System z Expo

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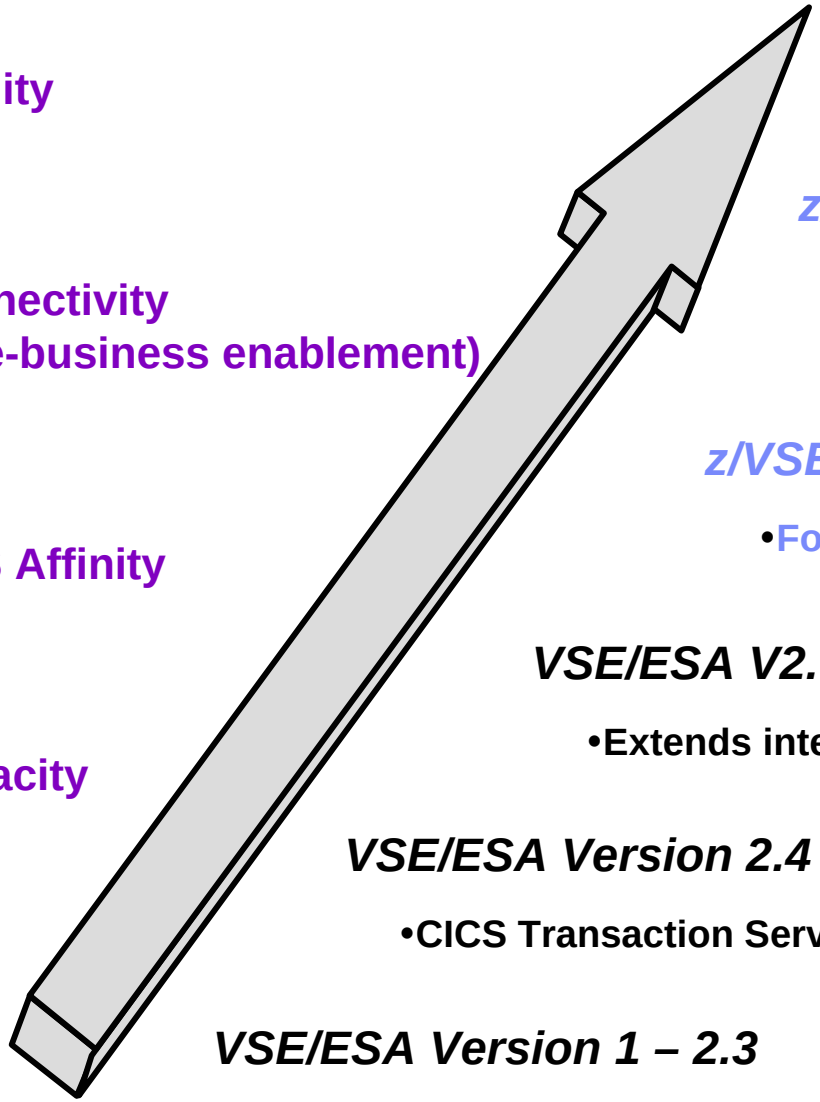
Agenda

- Roadmap
- VSE strategy
- z/VSE 3.1, z/VSE 4.1, z/VSE 4.2
- Hardware support
- Enhancements in z/VSE components / products
- Interoperability
- Security
- Encryption Facility for z/VSE V1.1

VSE Roadmap



Quality

Connectivity
(e-business enablement)

z/OS Affinity

Capacity

z/VSE 4.2 Preview October 2007, planned for 10/17/2008

- **More tasks, more memory, EF for z/VSE, SCRT on z/VSE, SoD for CICS/VSE**

z/VSE 4.1 March 2007

- **z/Architecture only, 64 bit real addressing, MWLC – full and sub-capacity pricing**

z/VSE 3.1 March 2005

- **Focus on System z and infrastructure simplification**

VSE/ESA V2.7 March 2003

- **Extends interoperability, e.g. to Linux on zSeries**

VSE/ESA Version 2.4 – 2.6 1999 - 2001

- **CICS Transaction Server for VSE/ESA, *e-business, interoperability***

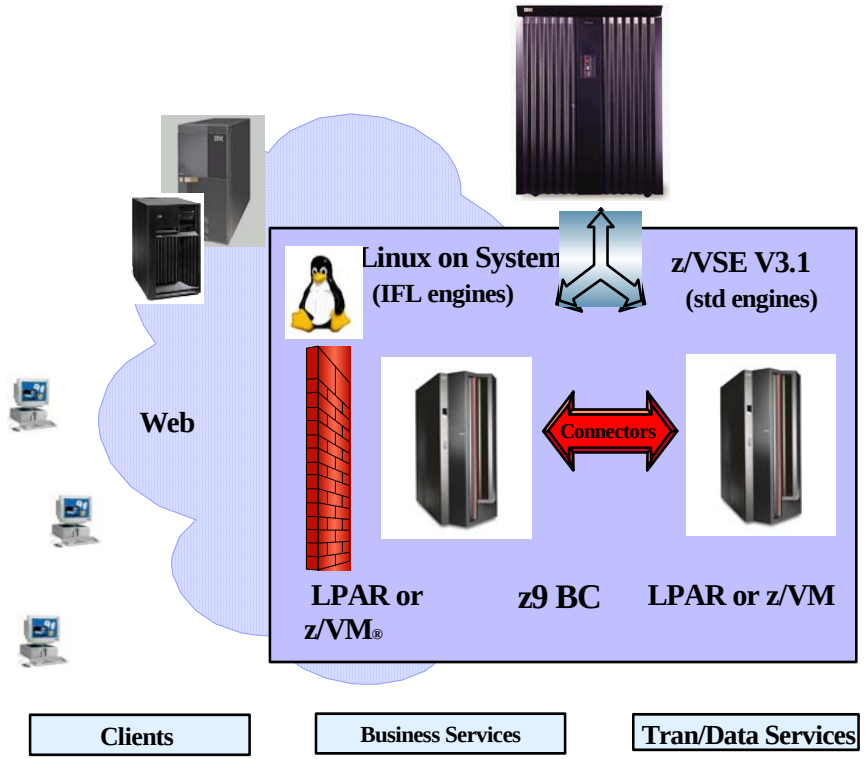
VSE/ESA Version 1 – 2.3 1990 – 1994, 1997

- **TCP/IP based communication, N-way S/390 Servers, Investment Protection - Year 2000, Constraint Relief, ESA exploitation**

VSE Strategy

- Helps **Protect** your existing investments in core VSE programs, data, equipment, IT skills, *plus* business processes, end user training, etc.
  - modernize, i.e. extend VSE resources to Web
  - exploit IBM servers, storage, and software
- **Integrate** VSE with the rest of your IT based on open and industry standards
  - IBM middleware
  - VSE connectors and web services
- **Extend** with Linux on System z
  - infrastructure consolidation/simplification
  - add new infrastructure and/or line-of-business applications

Why Not Think Inside the Box?



z/VSE 3.1

- Previewed in 4/2004, announced 2/2005, GA 3/4/2005
- Support of Small Computer System Interface (SCSI) devices
- System z 9 Support
  - HiperSockets, incl spanned HiperSockets
  - PCICA hardware encryption assist
  - Adapter interrupts for OSA-Express
  - OSA-Express, incl Ethernet and Token Ring
  - OSA-Integrated Console Controller
  - FICON-Express
- Expand focus on interoperability - Especially with Linux on System z
- Simplified packaging (Language Environment as part of VSE Central Function)
- Options for electronic internet delivery and CD-ROM shipment
- z/VSE can execute in 31-bit mode only
- FSU from VSE/ESA 2.6, 2.7 (ECKD devices)

z/VSE 3.1.x

- z/VSE 3.1.1 - 11/2005
  - Support for
    - IBM System z9 processors
    - N_Port ID Virtualization (NPIV) of IBM System z9
    - Preferred paths to SCSI disks
    - IBM TotalStorage 3584 UltraScalable Tape Library
    - IBM TotalStorage 3592 Model E05 Tape Drive
  - Security enhancements
  - VSE/POWER enhancements
- z/VSE 3.1.2 - 7/2006
  - Support for IBM System z9 BC and z9 EC processors
  - VTAM constraint relief
- z/VSE 3.1.3 – 1/2008
  - DB2 Server for VSE & VM 7.5
  - IBM System Storage TS1120 encryption tape drive support
- End of Marketing: 05/31/2008, End of Service: 07/31/2009

z/VSE 4.1

- Previewed in 4/2006, announced 1/2007, GA 03/16/2007
  - z/VSE 4.1.1 – GA 11/2007, z/VSE 4.1.2 – GA 06/2008
    - Encryption Facility for z/VSE V1.1 as optional priced feature of VSE Central Function
    - DB2 Server for VSE & VM 7.5
- z/VSE 4.1 is designed to
  - Support IBM System z9 BC and z9/z10 EC processors
  - Execute in z/Architecture mode only
  - Support 64 bit real addressing
  - Support more than 2 GB real storage (up to 8 GB)
- z/VSE 4.1 will provide
  - sub-capacity monitoring tool (to support LPAR and z/VM environments)
  - Support for selected IBM System z9 features
- Midrange Workload License Charges (MWLC) with sub-capacity mode
- IBM TS1120 Tape data encryption
- FSU from VSE/ESA 2.7 and z/VSE 3.1
- z/VM 5.2 or later required

z/VSE V4.2

- Preview 10/2007; announced 08/2008, planned GA 10/17/2008
- z/Architecture mode only
  - 64-bit *real* addressing (31-bit *virtual* addressing) -> up to 32 GB real processor storage
  - IBM System z9 EC, z9 BC and z10 EC servers, IBM eServer zSeries 990, 890, 900, 800 servers
- More up to 512 VSE tasks
  - Enable growth, ease migration to CICS TS
- Sub-Capacity Reporting Tool (SCRT)
  - Available now with z/VSE 4.1 (and later)
- Encryption Facility for z/VSE V1.1
  - Optional priced feature on z/VSE V4.1 (and later); MWLC enabled
- Added support for System Storage
  - Parallel Access Volume (PAV) feature of DS8000, DS6000, ESS series
  - TS3400 Tape Library, TS7740 Virtualization Engine
  - SAN Volume Controller (SVC) support for SCSI devices
- LDAP (Lightweight Directory Access Protocol) sign-on for z/VSE
- CICS TS & CICS/VSE supported w/ z/VSE V4.2
  - Statement of Direction (SoD) for CICS/VSE
- FSU from z/VSE V3.1 and z/VSE V4.1

Hardware Support

- Processors
- 64 bit real support (z/VSE 4.1 only)
- SCSI support
- System z exploitation
- Device support

Supported z/VSE Environments

- z/VSE runs on the following platforms only
  - z/VSE 3.1
    - S/390 Multiprise 3000
    - S/390 Parallel Enterprise Server G5, G6
  - z/VSE 3.1, z/VSE 4.1, z/VSE 4.2
    - IBM e-server zSeries processors (z800, z900, z890, z990)
    - IBM System z9 Business Class (z9 BC)
    - IBM System z9 Enterprise Class (z9 EC)
    - IBM System z10 Enterprise Class (z10 EC)

and supports

- uni- and multiprocessors
- Basic mode (z800, z900 only), as z/VM guest or in LPAR
- z/VSE 4.1 and 4.2 require z/VM 5.2 or later

VSE Support for System z

VSE Version and Release	z800 / z900	z890 / z990/ System z9 / z10	VSE EoS
z/VSE V4.2	**Yes**	**Yes**	**tbd**
z/VSE V4.1	**Yes**	**Yes**	**tbd**
z/VSE V3.1	**Yes (2)**	**Yes (2)**	**07/31/2009**
VSE/ESA V2.7	Yes (2)	Yes (2)	02/28/2007
VSE/ESA V2.6	Yes (2)	Yes (2)	03/2006
VSE/ESA V2.5	Yes (2)	No	12/2003
VSE/ESA V2.4	Yes (2)	No	06/2002
VSE/ESA V2.3	No	No	12/2001

Note 1: z/VSE 3.1 can operate in 31-bit mode only. It does not implement z/Architecture and specifically does not implement 64-bit mode capabilities. z/VSE is designed to support selected features of IBM System z hardware
Note 2: 31-bit mode only

Sub-capacity monitoring tool

- Tool can be activated on z9 BC, z9 EC or z10 EC models
- z/Architecture mode required -> z/VSE 4.1 and z/VSE 4.2 only
- z/VSE supported in LPAR mode and as z/VM guest
- Implementation
  - System task
    - Will measure CPU usage and calculates MSUs
    - Measurement interval every 30 minutes
    - Calculation of the 4 hour rolling average
    - SMF like (SCRT89) records written to dataset
  - Dataset is input for the Sub-Capacity Reporting Tool (SCRT)
- SCRT with support for z/VSE 4.1 / 4.2, available since October 2007
- Required for Midrange Workload License Charges (MWLC)
  - Sub-capacity option
- 13 z/VSE products participate in MWLC

64 bit real (z/VSE 4.1 / 4.2 only)

- Processor storage > 2 GB, up to 8 GB, **z/VSE 4.2: up to 32 GB**
- Virtual address/data space size remains at max. 2 GB
- 64 bit virtual addressing not supported
- 64 bit addressing mode not supported for applications or ISVs
- Implementation transparent to user applications
- Performance: 64 bit real can reduce / avoid paging
- Many z/VSE environments can run without a page dataset (NOPDS option)

64 bit real - Implementation

- IPL starts in ESA/390 mode and switches to z/Architecture mode during the IPL process
- Simulation of ESA/390 low core fields
- Only the z/VSE page manager has access to the area above 2 GB
- Virtual pages can be backed by 64 bit real pages
- PFIX or TFIX requests will use real page frames below 2 GB
- z/VSE 4.1: Page manager control blocks below 2 GB
  z/VSE 4.2: Page manager control blocks above 2 GB
- Page out requests will directly go to Page Dataset

System z Exploitation

- SCSI enhancements
  - Support point-to-point connections for FCP-attached SCSI disks
  - N-Port ID Virtualization
- FICON Express 4 - Higher I/O bandwidth
- Adapter interruptions
  - Performance improvements for OSA Express2 (QDIO mode), FICON Express4 (FCP)
- Cryptographic assists
  - Crypto Express 2 and CPACF enhancements
  - Exploited by TCP/IP SSL support
- Open Systems Adapter features
  - OSA Express2 10 Gigabit Ethernet, Gigabit Ethernet
  - OSA Express3 10 Gigabit Ethernet (2 ports), Gigabit Ethernet (z/VSE 3.1: 2 ports, z/VSE 4.1/4.2: 4 ports)
  - OSA Express2 1000BASE-T Ethernet (4 modes of operation)
    - ICC (Integrated Console Controller)
    - QDIO (Queued Direct I/O) for TCP/IP traffic
    - Non-QDIO for TCP/IP and SNA traffic
    - OSN (Open System Adapter for NCP) works with IBM Communication Controller for Linux on System z

Exploitation of IBM TotalStorage Products

- IBM System Storage TS1130 Tape Drive
- IBM Virtualization Engine TS7700
- IBM System Storage TS3400 Tape Library as an autoloader
- IBM System Storage TS3500 Tape Library
- Support through S/390 channel command interface via
  - Perform Subsystem Function (PSF)
  - Perform Library Function (PLF) commands

SCSI Support in z/VSE

- SCSI disks as emulated FBA disks on z/VM V5.2 or higher
  - z/VSE supports a max. size of 2 GB
- Direct attached SCSI disks
  - z/VSE supports up to 24 GB (VSAM: 16 GB)
  - z/VSE supports SCSI disk devices only
  - Impact on applications
    - Transparent to all VSE applications and subsystems,
    - Reasons for transparency:
      - z/VSE's SCSI implementation is based on FBA support
      - Applications can not exploit SCSI commands directly
      - FBA to SCSI emulation on low level I/O interface
- **z/VSE 4.2: SAN Volume Controller (SVC)**
  - **To access FCP-SCSI disks in DS8000, DS6000, DS4000 and ESS series as well as disk subsystems from other manufacturers supported by SVC**

Exploitation of IBM TotalStorage Products ...

- IBM System Storage DS8000/DS6000 64K cylinder support
  - Supported by BAM and VSE/VSAM
- VSAM supports more than 1,500 clusters per catalog
- VSAM FAT-BIG DASD support
  - **Small DASD** (normal): smaller than 64k tracks per volume
    - 3390 in LISTCAT
  - Large DASD with two subtypes:
    - **Big DASD**: more than 64k tracks per volume
      - BIG-3390 in LISTCAT
      - Support of up to 10017 cylinders
    - **Fat DASD**: up to 64k cylinders
      - FAT-3390 in LISTCAT
      - New type of volume
- IBM System Storage DS8000 FlashCopy SE (Space Efficient)
  - Allocates storage on target volume only “as-needed”, if copied tracks from target volume
  - Delivered later via PTF

z/VSE 4.2: Parallel Access Volume (PAV)

- Optional licensed feature of DS8000, DS6000, ESS series
- Enables z/VSE to simultaneous process multiple I/O operations to the same volume
- Can provide enhanced throughput
- Multiple logical addresses to the same physical device
  = Base and alias volumes for concurrent processing of I/O operations
  - Configuration in DASD, IOCDS and z/VSE
- Multiple z/VSE jobs can transfer data to or from the same physical volume in parallel
- Can help to consolidate small volumes to large volumes
- In z/VSE PAV processing can be dynamically activated or deactivated via the AR/JCL command SYSDEF PAV=START or STOP
- Delivered later via PTF

z/VSE 4.2: up to 512 tasks

- More tasks may help to
  - Grow CICS workloads
  - Consolidate VSE systems
  - Ease migration from CICS/VSE to CICS TS
- Technical details:
  - System and maintasks are considered as old tasks
    - Old tasks are tasks with ids from 1 to 255
  - No IPL option required
  - Still 32 tasks per partition
  - System option (SYSDEF) to set max. number of tasks and defaults
    - SYSDEF SYSTEM,NTASKS=(nnn|MAX),TASKS=(ANY|OLD)
  - EXEC parameter for compatibility mode
    - // EXEC phase,TASKS=(ANY|OLD)
  - MAP/QUERY / SIR to show more task details
    - Display settings via QUERY command / MAP command

z/VSE base and optional products

- IBM High Level Assembler for z/OS, z/VM, and z/VSE V1.6 (HLASM)
- IBM DB2 Server for VSE and VM V7.5
  - Client Edition
  - Performance improvements
- CICS Transaction Server for VSE/ESA V1.1.1
  - CICS/VSE V2.3 shipped with CICS TS
  - **Intend that z/VSE 4.2 will be the last release to offer CICS/VSE**
- MQSeries for VSE V2.1.2
- TCP/IP for VSE/ESA V1.5.0 (Service Pack F)
  - Corrections for customer-reported problems
  - Transparent exploitation of CPACF for symmetric encryption
  - Support 4-port configurations of OSA Express3 GbE feature

z/VSE 4.2 Enhancements

- CPU balancing
  - When active, z/VSE Turbo Dispatcher will only use CPUs required for the current workload
- EZA socket programming interface enhancements
  - Allows selection of a local TCP/IP stack
  - Support of READV and WRITEV functions
- Language Environment (LE/VSE)
  - Enhancements to address customer and vendor requirements
- VSE/VSAM
  - IDCAMS SNAP enhancements (IXFP NOCOPY / DDSR support, BSM protection)
  - Cross-reference listing provided for backups created by IDCAMS
  - Meaningful cluster names
  - Duplicate candidate volumes can no longer be added to an existing cluster
- VSE/POWER
  - Enhancements to address customer requirements, such as manipulation of queue entries based on age
- VSE/Fast Copy
  - Exploitation of IXFP NOCOPY and DDSR

Interoperability with z/VSE

- VTAM constraint relief
- Connectors
- System z Hipersockets

VTAM Constraint Relief

- VSE VTAM 31bit IO Buffer Support
  - IO buffer pool and all IO CTC packing buffers can be moved above the 24 bit line
    - Allows to grow communication workloads
  - New VTAM start option IOBUF31 (default 24 bit buffers)
    - If IOBUF31=YES, ICA resources can not be activated
  - New setting can be displayed via VTAM command
  - Requires VTAM and z/VSE PTFs
    - See z/VSE home page for details

z/VSE e-business Connectors

- Easy access to z/VSE resources from other systems

- z/VSE e-business connectors include
  - Server code running on z/VSE
  - JAVA beans, servlets and samples on Java capable clients
    - Such as IBM's WebSphere Application Server
      which may run on Windows, Linux, AIX, z/OS, ...

- Advantages
  - Exploitation of non-VSE e-business infrastructure
  - Always newest e-business components
    - Java, web server, security
    - Platform independent
  - z/VSE resources can be easily integrated into new e-business applications
    - VSE e-business connectors
    - Other IBM connectors (DB2 Connect, MQ Series client, CICS TS Gateway, ...)

z/VSE e-business Connectors ...

- DB2 based connectors for VSAM and DL/I
  - Exploitation of DB2 infrastructure
    (JDBC/ODBC, DB2 Connect, DB2 server, DB2 stored procedures)
  - Mapping of SQL requests to VSAM and DL/I data
  - Sample mappings and applications provided
  - Communication via DRDA (SNA or TCP/IP based with DB2 V7 or higher)

- External services based VSE connectors
  - Access to z/VSE resources, such as
    VSE/VSAM files, VSE/POWER, VSE/ICCF, VSE Librarian, VSE console, DL/1, JDBC to VSAM, VSE Print
  - Access provided via
    - external services running on z/VSE
    - Java-based services running on
      e.g. web application server environments
  - Java samples are provided
  - Communication TCP/IP based

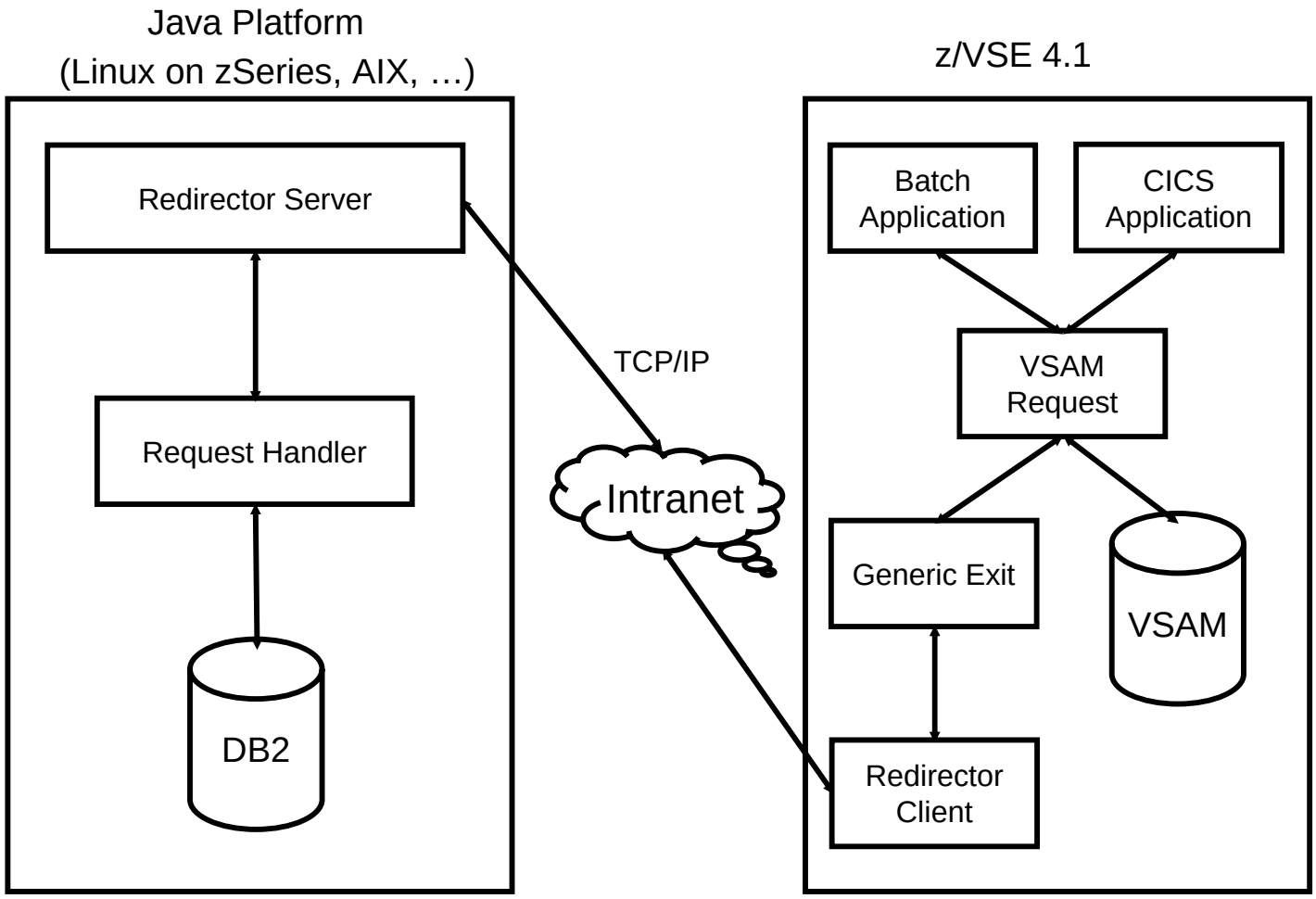
- **Java-based e-business connectors updated to support JDK 1.6**

VSAM Redirector

- VSAM Redirector provides
  - Access to remote data
    - on Java capable platform (e.g.Linux on zSeries)
    - transparent to z/VSE program (batch or online)
  - Samples to access flat files and DB2 UDB
  - Interfaces to include other data
  - Communication to other platform via TCP/IP
  - VSAM capture exit – **new in z/VSE 4.1**
    - captures changes to a specific VSAM cluster

➔ z/VSE as a client

VSAM Redirector...



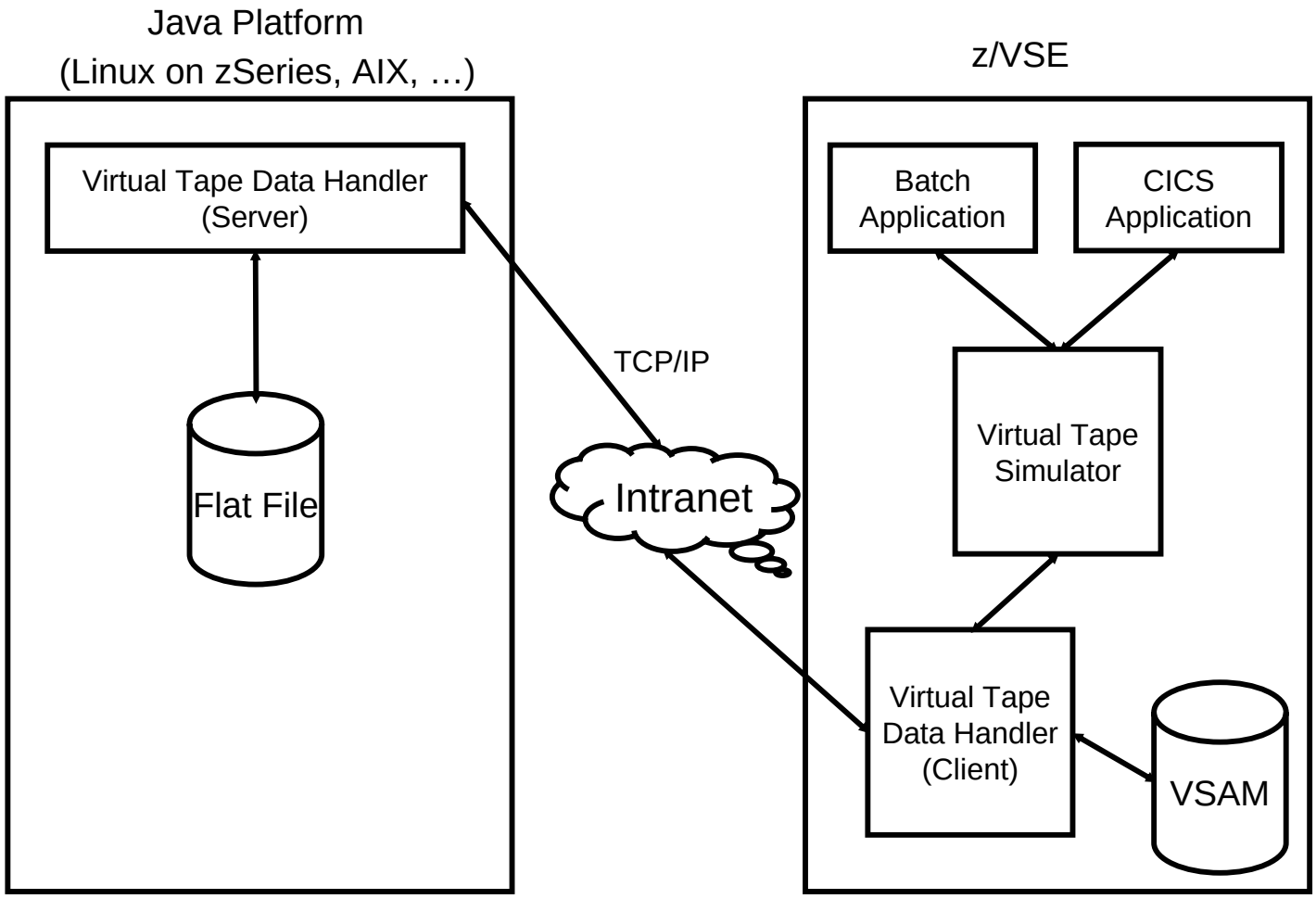
Virtual Tape

- File or dataset containing a tape image, that is
  - VSE/VSAM ESDS file on z/VSE
  - Remote file on Java-capable server platform (Windows, Linux, ...)
- Has most functions of physical tape
  - Some functions not supported
    e.g. SDAID to tape, Ditto Erase function
- "virtual tape" device need to be ADDed at IPL
- VTAPE command to manage virtual tapes

- VTAPE enhancements in **z/VSE 4.1**
  - Allow user labels for VSAM ESDS
  - New VTAPE QUERY command

  - Back up VSE data using Tivoli Storage Manager (TSM)

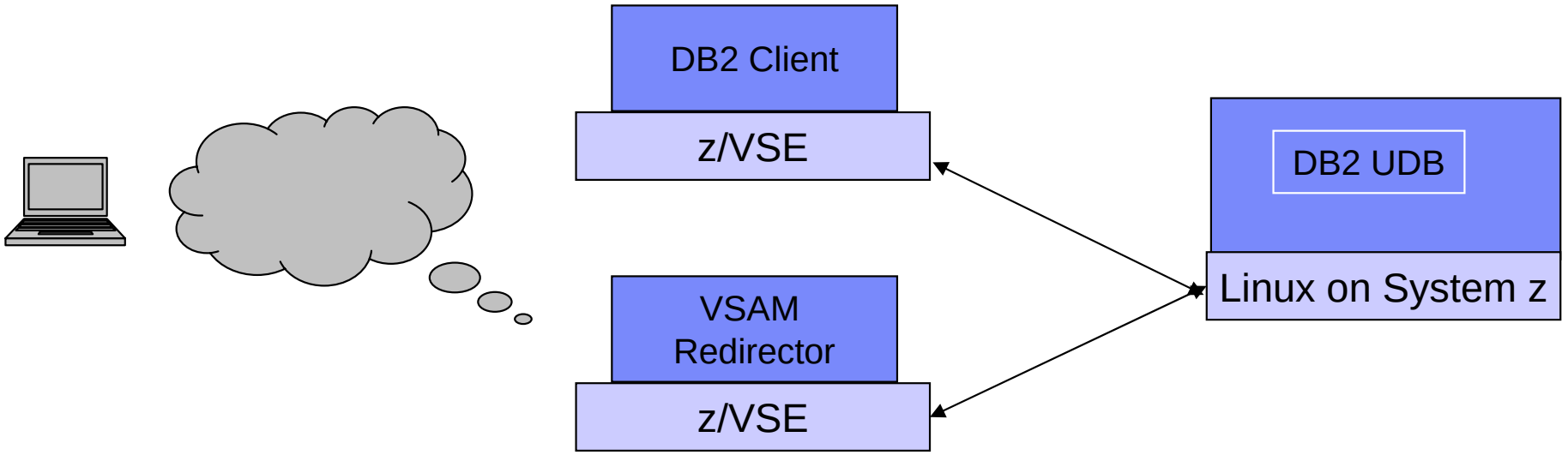
Virtual Tape ...



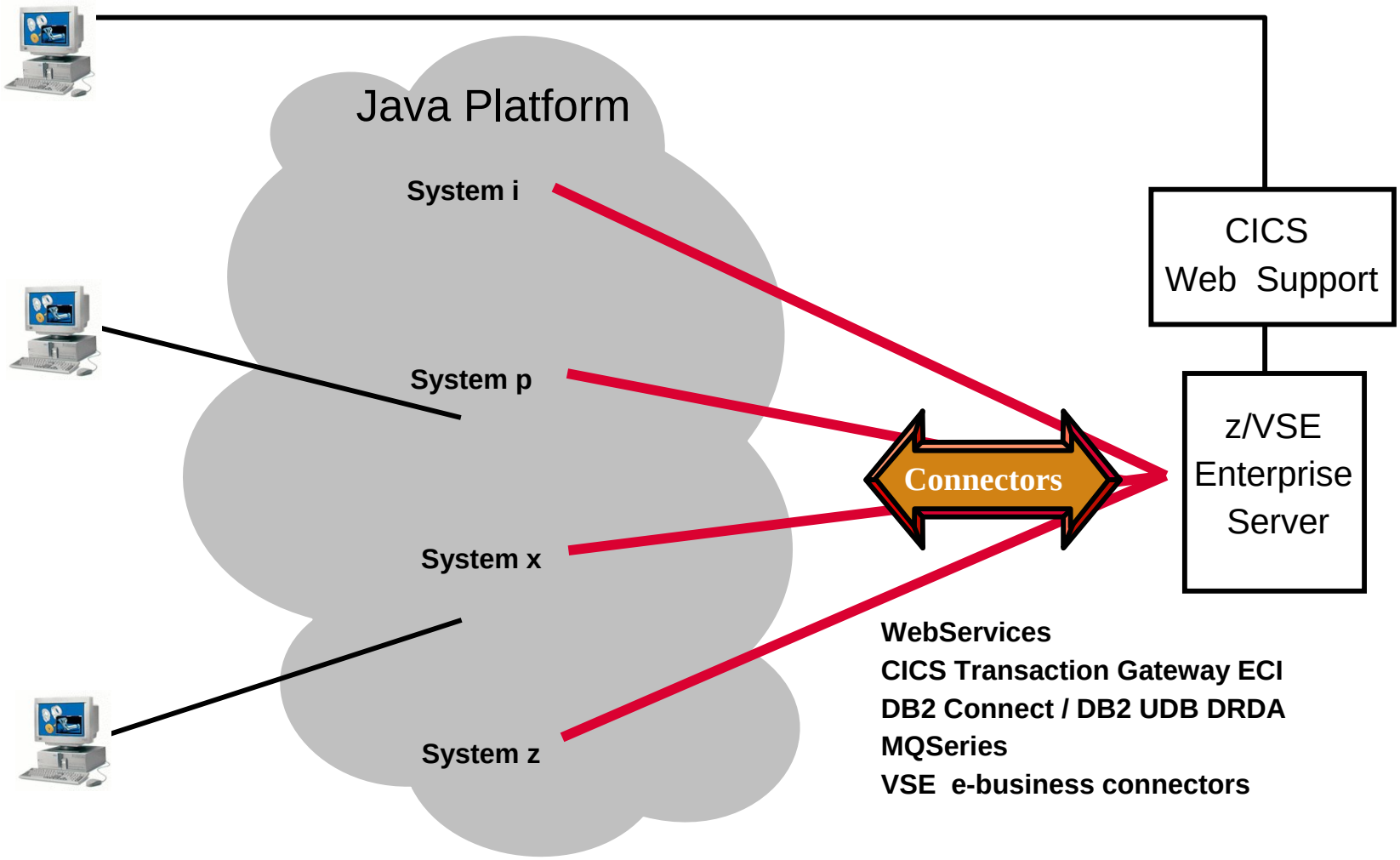
Web Services

- Enhanced interoperability through
  - Simple Object Access Protocol (SOAP)
    - information exchange over the internet (e.g. with CICS appls)
    - z/VSE SOAP server/client
      implemented as CICS program using CICS Web Support (CWS)
    - Any SOAP enabled platform may call a web service
      running as a CICS application
    - SOAP based on XML
  - Extensible Markup Language (XML)
    - creation and parsing XML data streams from VSE applications
    - Can be called from batch and CICS applications

Connect to DB2 UDB



z/VSE e-business Connectors …

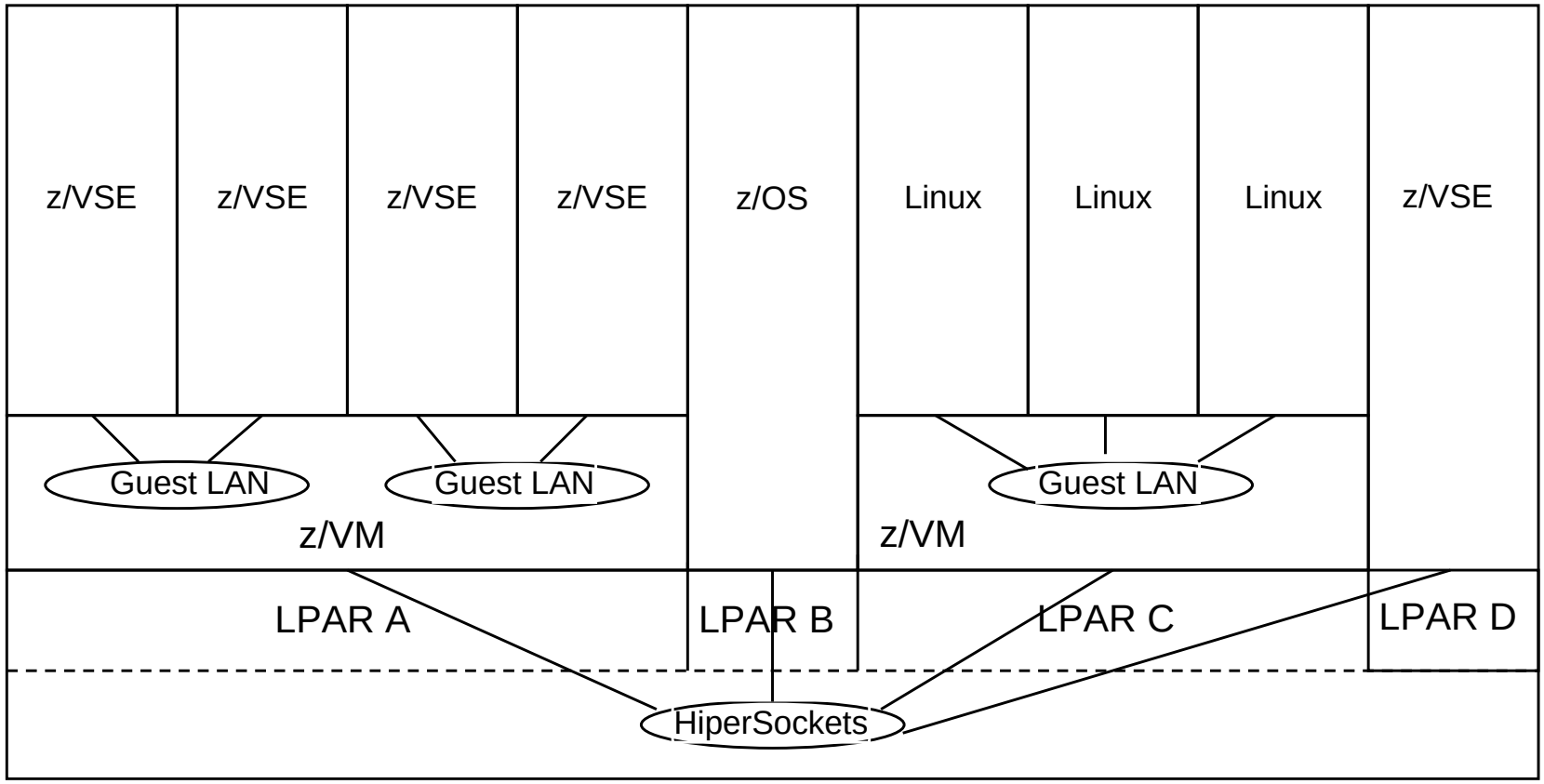


Client | **e-Business Applications** | **Tran/Data Services**

System z HiperSockets

- "network in the box",
  TCP/IP based communication at near memory speed within one system
  - System z Logical Partitions (LPARs)
  - z/VM guests (via virtual guest LAN)
  - z/VM guests and LPARs
- z/VSE 4.2 may communicate with
  - Linux on System z
  - z/OS
  - z/VM
  - z/VSE 3.1, z/VSE 4.1, z/VSE 4.2
- Virtual HiperSockets via z/VM Guest LAN support

HiperSockets Example



Security

- Security Enhancements
- Data Encryption
- Internet Security
- System z crypto support

z/VSE 4.2: Security Enhancements

- Lightweight Directory Access Protocol (LDAP)
  - z/VSE provides the LDAP client only
  - LDAP server running on a non-z/VSE system
  - z/VSE connected via the TCP/IP network to the LDAP server
  - LDAP sign-on enables users to z/VSE with long company-wide userids/passwords
    - Can resolve previous limitation of 4 to 8 character userids / 8 character passwords
    - Userids/passwords can be up to 64 character
  - Allows centralized management of userids
    - Password rules and password renewal can be enforced via LDAP server
- SOA security enhancements
  - Secure Socket Layer (SSL/TLS) for HTTP communication (z/VSE as client or server)
  - Transport layer authentication using HTTPbasic password or SSL client authentication
  - Message layer (end to end) authentication using username/token with password or certificate
- Basic Security Manager (BSM) enhancements
  - Improved auditing of resource access
    - Logging on access level (read/write)
    - Logging of BSTADMIN commands
- Secure FTP (z/VSE 4.1 + PTF, z/VSE 4.2)

Data Encryption (z/VSE 4.1 + PTF)

- IBM TS1130 Tape Drive with encryption feature
  - Supported by z/VSE 3.1, z/VSE 4.1, z/VSE 4.2
  - Supports data encryption within the drive itself
  - Using Systems Managed Encryption with the TS1130
  - z/VSE support will require the Encryption Key Manager component running on another operating system other than z/VSE using an out-of-band connection.
    - Generation and communication of encryption keys for tape drive
    - TCP/IP connection between EKM and the tape controller
  - Data encryption is transparent to z/VSE applications
  - Data encryption
    - Data will be encrypted and compressed, when specified
    - Default: encryption disabled
  - **z/VSE 4.2: encryption re-keying support to encrypt data key of encrypted tape cartridge**

System z hardware cryptographic support

- Enhances Internet security
- Cryptographic assists - Exploited by TCP/IP SSL support transparently
  - CPACF – for symmetric encryption
    - z/VSE 4.1 / 4.2: AES for 128-bit keys (z9 EC, z9 BC), AES for 256 keys (z10 EC)
  - Crypto Express2 (crypto card) – for asymmetric encryption
    - Encryption hardware assist for increased SSL throughput
      Supports SSL handshaking only
      for applications that use the SSL crypto API
    - Exploit 2048-bit RSA keys with Crypto Express2 and z/VSE 4.1 / 4.2
    - Configurable Crypto Express2
      - Dynamically configurable in coprocessor or accelerator mode
    - **z/VSE 4.2: dynamic change of cryptographic processors**
      - **Add/remove cryptographic processor of z10 LPAR**
- Transparent for TCP/IP applications
  (VSE connector server, CWS, VSE/Power PNET)
- No definition necessary

Encryption Facility for z/VSE V1.1

- Announced: 10/2007, GA: 11/2007
- Optional priced feature for VSE Central Functions V8
  - requires z/VSE V4.1 or later, MWLC-eligible
- Requires CP Assist for Cryptographic Function (CPACF)
  - no charge feature, only on z990, z890, z9 EC, z10 EC and z9 BC servers
- Extends affinity between z/VSE and z/OS
  - function roughly equivalent to EF for z/OS V1.1
  - compatible with EF for z/OS V1.1 (Encryption Facility System z format)
    - EF for z/VSE tapes can be read by EF for z/VSE, EF for z/OS, EF for z/OS Java Client, and Decryption Client for z/OS,
    - EF for z/OS V1.1 and EF for z/OS Java client tapes can be read by EF for z/VSE V1.1
- Complements z/VSE support for IBM TS1130 tape
  - TS1130 preferred solution for high volume backup/archive
  - EF option for limited backup/archive and/or exchange with partners with no TS1130

More Information

- **… on VSE home page:**

http://ibm.com/vse