



z/VSE Live Virtual Class Series

Encryption Facility for z/VSE V1.1

Program number: 5686-CF8-40

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Nov 29, 2007

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Agenda

- § **News: Loss of sensitive data in UK**
- § **Overview: TS1120 tape drive**
- § **Encryption Facility for z/VSE**
 - Password-based encryption
 - Public key encryption
- § **Relationship to**
 - z/OS Encryption Facility
 - TS1120



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Last Updated: Thursday, 22 November 2007, 16:30 GMT

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Q&A: Child benefit records lost

How worried should people be by the loss of discs containing child benefit recipients' personal details?

What has happened?

HM Revenue and Customs has lost computer discs containing the entire child benefit records, including the personal details of 25 million people - covering 7.25 million families overall. The two discs contain the names, addresses, dates of birth and bank account details of people who received child benefit. They also include National Insurance numbers.

How were the discs lost?

They were sent via internal mail from HMRC in Washington, in the North East of England, to the National Audit Office in London on 18 October, by a junior official, and never arrived. That broke data protection laws and is the reason Revenue and Customs chairman Paul Gray resigned.

BENEFIT RECORDS LOST

Queries answered
BBC personal finance reporter Jennifer Clarke answers your questions on the crisis

KEY STORIES

- ▶ Six more data discs 'are missing'
- ▶ Disc search moves to courier firm
- ▶ Private data 'also given to firm'
- ▶ E-mails reveal data warning
- ▶ Government challenges claims
- ▶ Cameron calls for ID cards halt
- ▶ Threat of fraud 'looms for years'
- ▶ Brown orders data spot checks
- ▶ Brown apologises for records loss
- ▶ UK's families put on fraud alert
- ▶ Government letter: full text

SKETCH

Done

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What is the government saying?

Prime Minister Gordon Brown told MPs: "I profoundly regret and apologise for the inconvenience and worries that have been caused to millions of families who receive child benefits. When mistakes happen in enforcing procedures, we have a duty to do everything we can to protect the public." He denied the data was lost because of "systemic" failures at the HMRC saying it had been due to procedures not being followed. He ordered security checks on all government departments to ensure data is properly protected.

What is being done to find the discs?

The Metropolitan Police, National Audit Office, Revenue and Customs staff and courier firm TNT have all been searching for the discs.

How worried should people be?

The details on the lost discs would be sought after by fraudsters. Mr Darling says the information was password protected, but that was not good enough. He said there was no suggestion that anything untoward had happened as a result of the discs' loss to date. Experts say such data should normally be sent in encrypted form.

▶ **Analysis: How worried should we be?**

SKETCH

'Profound regret'
How Brown dealt with data crisis in weekly Commons grilling

FEATURES AND BACKGROUND

- ▶ Q&A: Child benefit records lost
- ▶ Taking cover from ID theft
- ▶ Point-by-point: Darling statement
- ▶ The dealers in data
- ▶ Life inside the beleaguered HMRC
- ▶ Timeline: Benefits records loss
- ▶ Revenue's previous data failings

HAVE YOUR SAY

- ▶ Your reaction to lost records
- ▶ 'Our data was put at risk'

WATCH/LISTEN

- ▶ **WATCH** Brown's apology
- ▶ **WATCH** Alistair Darling

RELATED INTERNET LINKS

- ▶ HMRC
- ▶ Treasury committee

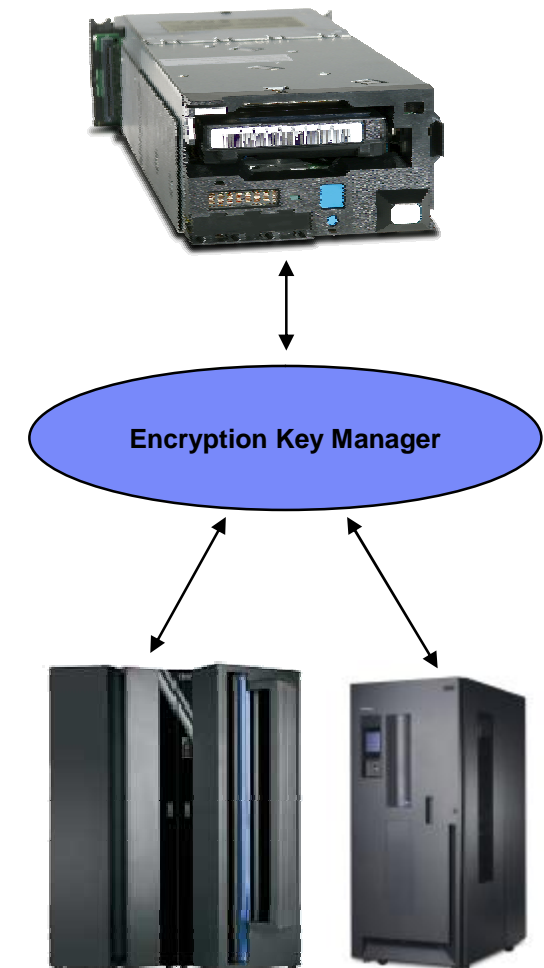
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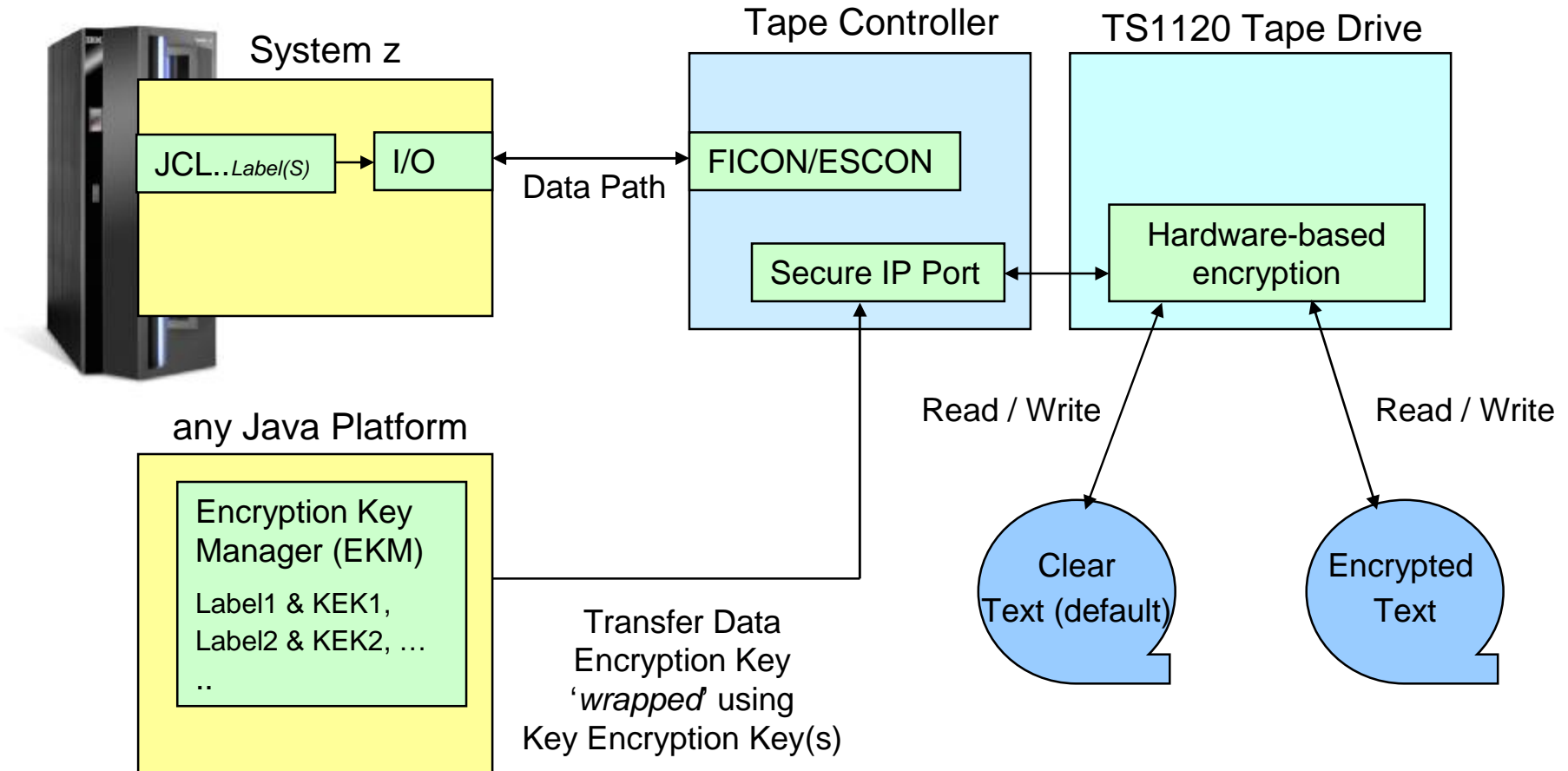
IBM TS1120 Tape Drive Encryption

- § Standard feature on new TS1120 tape drives
- § Supports “traditional” and “encrypted” modes of operation
- § encryption “disabled” unless otherwise specified
- § Implements data encryption using AES-256 encryption
- § Data is automatically compressed then encrypted – no change in media utilization
- § Supported by z/VSE V4.1 & V3.1
- § **IBM Encryption Key Manager (EKM) for Java platform™**
 - EKM stores and manages labels and key encrypting keys
 - runs on z/OS, AIX, Linux (incl System z), i5/OS, HP, Sun, & Windows
 - Secure TCP/IP connection between EKM and TS1120
 - Operates with IBM tape systems, libraries
- § Enhancements to Tivoli Storage Manager™ to exploit TS1120 encryption





IBM Tape Encryption – TS1120



TS1120 Summary

§ Hardware-based encryption

- No host cycles used

§ Designed for high volume backup

§ Encryption Key Manager (EKM) on a Java platform

- for centralized key management
- with SSL connection between tape controller and EKM

§ Encryption option specified in VSE via JCL commands

- // ASSGN ...
- // KEKL ...

What is Encryption Facility for z/VSE?

- § **Host-based tool**
- § **provides encryption for single SAM files, VSAM files, or VSE Library members, but also for complete backups made with any backup tool either from IBM or vendors**
- § **Similar to the “Encryption Facility for z/OS”**
 - http://www.ibm.com/servers/eserver/zseries/zos/encryption_facility/
 - Compatible to Encryption Facility for z/OS V1.1 and V1.2 using System z data format
- § **Support of TDES and AES-128 for data encryption**
- § **IBM crypto hardware exploitation**
 - crypto cards and CPACF
- § **Eligible for MWLC pricing**
- § **Two main functions**
 - Password-based encryption
 - Public-key based encryption

Relationship to z/OS Encryption Facility

IBM Encryption Facility for z/VSE, 1.1

Program number: 5686-CF8-40
 Runs on: System z9 EC, z9 BC
 zSeries 890 or 990

Requires: z/VSE 4.1 (with DY46717) or higher;

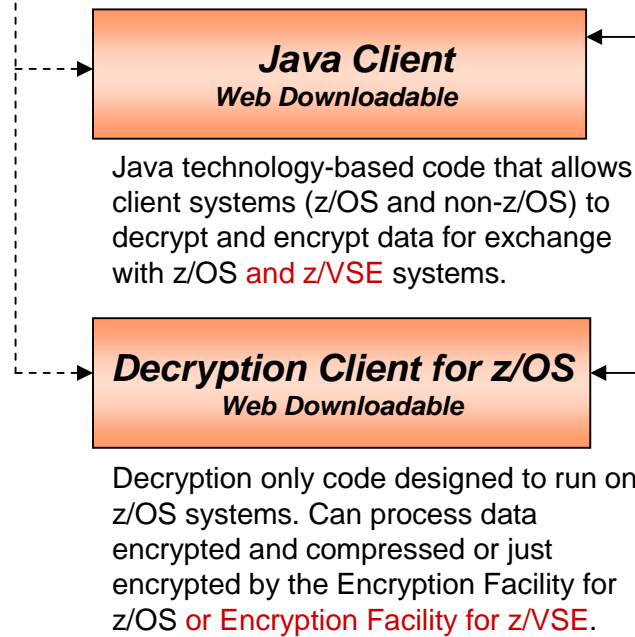
IBM Encryption Facility for z/OS, 1.1

Program number: 5655-P97
 Runs on: System z9 EC, z9 BC
 zSeries 900 or 990
 zSeries 800 or 890

Requires: z/OS 1.4 or higher; z/OS.e 1.4 or higher

Optional Priced Feature

- § Supports encrypting and decrypting of data at rest (tapes, disk)
- § Supports either Public Key/Private keys or passwords to create highly-secure exchange between partners
- § Use z/OS Java Client or Decryption Client for z/OS for data exchange with client systems or decryption on z/OS.
- § Use zvse@de.ibm.com mailbox for questions about z/OS Java Client and Decryption Client for z/OS when used in relation with VSE.



Feature:
Encryption Services

Optional Priced Feature

- § Supports encrypting and decrypting of data at rest (tapes, disk)
- § Supports either Public Key/Private keys or passwords to create highly-secure exchange between partners

Feature:
DFSMSdss Encryption

Optional Priced Feature

Functionality

§ Encryption/decryption of datasets

- A dataset can reside on disk or on tape
- Clear dataset: LIBR member, VSAM cluster (ESDS, RRDS, or KSDS), SAM dataset on tape or disk
- Encrypted dataset: LIBR member, a VSAM ESDS cluster or a SAM dataset on tape or disk.
- Option to compress data prior to encryption

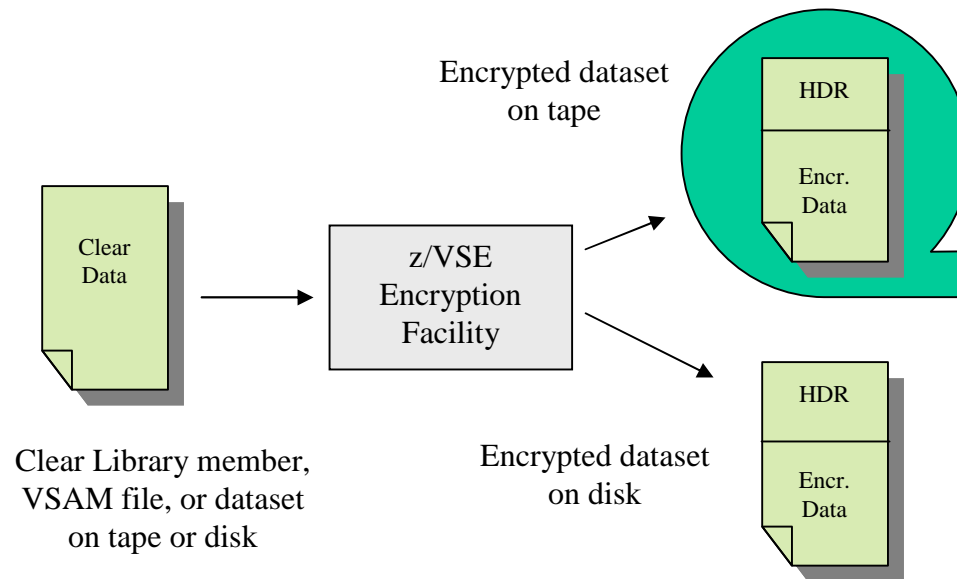
§ Algorithms: TDES and AES-128

- AES-128 requires a z9 BC or EC
- with password-based encryption
- with public-key encryption

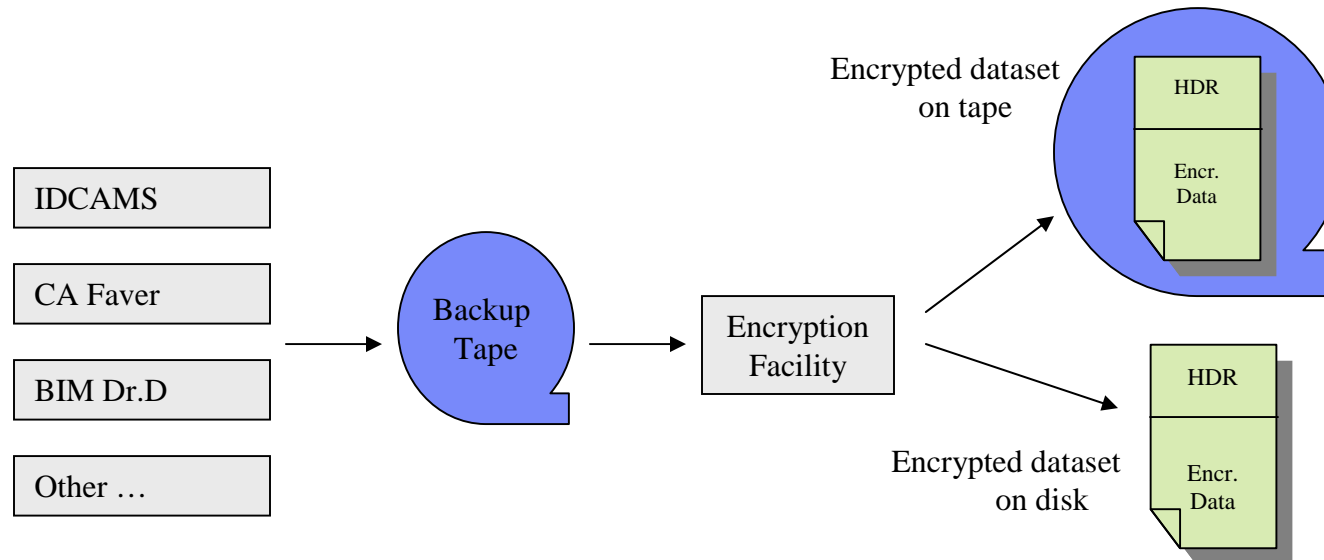
§ Also available: Encryption Facility for z/OS Java Client

- Freely downloadable Java-tool
- Can encrypt/decrypt datasets on any Java-capable platform, including Windows, Linux, AIX, and even z/OS
- Source code available for customers for reference and customization
- Can be also used by VSE customers

Encryption of a single file



Encryption of a complete backup



- § Any proprietary backup tape can be encrypted and written to a second tape or to disk.
- § Note that the complete input tape results in just one encrypted dataset, which resides on tape or disk.

Password-based encryption (PBE)

§ Encryption key (data key) is generated from

- the given secret password (8 ... 32 characters)
- iteration count, and
- a 8-byte random number (the “salt”), which is different for each encryption process.

§ The iteration count and salt value are stored in the encrypted dataset header.

- icount and salt are not secret
- When encrypting the same data twice with the same password and iteration count, the resulting encrypted data will be completely different, because of the randomly created salt value.

§ No need to deal with keys, but

§ Need to manage/archive passwords

- Many free tools available, e.g.
- KeePass : <http://keepass.sourceforge.net/>

PBE: Example for generating a key

§ Example of a “Password-based key derivation function”

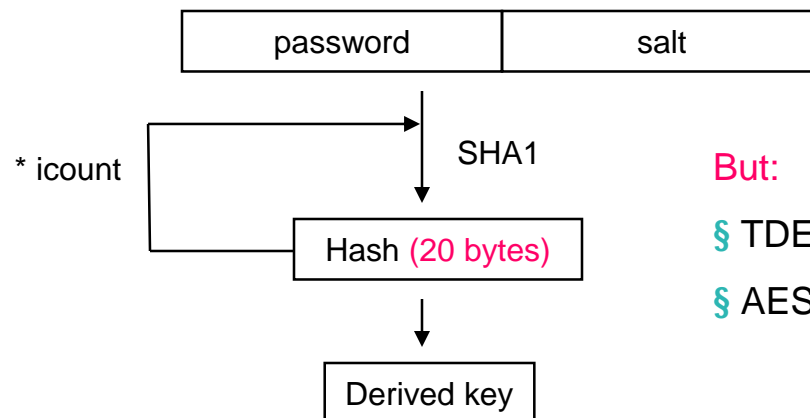
§ PBKDF1(password, salt, iteration_count, dkLen)

§ Disadvantage:

- Derived key length (dkLen) limited to output of underlying hash function (MD5 = 16 bytes, SHA-1 = 20 bytes)
- Used today only for compatibility with older applications

§ Described in RFC 2898

§ Process:



Note: this is not exactly the process used in Encryption Facility for z/VSE. It's only an example.

But:

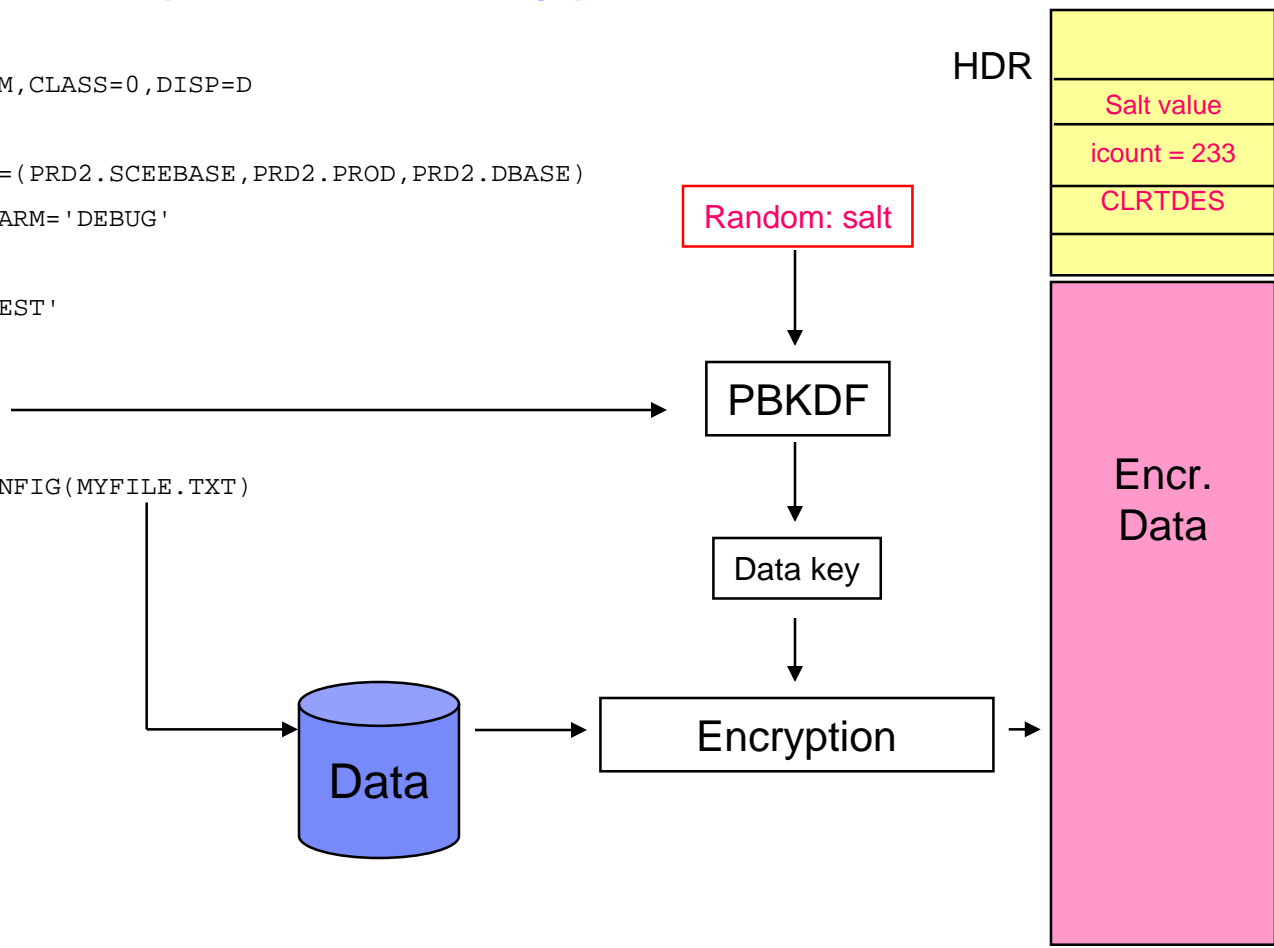
§ TDES key = 3 * 8 bytes = 24 + 8 bytes ICV = 32

§ AES-128 key = 16 bytes + 16 bytes ICV = 32

PBE: Job example for encryption

```

* $$ JOB JNM=ENCMEM,CLASS=0,DISP=D
// JOB ENCMEM
// LIBDEF *,SEARCH=(PRD2.SCEEBASE,PRD2.PROD,PRD2.DBASE)
// EXEC IJBEFVSE,PARM='DEBUG'
ENCRYPT
DESC='ENCRYPTION TEST'
CLRTDES
PASSWORD=BLAHBLAH
ICOUNT=233
CLRFILE=DD:PRD2.CONFIG(MYFILE.TXT)
ENCFILE=DD:ENCDATA
/*
/&
* $$ EOJ
    
```



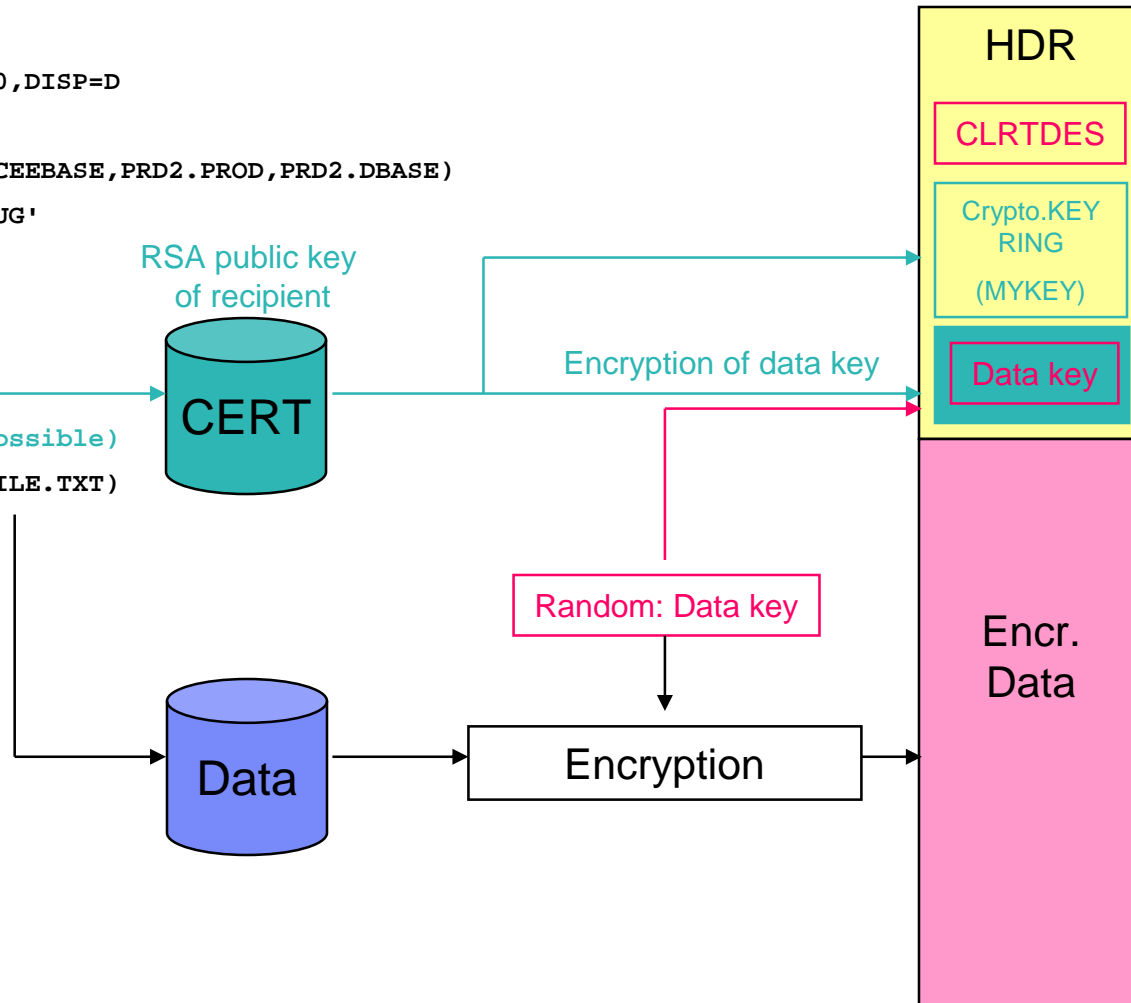
Public-key encryption (PKE)

- § **Encryption key (data key) is randomly generated**
- § **Data key is then encrypted with the public key of the recipient of the encrypted data**
 - Needs a Crypto Express2 or PCIXCC card for 2048 bit keys
 - Crypto cards are transparently used also for 1024 bit keys when available
- § **Data key is put into the encrypted dataset together with the encrypted data**
- § **Only one recipient is able to decrypt the data key and thus, the encrypted data, using the corresponding private key**
- § **Need to manage / exchange public RSA keys**
 - Can be done with the Keyman/VSE tool

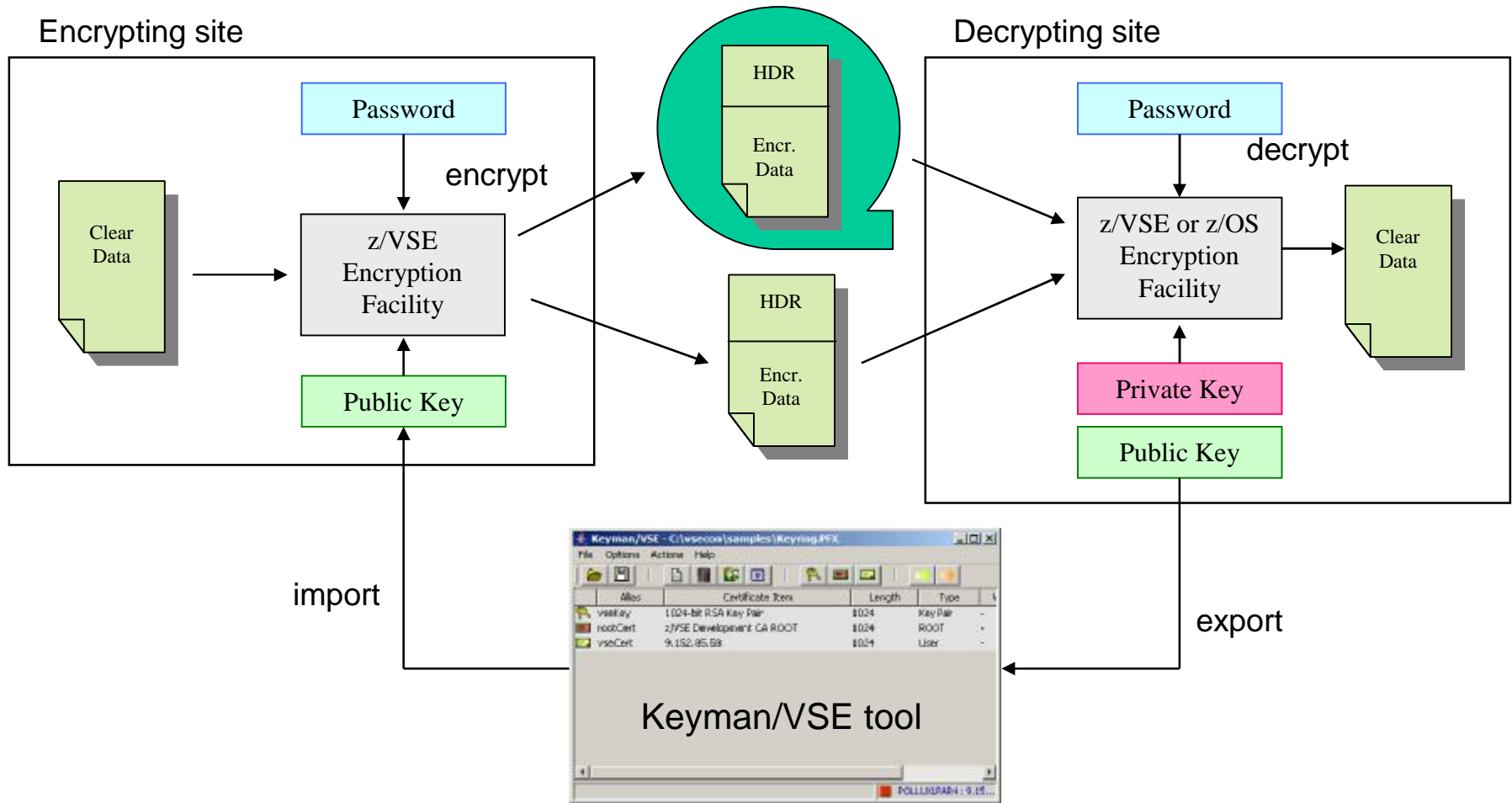
PKE: Job example for encryption

```

* $$ JOB JNM=ENCMEM,CLASS=0,DISP=D
// JOB ENCMEM
// LIBDEF *,SEARCH=(PRD2.SCEEBASE,PRD2.PROD,PRD2.DBASE)
// EXEC IJBEFVSE,PARM='DEBUG'
ENCRYPT
DESC='ENCRYPTION TEST'
CLRTDES
RSA=CRYPTO.KEYRING(MYKEY)
(up to 16 RSA statements possible)
CLRFILE=DD:PRD2.CONFIG(MYFILE.TXT)
ENCFILE=DD:ENCDATA
/*
/&
* $$ EOJ
    
```



PBE and PKE scenario



Keyman/VSE

§ New Keyman/VSE version available for download:

- <http://www.ibm.com/servers/eserver/zseries/zvse/downloads/#vkeyman>

§ New version provides some additional functions for Encryption Facility, including:

- Support for Java keystores (JKS): allows to import certificates directly from a z/OS JKS
- Upload self-signed certificates as CERT member on VSE

Prerequisites

§ z890/z990

- “CPU Assist for cryptographic function” CPACF (*) for TDES
- TCP/IP for VSE/ESA 1.5E with ZP15E214 for public key encryption
- CryptoExpress2 or PCIXCC for 2048-bit public key

§ z9 EC/z9 BC

- CPACF for TDES and AES-128
- TCP/IP for VSE/ESA 1.5E with ZP15E214 for public key encryption
- CryptoExpress2 or PCIXCC for 2048-bit public key

(*) CPACF is a no-charge feature, available only on z890, z990, z9 BC and z9 EC servers

Availability

§ **Nov 30, 2007**

§ **Requires APAR DY46717 (PTF UD53196)**

§ **Optional priced feature**

§ **Program number: 5686-CF8-40**

§ **Documentation in z/VSE 4.1.1 Administration book,
Chapter 43**

- Available on CD-ROM, or
- Download as PDF from:

<http://www.ibm.com/servers/eserver/zseries/zvse/documentation/#vse>

Customer value

- § No special tape hardware requirements (e.g. TS1120)
 - But exploits IBM crypto hardware (crypto cards and CPACF)
- § Host-based utility, no additional client/server workstations
- § Easy to use
 - No special setup necessary for password-based encryption
- § Supports all VSE data formats: single files and complete tape backups (LIBR, IDCAMS, POWER, etc.)
- § Supports even proprietary vendor backup formats
- § Encrypted datasets and tapes can easily be exchanged between business partners even on non z platforms
 - Password-based
 - Public-key based

Positioning to TS1120

	TS1120	Encryption Facility
High volume backup/archiving	x	-
Data encryption for rest on VSE disks	-	x
Data encryption for subsequent file transfer (e.g. FTP)	-	x
Local archiving	x	x
Data exchange with remote sites having TS1120	x	-
Use existing TS1120 environment with EKM	x	-
Data exchange with Encryption Facility for z/OS V1.1	-	x
Data exchange with non z platforms (EF Java client)	-	x
Password-based encryption	-	x
Public key based encryption	x	x
Offload CPU cycles	x	-

More information

- § **VSE Homepage**
<http://www.ibm.com/servers/eserver/zseries/zvse/>
- § **Keyman/VSE tool and VSE Connector Client**
<http://www.ibm.com/servers/eserver/zseries/zvse/downloads/>
- § **Encryption Facility for z/OS**
http://www.ibm.com/servers/eserver/zseries/zos/encryption_facility/
- § **IBM Encryption Facility for z/OS Java Client**
<http://www.ibm.com/servers/eserver/zseries/zos/downloads/#efclient>
- § **IBM PCI Cryptographic Accelerator (PCICA)**
<http://www.ibm.com/security/cryptocards/pcica.shtml>
- § **IBM Crypto Express2 (CEX2)**
<http://www.ibm.com/systems/z/security/cryptography.html>
- § **CP Assist for Cryptographic Function (CPACF)**
<http://www.ibm.com/systems/z/security/cryptography.html>
- § **IBM Security Products – Overview**
<http://www.ibm.com/security/products/>
- § **KeePass Password Safe – a free Open Source Password Manager for many operating systems**
<http://keepass.sourceforge.net/>

New technical articles on VSE homepage

§ <http://www.ibm.com/servers/eserver/zseries/zvse/documentation/documents.html>

Technical articles

-  [How to setup Secure Telnet with VSE \(PDF, 1.7MB\)](#)
Joerg Schmidbauer, IBM
-  [How to setup Secure FTP with VSE \(PDF, 1.2MB\)](#)
Joerg Schmidbauer, IBM
-  [How to setup cryptographic hardware for VSE \(PDF, 1.1MB\)](#)
Joerg Schmidbauer, IBM

Questions

