER = REDIRECTOR
- ▶ **migration** of VSAM data to another file system
 - ▶ OWNER = REDIRECTOR and REPRO to redirected cluster
- ▶ **synchronization** of VSAM data with data on another platform (independent of file organizations)
 - ▶ OWNER = VSAM
- ▶ transparent for CICS or Batch

VSE/ESA 2.6

Virtual Tape Support

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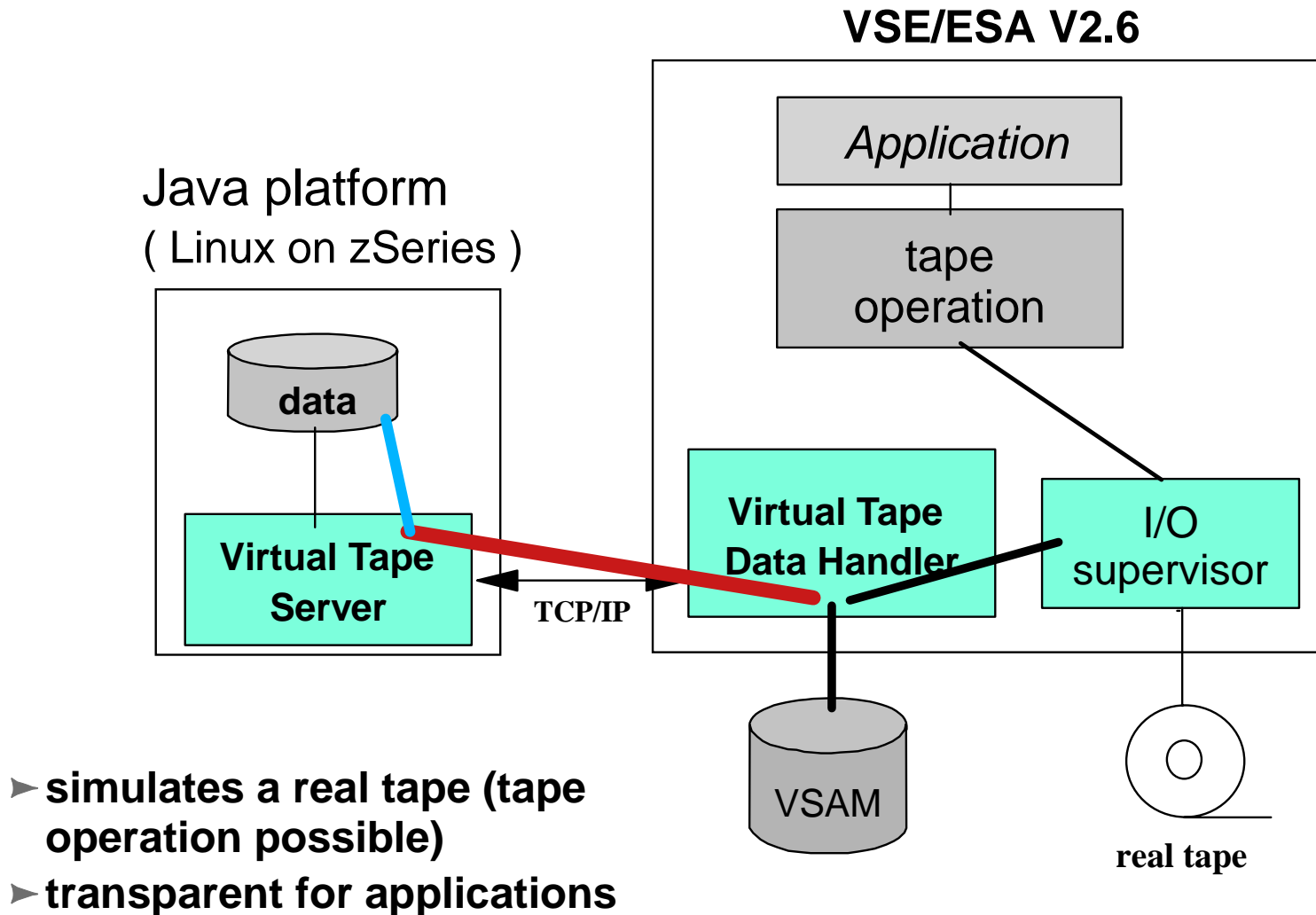
Virtual tape support

Agenda

- **Overview**
- **VSAM and remote tape images**
- **VSAM Considerations**
- **Usage Examples**
- **Transferring tape images**

Virtual tape support

Functional view



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Virtual tape support

Overview

- **VSE Virtual Tape support is part of VSE/ESA 2.6**
 - ▶ NOT a Virtual Tape Server (VTS) device - Hardware
- **Emulates a tape with multiple tape files**
 - ▶ not just one tape file
- **Uses a tape image file instead of a physical tape**
- **A tape image file can reside in**
 - ▶ VSAM ESDS
 - ▶ Remote file (e.g. on a workstation)
- **The tape image file has AWSTAPE format**
 - ▶ known from P/390, R/390, Flex-ES

Virtual tape support

Operation

- **A tape CUU can be switched to virtual**
 - ▶ **VTAPE START,UNIT=cuu ...**
 - ▶ **VTAPE STOP,UNIT=cuu**
- **Tape image file is opened at VTAPE START**
- **Tape image file is closed at VTAPE STOP**
- **Access to tape image can be**
 - ▶ **READ** read only
 - ▶ **WRITE** read and write (existing content is kept)
 - ▶ **SCRATCH** read and write (content is cleared)

Virtual tape support

Data Handler

- **VSE Virtual Tape Data Handler runs in a batch partition**
 - ▶ Dynamic class R per default
- **Accesses VSAM tape images**
- **Establishes TCP/IP connections to remote system**
- **Startup job TAPESRVR**
 - ▶ Skeleton SKVTASTJ in ICCF lib 59
 - ▶ Do not change the job name (TAPESRVR)

```
* $$ JOB JNM=TAPESRVR,DISP=L,CLASS=R
* $$ LST CLASS=A,DISP=D
// JOB TAPESRVR START UP VSE TAPE SERVER
// LIBDEF *,SEARCH=(PRD2.CONFIG,PRD1.BASE,PRD2.SCEEBASE)
// ID USER=VCSRVR
// EXEC $VTMAIN,SIZE=$VTMAIN
/*
/&
* $$ EOJ
```

Virtual tape support

Data Handler - remote tape image

- **A remote tape image resides in a file**
 - ▶ on the remote workstation's filesystem
- **The file is created automatically (if not existing)**
 - ▶ at execution of VTAPE START command
- **Filename (and path) are remote system dependent**
 - ▶ attention with uppercase translation of filenames
- **Remote systems can be**
 - ▶ Any Java capable platform i.e.
 - Windows (95/98/XP/NT/2000/...)
 - Linux (on zSeries or Intel based server)
 - Unix (Aix, Sun, HP, ...)

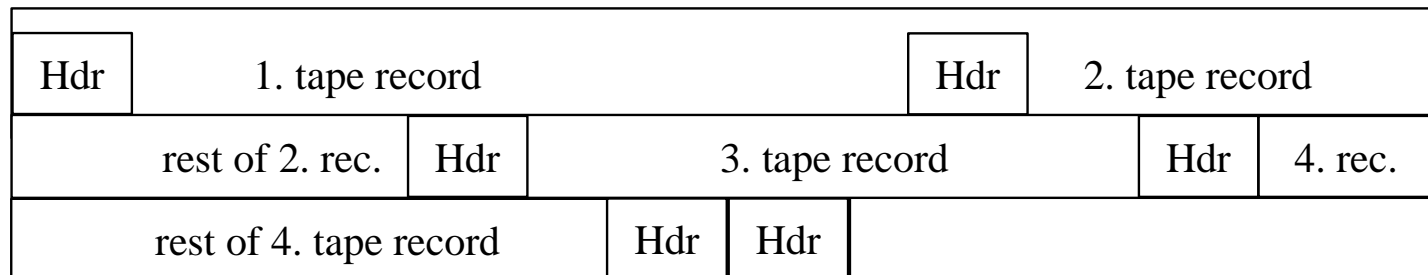
Virtual tape support

Data Handler - VSAM tape image

- **A VSAM tape image resides in a VSAM ESDS Cluster**
- **Recommended file attributes**
 - ▶ CI size = 32768
 - ▶ Record Size = 32758 (32768-10)
 - ▶ REUSE = YES
 - ▶ Shareoption = 1
 - ▶ Records/Cylinder/Tracks depends on amount of data
- **A label must exist in the standard labels**
- **Skeleton SKVTAPE in ICCF lib 59**

VSAM tape image Considerations

- **Tape data is reblocked into the VSAM records**



- **Independent of VSAM record size**
 - ▶ Choose as large as possible (32758 bytes)
- **Independent of tape record sizes**
 - ▶ Up to 64K

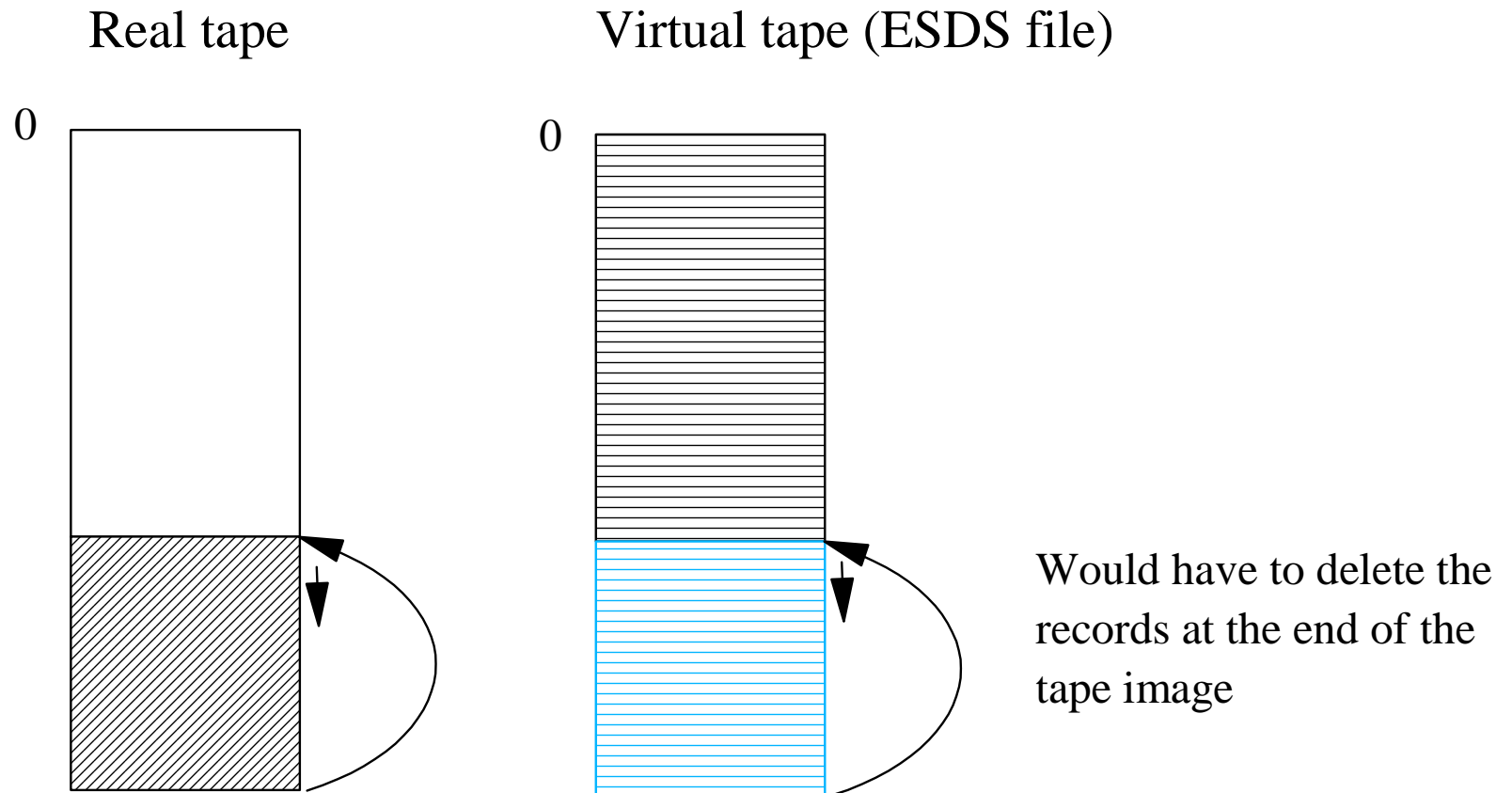
VSAM tape image

Considerations - continued

- **No overwrite of existing data possible**
- **Only append to file possible**
- **But: rewrite from the beginning is possible**
 - ▶ Implicit reopen of the VSAM file with REUSE
- **Why?**
 - ▶ ESDS can not delete records
 - ▶ ESDS can update records
 - But cannot change length of records
 - This would be necessary to support AWSTAPE forma

VSAM tape image

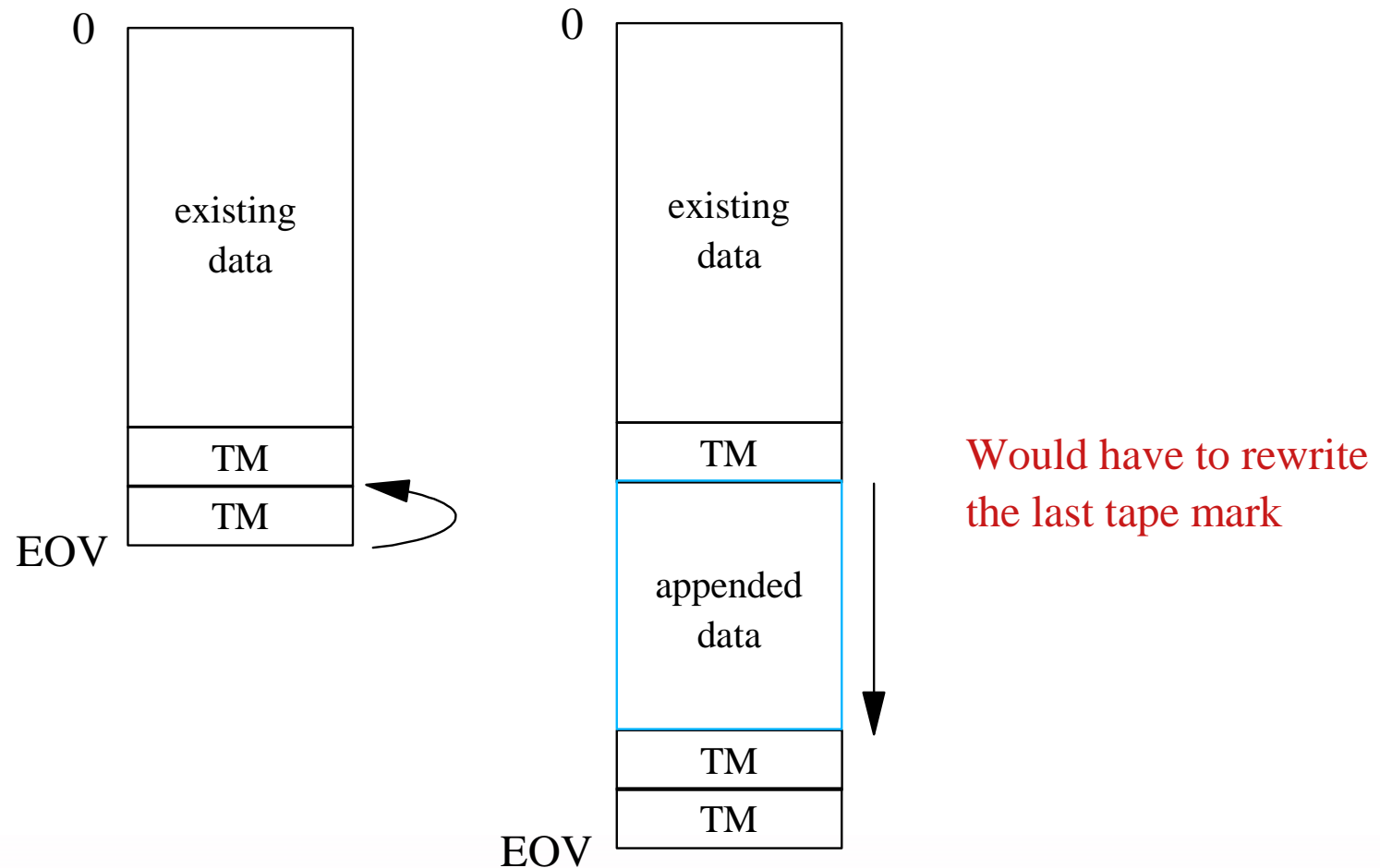
Considerations - continued



VSAM tape image

Considerations - continued

Special case: Append of data to a tape



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VSAM tape image Considerations - Summary

- **Append of tape data is possible**
 - ▶ before VTAPE STOP (NOT after VTAPE STOP)
- **Overwrite from the beginning is possible**
 - ▶ If VSAM ESDS defined with REUSE=YES

Virtual tape support

Example - BACKUP to CD-ROM

- **Step 1: Do a backup to a virtual tape**
// JOB BACKUP
DVCDN 480
VTAPE START,UNIT=480,LOC=9.164.186.20,FILE='d:\backup.aws'
DVCUP 480
MTC REW 480
MTC WTM,480
// EXEC LIBR
BACKUP LIB=PRD2 TAPE=480
/*
DVCDN 480
VTAPE STOP,UNIT=480
DVCUP 480
/&
- **2. Step: Copy (burn) d:\backup.aws to a CD-ROM**
- **3. Archive the CD-ROM**
- **4. Step: Restore directly from CD-ROM**

Virtual tape support

Example - DUMP OFFLOAD

- **Create a (remote) virtual DUMP tape**
 - ▶ DUMP Fx, cuu
 - ▶ DUMP SVA, cuu
 - ▶ DUMP SUF, cuu
 - ▶ Offload function in IUI Dialog (Fastpath 43)

- **Send the tape image containing the DUMP to IBM for analysis**
 - ▶ Attach it to a e-mail
 - ▶ Put in onto IBM's FTP server

Virtual tape support

Transfer of tape images

- **Transfer tape images in binary**
 - ▶ From one workstation to another workstation
 - using shared network drive
 - via file transfer (i.e. ftp)
 - ▶ From a workstation to a VSAM ESDS cluster

ftp 9.120.196.201

bin

quote site lrecl 32758

quote site recfm v

put d:\backup.aws VSAM.TAPE.IMAGE - transfer the file

- initiate FTP session
- transfer in binary
- specify record size
- record format variable

Additional Information

- ❖ VSE/ESA Home Page

<http://www.ibm.com/servers/eserver/zseries/os/vse/>

- ❖ e-business Connectors User's Guide

SC33-6719

- ❖ VSAM Data Access (VDA) Exit:

<http://www-1.ibm.com/servers/eserver/zseries/os/vse/support/vsam/vdaexits.htm>

- ❖ HTML documentation within Redirector Server

- ❖ e-business connector tools for VSE/ESA customers

<http://www-1.ibm.com/servers/eserver/zseries/os/vse/support/vseconn/conmain.htm>

We appreciate your comments at : VSEESA@de.ibm.com



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