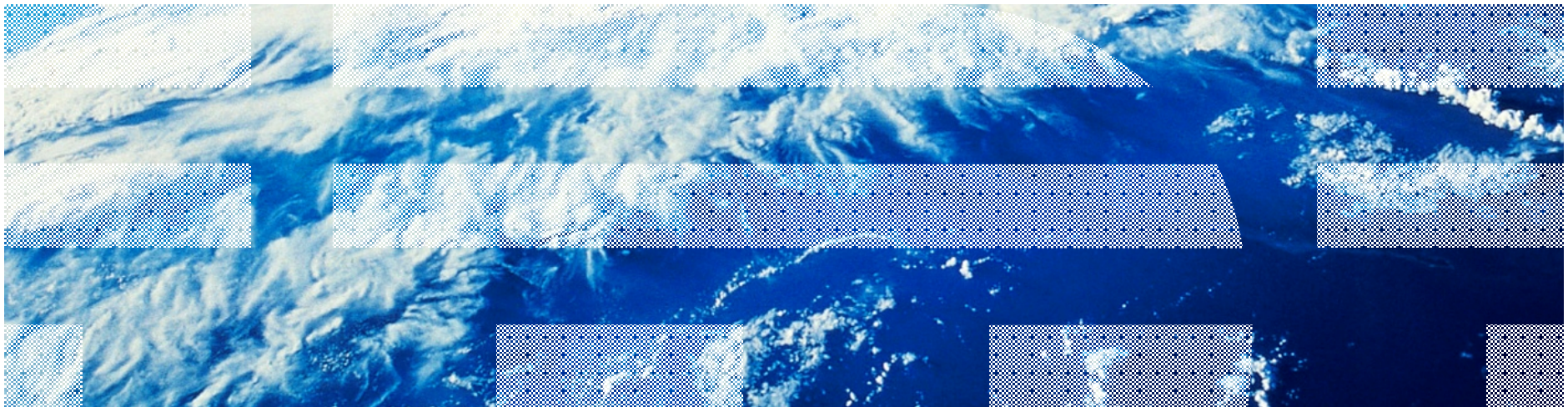


z/VSE Security Exploitation with Crypto Hardware

Ingo Franzki, IBM



Trademarks

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

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

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

For a complete list of IBM Trademarks, see www.ibm.com/legal/copytrade.shtml:

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

The following are trademarks or registered trademarks of other companies.

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

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

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

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

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

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

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

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

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

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

Notes:

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

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

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

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

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

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

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



Security requirements

- § Security requirements are increasing in today's world
 - Data security
 - Data integrity
 - Keep long-term data audit-save
- § The number of attacks increase daily
 - Industrial spying
 - Security exploits, Denial-of-Service attacks
 - Spam, Phishing, ...
- § Not paying attention to security requirements can be very expensive
 - Your data is the heart of your company
 - Loosing your customer data is a disaster
 - You can loose customers
- § IT Security gets more and more important
 - You need to consider the whole IT Environment not only single systems



BBC NEWS | UK | UK Politics | Q&A: Child benefit records lost - Mozilla Firefox

File Edit View History Bookmarks Tools Help

http://news.bbc.co.uk/2/hi/uk_news/politics/7103828.stm

BBC Home News Sport Radio TV Weather Languages

UK version International version | About the versions

Low graphics | Accessibility help

BBC NEWS WATCH One-Minute World News

News services
Your news when you want it

News Front Page

Africa
Americas
Asia-Pacific
Europe
Middle East
South Asia
UK
England
Northern Ireland
Scotland
Wales
UK Politics
Education
Magazine
Business
Health
Science/Nature
Technology

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

E-mail this to a friend Printable version

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



BBC NEWS | UK | UK Politics | Q&A: Child benefit records lost - Mozilla Firefox

File Edit View History Bookmarks Tools Help

http://news.bbc.co.uk/2/hi/uk_news/politics/7103828.stm

Google

Technology

Entertainment

Also in the news

Video and Audio

Have Your Say

In Pictures

Country Profiles

Special Reports

RELATED BBC SITES

SPORT

WEATHER

ON THIS DAY

EDITORS' BLOG

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](#)

The BBC is not responsible for the content of external internet sites

TOP UK POLITICS STORIES

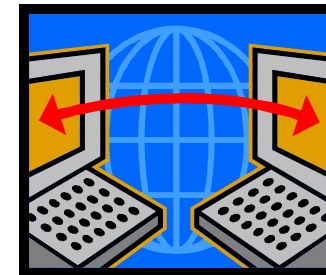
Done

What can cryptography do for you?

Main areas of cryptography:

§ Encryption of data transmitted over network connections

- SSL, HTTPS
- SecureFTP



§ Encryption of data stored on disk or tape

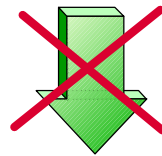
- Encryption of backups or archives
- Exchange of encrypted and/or signed data with customers or business partners
- TS1120 Encrypting Tape Drive
- Encryption Facility for z/VSE



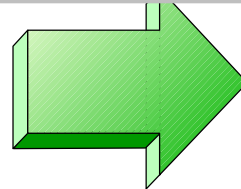
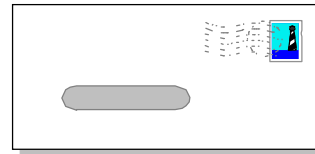
Keeping Secrets



Charly



Alice

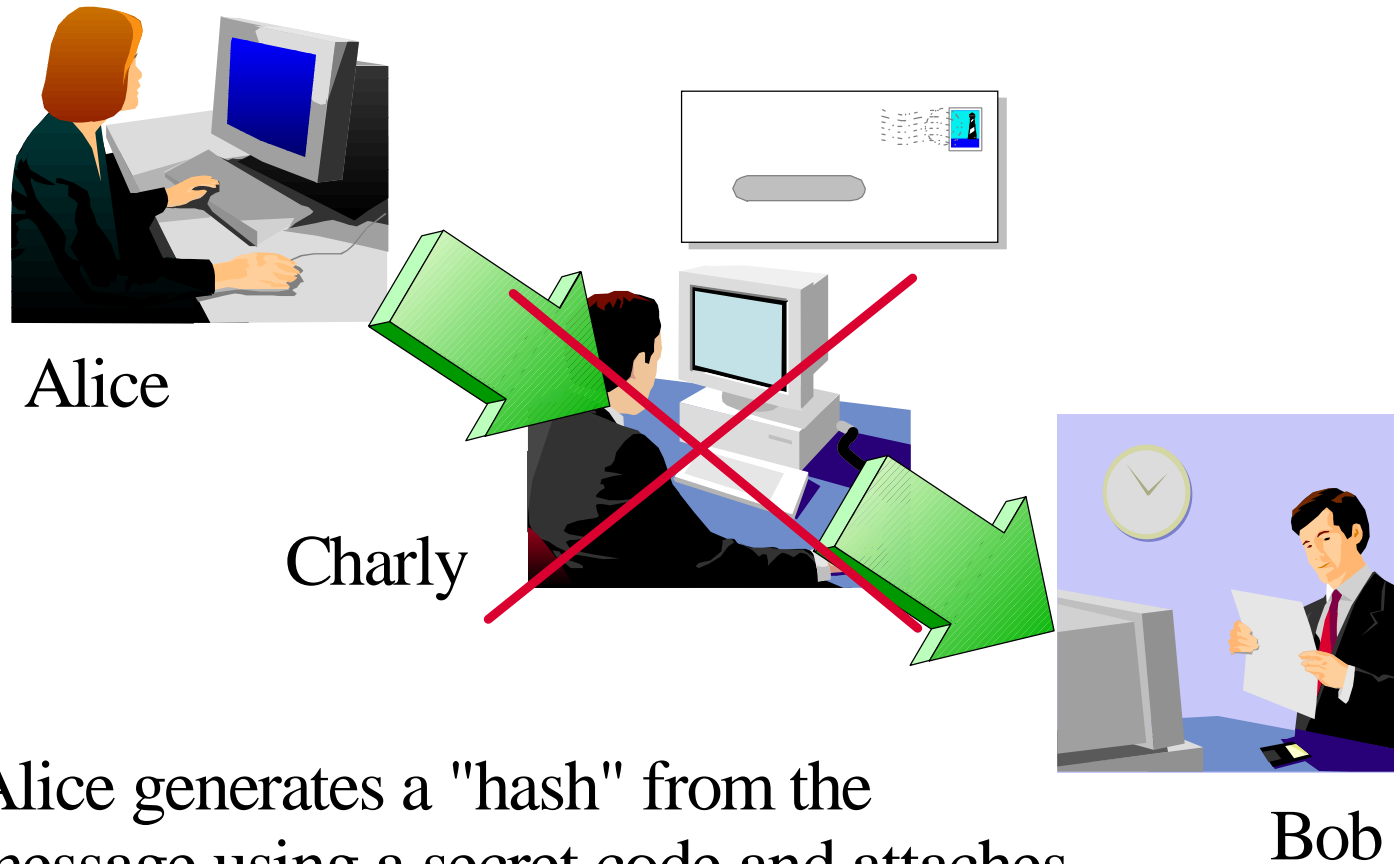


Bob



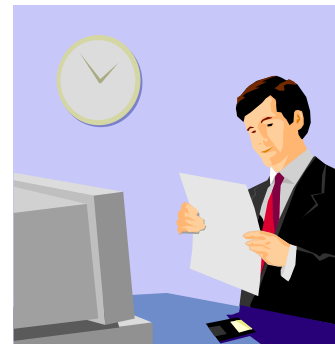
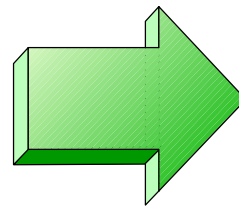
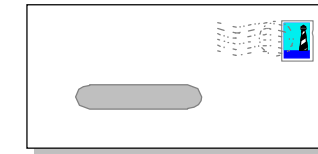
Alice encrypts the message with a secret code that only she and Bob knows

Verifying Information



Alice generates a "hash" from the message using a secret code and attaches it to the message. Bob also generates the hash from the received message and compares it.

Proving Identity



Alice

Bob

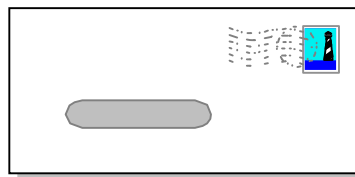
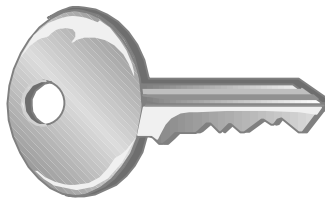
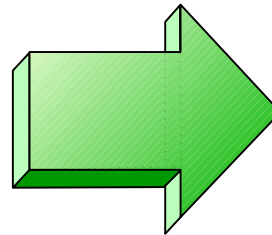
Alice "signs" the message by attaching a secret phrase that only she and Bob knows

Secret Key Cryptography - continued

Alice



Bob



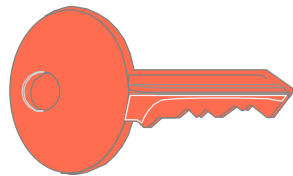
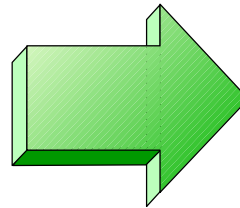
Alice encrypts the message with the secret key and sends it to Bob. Bob decrypts the message with the secret key.

Public Key Cryptography - Encrypting

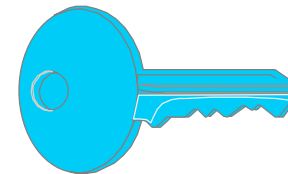
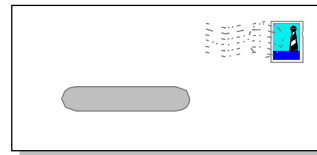
Alice



Bob



Bob's public key



Bob's private key

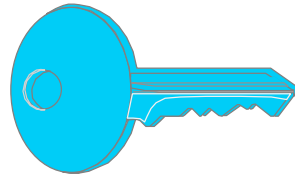
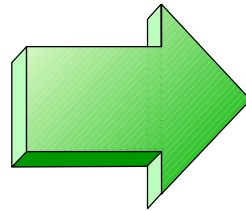
Alice encrypts the message using Bobs public key and sends it to Bob. Bob decrypts it using his private key. Since only Bob knows his private key, only he can read the message.

Public Key Cryptography - Signing

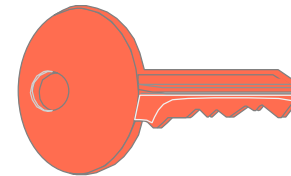
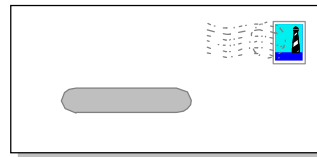
Alice



Bob



Alice's private key



Alice's public key

Alice encrypts the message using her private key and sends it to Bob. Bob decrypts it using Alice's public key. The message is "signed" by Alice since it can only be decrypted using **her** public key.

Combined Symmetric and Asymmetric Cryptography

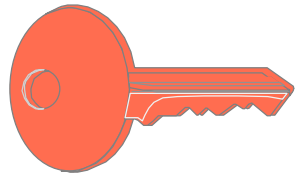
Alice



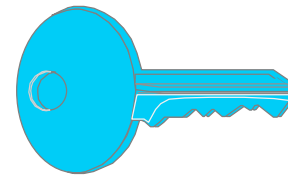
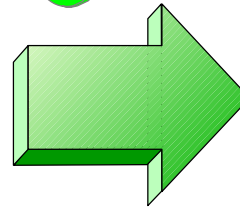
Bob



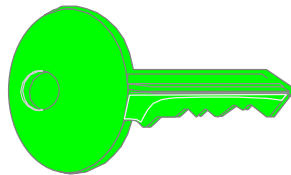
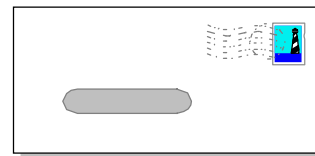
secret key



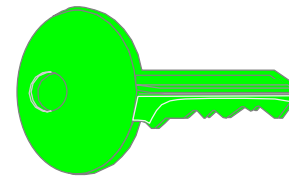
Bob's public key



Bob's private key



secret key

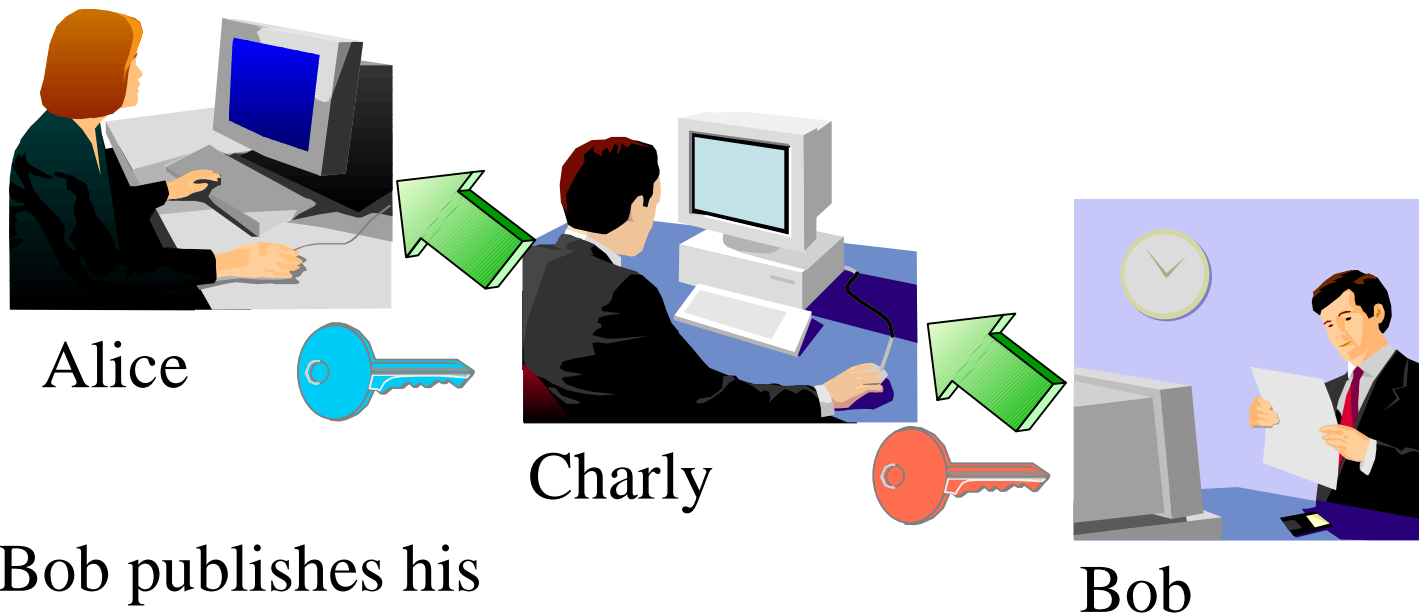


secret key



Key Management

- Key exchange is not trivial:
 - ▶ Is the public key really from the right person?



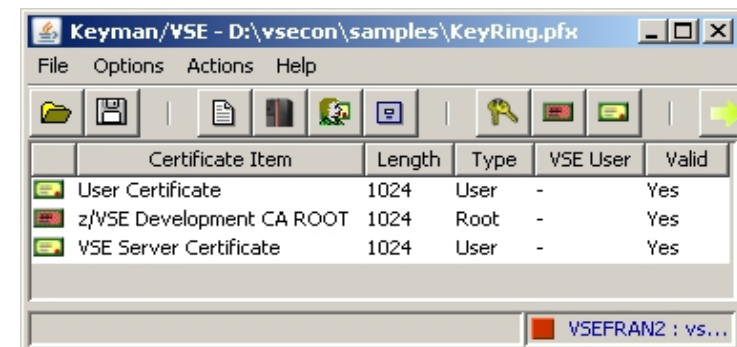
Bob publishes his public key, but Charly intercepts this and instead sends his public key to Alice.

Key Management

- § Key Management is not trivial
 - Key must often be kept secure for a very long time
 - You must be able to associate the encrypted data with the corresponding key(s)
 - Encrypted data and the corresponding key(s) must be strictly separated

- § Keyman/VSE

- Creation of RSA keys and digital certificates
- Upload of keys and certificates to VSE
- Creation of PKCS#12 keyring files (use with Java-based connector or import into a Web browser)
- Download from VSE Homepage
<http://www.ibm.com/systems/z/os/zvse/downloads/#vkeyman>



Certificates

- § A certificate contains the following items
 - The subject (name of the person)
 - The subject's public key
 - Period of validity
 - The issuer
 - Issuers signature

- § The issuer "signs" the certificate by encrypting a hash of the certificate content with his private key

- § Everyone can check the sign by decrypting it with the issuers public key

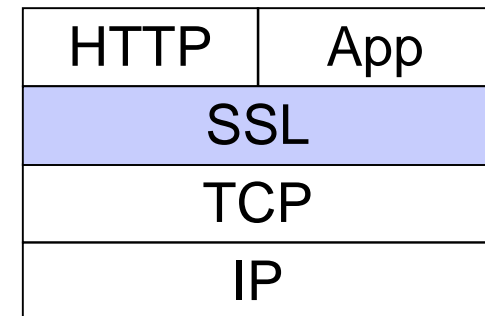
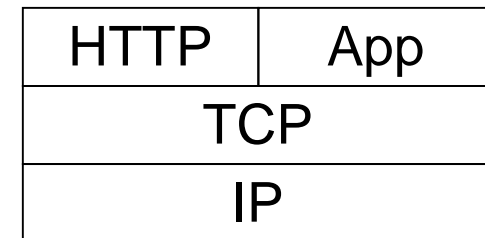
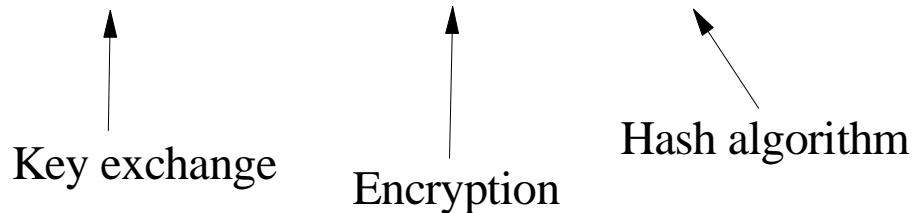
- § A certificate is issued by a certificate authority (CA)
 - If a user trusts the certificate authority, he can trust the certificates issued by this CA



Secure Socket Layer – Encrypted data transfer over a network

- § SSL provides a communication channel with message integrity, authentication, and confidentiality
- § SSL is a widely used protocol
 - Secure HTTP (HTTPS) is used very often in the Internet
- § SSL uses a TCP connection to transfer encrypted messages
 - Uses asymmetric cryptography for **session initiating**
 - Uses symmetric cryptography for **data encryption**
- § As the name implies, SSL is a layer on top of TCP
- § Cipher suites defines the algorithms used:
 - For key exchange
 - For encryption
 - For hash algorithm

SSL_**RSA**_WITH_**DES**_CBC_**SHA**



Secure Socket Layer - Certificates

§ For **production purposes**, certificates are usually issued by a well known and trusted **Certificate Authorities (CA)**

- For example Thawte, VeriSign
- Usually this cost money



§ For **in-house use** (Intranet), you can have your own Company-wide Certificate Authority

- Certificates are trusted inside your company, but not outside

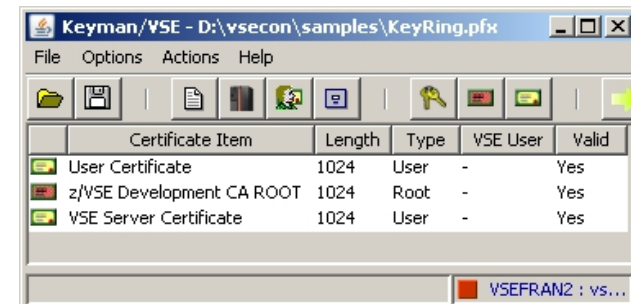
§ For **test purposes** you can use self-signed Certificates (you are your own Certificate Authority)

- Nobody trusts these Certificates (except you)

§ To setup all required keys and certificates, it is recommended to use the Tool **Keyman/VSE**

- Download from VSE Homepage

<http://www.ibm.com/systems/z/os/zvse/downloads/#vkeyman>



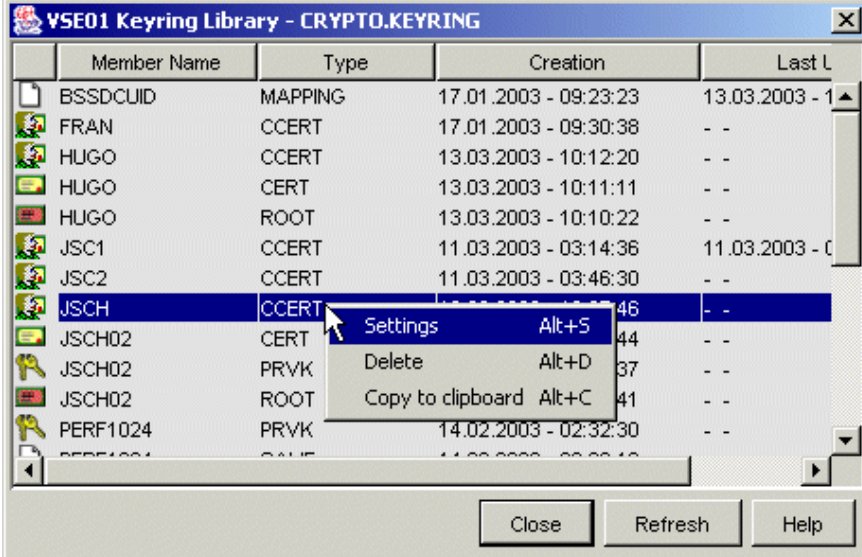
Where are keys and certificates stored on VSE ?

§ Keys and certificates are stored on a VSE Library

- Usually in CRYPTO.KEYRING
- This library should be secured using the VSE security mechanisms (access protection)

§ Member types:

- .PRVK – Public/Private Key
- .ROOT – Root Certificate
- .CERT – Server Certificate
- .CCERT – Client Certificate
- BSSDCUID.MAPPING – Contains the User to Certificate mapping information



Member Name	Type	Creation	Last L
BSSDCUID	MAPPING	17.01.2003 - 09:23:23	13.03.2003 - 1
FRAN	CCERT	17.01.2003 - 09:30:38	--
HUGO	CCERT	13.03.2003 - 10:12:20	--
HUGO	CERT	13.03.2003 - 10:11:11	--
HUGO	ROOT	13.03.2003 - 10:10:22	--
JSC1	CCERT	11.03.2003 - 03:14:36	11.03.2003 - 0
JSC2	CCERT	11.03.2003 - 03:46:30	--
JSCH	CCERT	11.03.2003 - 03:46:30	46
JSCH02	CERT	11.03.2003 - 03:46:30	44
JSCH02	PRVK	11.03.2003 - 03:46:30	37
JSCH02	ROOT	11.03.2003 - 03:46:30	41
PERF1024	PRVK	14.02.2003 - 02:32:30	--
PERF1024	PRVK	14.02.2003 - 02:32:30	--

The screenshot shows a context menu over the 'JSCH' row with options: Settings (Alt+S), Delete (Alt+D), and Copy to clipboard (Alt+C). The window has 'Close', 'Refresh', and 'Help' buttons at the bottom.

SecureFTP

- § The FTP protocol provides a easy and straight forward protocol for transferring files between systems on different platforms
 - Many installations rely on it to efficiently transmit critical files that can contain vital information such as customer names, credit card account numbers, social security numbers, corporate secrets and other sensitive information
 - FTP protocol transmits data without any authentication, privacy or integrity

- § SecureFTP provides user authentication, privacy and integrity by using RSA digitally signed certificates, DES encryption and SHA-1 secure hash functions
 - SecureFTP is integrated into TCP/IP for VSE with z/VSE V4.1 (at no additional charge) or offered as separately priced product by CSI

- § **How to setup Secure FTP with VSE:**
[ftp://ftp.software.ibm.com/eserver/zseries/zos/vse/pdf3/How to setup SecureFTP with VSE.pdf](ftp://ftp.software.ibm.com/eserver/zseries/zos/vse/pdf3/How_to_setup_SecureFTP_with_VSE.pdf)



Hardware Crypto Support on System z and VSE

by release

	z/VSE 4.2	z/VSE 4.1	z/VSE 3.1	VSE/ESA 2.7	VSE/ESA 2.6
PCICA	Yes	Yes	Yes	Yes	-
CEX2C	Yes	Yes	Yes	-	-
CPACF	Yes	Yes	Yes	-	-
CEX2A	Yes	Yes	Yes	-	-
PCIXCC	Yes	Yes	-	-	-

	prior z800	z800	z900	z890	z990	Z9	z10
PCICA	-	Yes	Yes	Yes	Yes	-	-
PCIXCC	-	-	-	Yes	Yes	-	-
CEX2C	-	-	-	Yes	Yes	Yes	Yes
CPACF	-	-	-	Yes	Yes	Yes	Yes
CEX2A	-	-	-	-	-	Yes	Yes

by server



CEX2C = Crypto Express2 in coprocessor mode

CEX2A = Crypto Express2 in accelerator mode

See: <http://www.ibm.com/systems/z/security/cryptography.html>



VSE Hardware Configuration

§ VSE hardware configuration not necessary for crypto hardware

- No IOCDs definition in VSE
- No device type
- No ADD statement
- You may have to define the devices in the HMC (LPAR) or z/VM directory



§ Use of crypto hardware is transparent to end users and even TCP/IP applications

- But use of crypto hardware can be disabled via TCP/IP SOCKOPT phase

§ How to setup cryptographic hardware for VSE:

- <http://www.ibm.com/systems/z/os/zvse/documentation/security.html#howto>

```
FB 0095 1J023I FOUND A CRYPTO EXPRESS2 CARD AT DEVICE INDEX 0
FB 0095 1J023I FOUND A CRYPTO EXPRESS2 CARD AT DEVICE INDEX 1
FB 0095 1J014I FOUND A PCICA CARD AT DEVICE INDEX 6
FB 0095 1J014I FOUND A PCICA CARD AT DEVICE INDEX 7
FB 0095 1J005I HARDWARE CRYPTO ENVIRONMENT INITIALIZED SUCCESSFULLY.
FB 0095 1J006I USING CRYPTO DOMAIN 0
FB 0095 1J022I CPU CRYPTOGRAPHIC ASSIST FEATURE AVAILABLE.
```

Crypto HW exploitation in VSE

§ Crypto cards are only used for RSA acceleration

- RSA decrypt/encrypt for SSL session initiation
- RSA encrypt for signing of certificates (CIALCREQ)

§ CPACF

- Acceleration of symmetric algorithms:
DES, TDES, AES (z9/z10 only), SHA-1
- Used at
 - SSL data transfer
 - CIAL functions in TCP/IP

§ Usage is transparent for TCP/IP applications

- If Crypto HW is available, it will be used. If not available, the SW implementation (as part of TCP/IP) will be used
- You can disable the use of Crypto HW via a setting in \$SOCKOPT Phase

News with z/VSE 4.2



§ Support for AES-256

- Requires TCP/IP for VSE 1.5F
- If running on a z10, it is done in hardware via CAPCF

§ Support for dynamically adding and removing of crypto cards

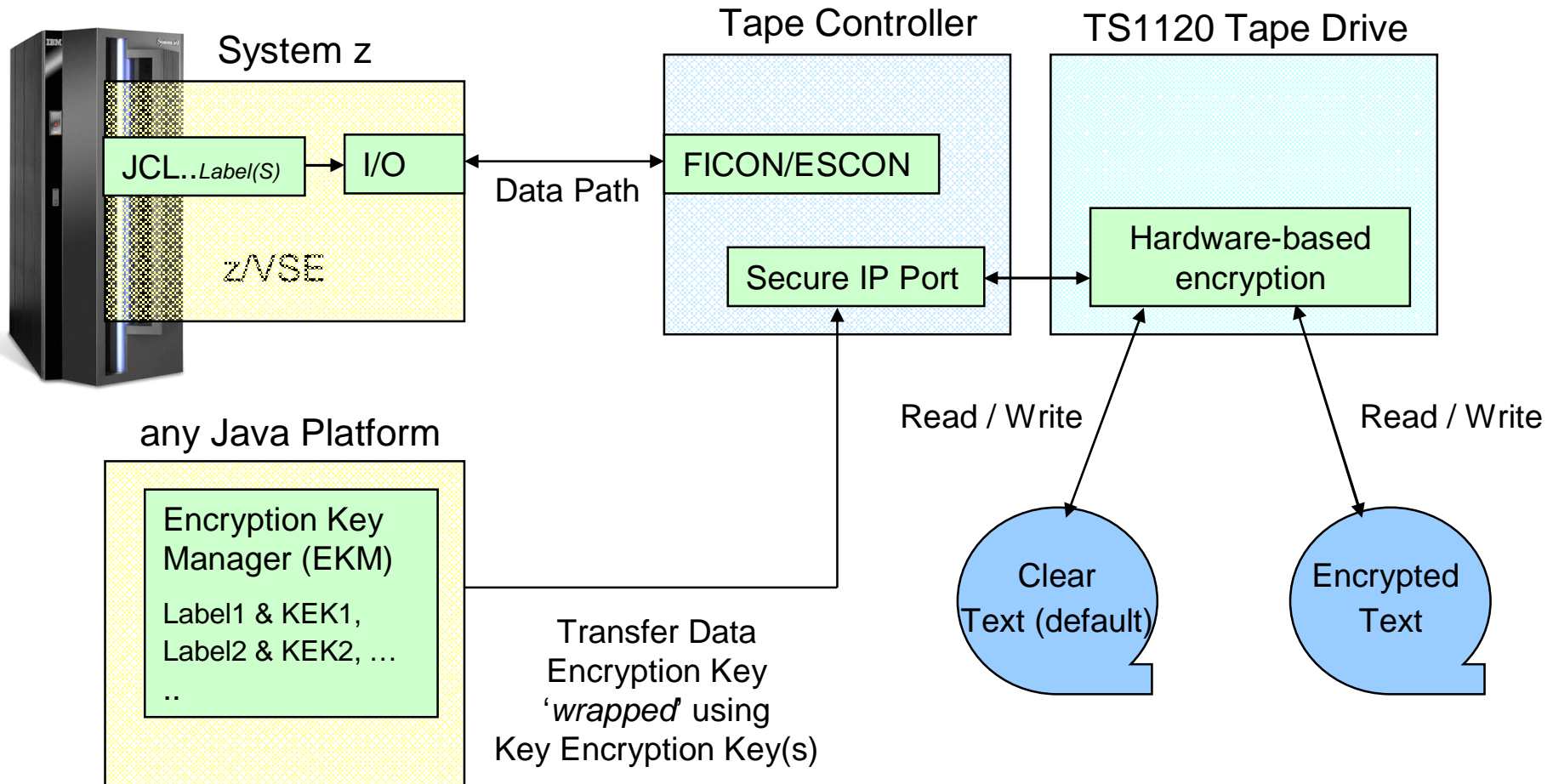
- On the System z10 processors, you can dynamically:
 - assign new Crypto devices to an LPAR,
 - remove crypto devices from an LPAR configuration,
- without the need to restart the LPAR.
- On z/VSE the following new commands have been added
 - **APSENSE** command to re-sense available APs (Crypto cards).
 - **APREM** command to remove/disable the related AP (Crypto card) from use by z/VSE before you remove a Crypto device from an LPAR configuration. The AP (Crypto card) is then flagged as being unavailable for processing Crypto requests in z/VSE.
 - **APADD** command to add/enable a disabled AP for use by z/VSE. The AP (crypto card) must be previously assigned to the z/VSE LPAR.
 - **APBUSY, APHIST, APQUE, APRETRY, APTERM** for maintaining crypto cards (APs)

IBM Tape Encryption – TS1120 & TS1130

- § The IBM System Storage TS1120/TS1130 Tape Drive has been enhanced to provide drive based data encryption
- § A new, separate IBM Encryption Key Manager component for the Java Platform (Encryption Key Manager) program is also being introduced:
 - supports the generation and communication of encryption keys for the tape drives across the enterprise.
- § **New:** Support is now available for z/VSE V4 and V3:
 - z/VSE V4.2: GA
 - z/VSE V4.1: [DY46682](#) (UD53141 and UD53142)
 - z/VSE V3.1: [DY46685](#) (UD53143, UD53144, UD53146) and [PK43473](#) (UK24398)
 - z/VM: [VM64062](#) (UM32012)
 - DITTO: [PK44172](#) - With this APAR, DITTO/ESA for VSE supports tape encryption interactively and via standard VSE JCL in BATCH mode



IBM Tape Encryption – TS1120 & TS1130



IBM Tape Encryption – TS1120 & TS1130

```
// JOB ENCRYPT
// ASSGN SYS005,480,03
// KEKL UNIT=480,KEKL1='MYKEKL1',KEM1=L,KEKL2='MYKEKL2',KEM2=L
// EXEC LIBR
  BACKUP LIB=PRD2 TAPE=SYS005
/*
/ &
```

encryption mode
(03=write)

key label1
(name of the 1. KEK-key in EKM)

encoding mechanism
(L=Label, H=Hash)

- § The Data-Key can be encrypted using 2 different public keys (KEK = Key Encrypting Keys), to be able to send the tape to 2 different receivers
- § More info can be found in the *z/VSE Administration* manual

IBM Tape Encryption – TS1120 & TS1130



Considerations and Restrictions:

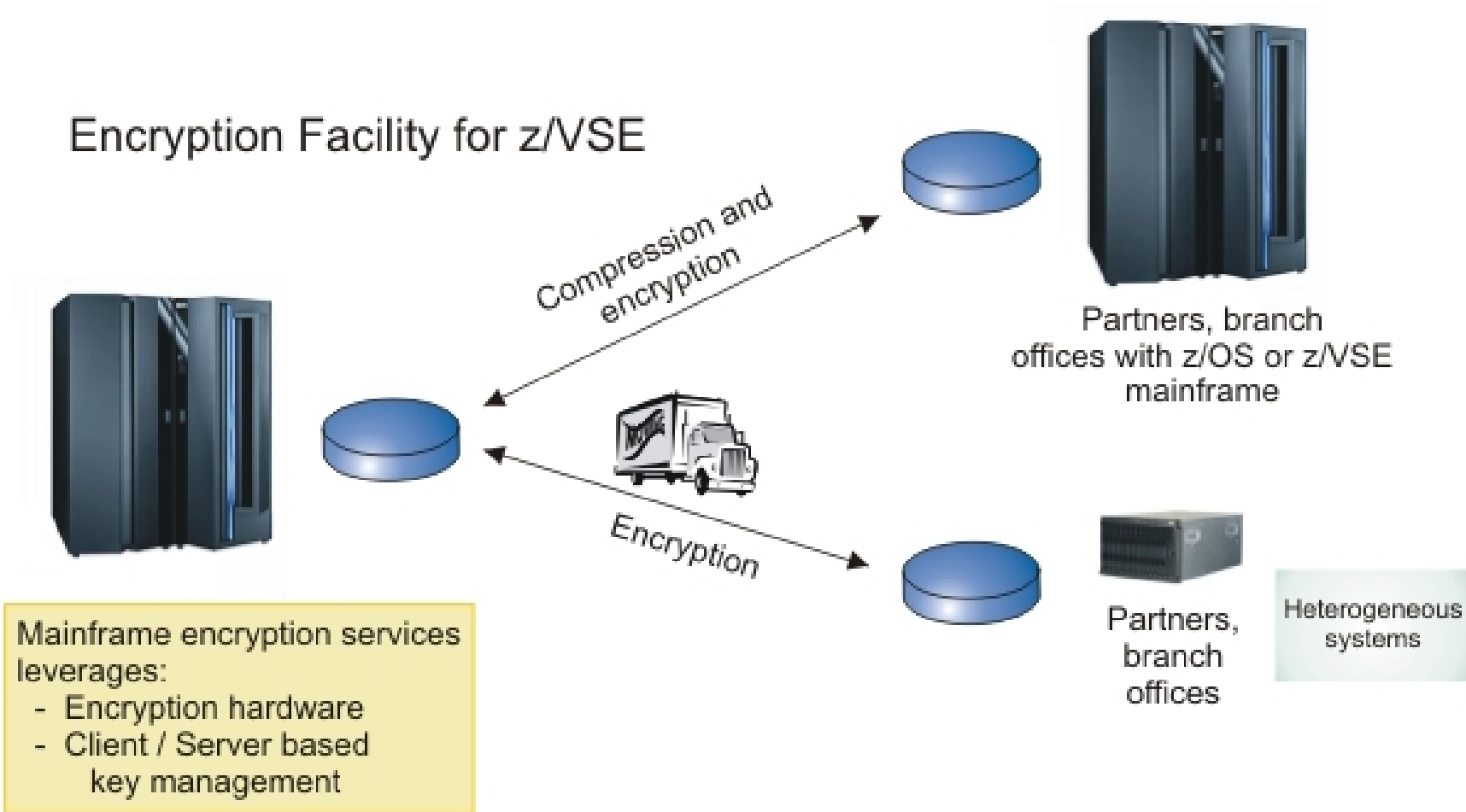
- § A tape can either contain encrypted data or unencrypted data

- § If you encrypt the first file on the tape, all subsequent files will also be encrypted using the same key
 - Important for multi file tapes

- § If you send an encrypted tape to a business partner, the other side will also require a TS1120 or TS1130 to be able to read the tape

Encryption Facility for z/VSE

Encryption Facility for z/VSE



Encryption Facility for z/VSE

- § IBM Encryption Facility for z/VSE can help you:
 - Secure business and customer data
 - Address regulatory requirements
 - Protect data from loss and inadvertent or deliberate compromise
 - Enable sharing of sensitive information across platforms with partners, vendors, and customers
 - Enable decrypting and encrypting of data to be exchanged between z/VSE and non-z/VSE platforms

- § The Encryption Facility for z/VSE is packaged as an **optional, priced feature** of VSE Central Functions V8.1 (5686-CF8-40).
 - Documentation in z/VSE Administration book, Chapter 43
 - V1.1 Available since November 30, 2007

- § **New: Encryption Facility for z/VSE V1.2 - OpenPGP:**
 - **Adds support for OpenPGP data format**



Encryption Facility for z/VSE V1.1

Possible choices:

Encrypt data using System z format with:	Decrypt data using System z format with:			
	Encryption Services feature of EF for z/OS	Encryption Facility for z/VSE V1.1	Decryption Client for z/OS	Java-based Client
Encryption Services feature of EF for z/OS	Yes	Yes	Yes	Yes
Encryption Facility for z/VSE V1.1	Yes	Yes	Yes	Yes
Java-based Client	Yes	Yes	No (*)	No (*)

Note: The terms and conditions for the no-charge Encryption Facility for z/OS Client only allow the use of the Encryption Facility for z/OS Client for decrypting information or data that was encrypted by IBM's Encryption Facility for z/OS or IBM's Encryption Facility for z/VSE, or for encrypting information or data to be decrypted by IBM's Encryption Facility for z/OS or IBM's Encryption Facility for z/VSE.



Encryption Facility for z/VSE V1.2 - OpenPGP

The Encryption Facility for z/VSE V1.2 uses the standard OpenPGP data format.

§ PGP stands for „Pretty Good Privacy“

–Invented by Phil Zimmermann in 1991

–Open Standard, described in RFCs 2440 and 4880

§ Compatible with Encryption Facility for z/OS V1.2 and many other OpenPGP implementations

§ Uses ZIP/ZLIB compression (software)

§ Supports various encryption algorithms

§ Provides data integrity using MDC

§ Supports the same file types as EF V1.1

§ EF V1.2 also “contains“ EF V1.1



Encryption Facility for z/VSE V1.2 - OpenPGP

Differences between Encryption Facility V1.1 and V1.2 OpenPGP:

	EF for z/VSE V1.1	EF for z/VSE V1.2 OpenPGP
Encrypted data format	System z format	OpenPGP format
Compatibility with	EF for z/OS V.1.1, EF for z/OS Java client	Any OpenPGP implementations, like GnuPG, EF for z/OS V1.2 OpenPGP
Symmetric Algorithms	TDES and AES-128	DES, TDES, AES-128, 192, 256
Hash algorithms	SHA1	MD5, SHA1, 224, 256, 384, 512
Compression	System z provided compression (hardware accelerated)	ZIP, ZLIB based compression (software)
RSA key lengths	512, 1024, 2048	1024, 2048
Data integrity	None	MDC
Public key format	x.509 certificates	PGP certificates
Signatures	None	RSA signatures

Encryption Facility for z/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



Other ways to encrypt your backups or tapes

Encrypt your backup data using VTAPE

- § Create a backup on a remote virtual tape
- § Store the tape image on an encrypted medium
 - Encrypted file system or directory (e.g. EcryptFS on Linux)
 - Use encryption tools (e.g. TrueCrypt)
 - Use Tivoli Storage Manager to store the backup data




Encrypt data in applications

- § Use CryptoVSE API to encrypt the data
 - Uses Hardware Crypto Support if available

New technical articles on VSE homepage


<http://www.ibm.com/systems/z/os/zvse/documentation/security.html#howto>

How to setup hardware crypto with VSE

 [How to setup WebSphere MQ for z/VSE V3.0 and WebSphere MQ for Windows V7.0 with secured connections using SSL \(PDF, 3.0MB\)](#)

Updated: March 2009

Joerg Schmidbauer, IBM

 [How to use Encryption Facility for z/VSE \(PDF, 360KB\)](#)

Updated: April 2009

Joerg Schmidbauer, IBM

 [How to setup SSL with CICS Web Support \(PDF, 1.4MB\)](#)


Updated: December 2008

Joerg Schmidbauer, IBM

 [How to setup Secure Telnet with VSE \(PDF, 1.7MB\)](#)


New: July 2008

Joerg Schmidbauer, IBM

 [How to setup Secure FTP with VSE \(PDF, 1.2MB\)](#)

Updated: January 2009

Joerg Schmidbauer, IBM

 [How to setup SSL with VSE \(PDF, 750KB\)](#)

New: April 2008

Joerg Schmidbauer, IBM

 [How to setup cryptographic hardware for VSE \(PDF, 1.4MB\)](#)

Updated: December 2008

Joerg Schmidbauer, IBM

Questions ?

