IS03 – z/VSE Trends & Directions

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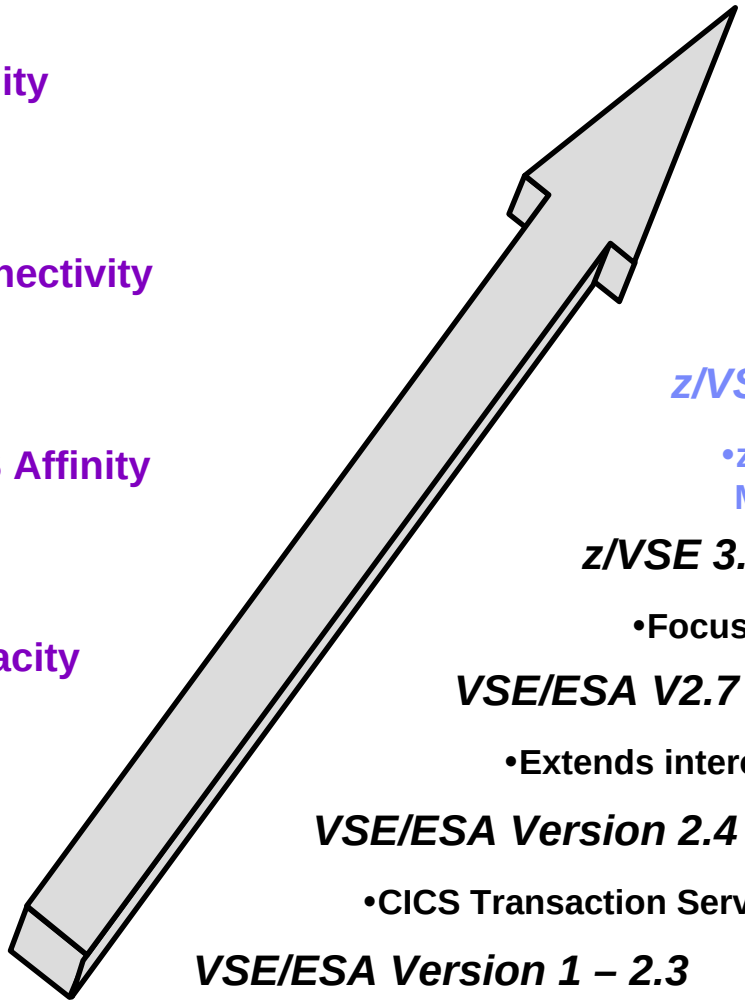
Agenda

- Roadmap
- VSE strategy
- z/VSE Version 4
- z/VSE 4.3 Preview

VSE Roadmap



Quality

Connectivity

z/OS Affinity

Capacity

z/VSE 4.3 Preview

•4 digit cuus, virtual constraint relief, SoD: IPv6

z/VSE 4.2 October 2008

•More tasks, more memory, EF for z/VSE 1.2, SCRT on z/VSE, SoD for CICS/VSE, PAV

z/VSE 4.1 March 2007, end of service 04/30/2010 (*)

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

z/VSE 3.1 March 2005, end of service 07/31/2009

•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*

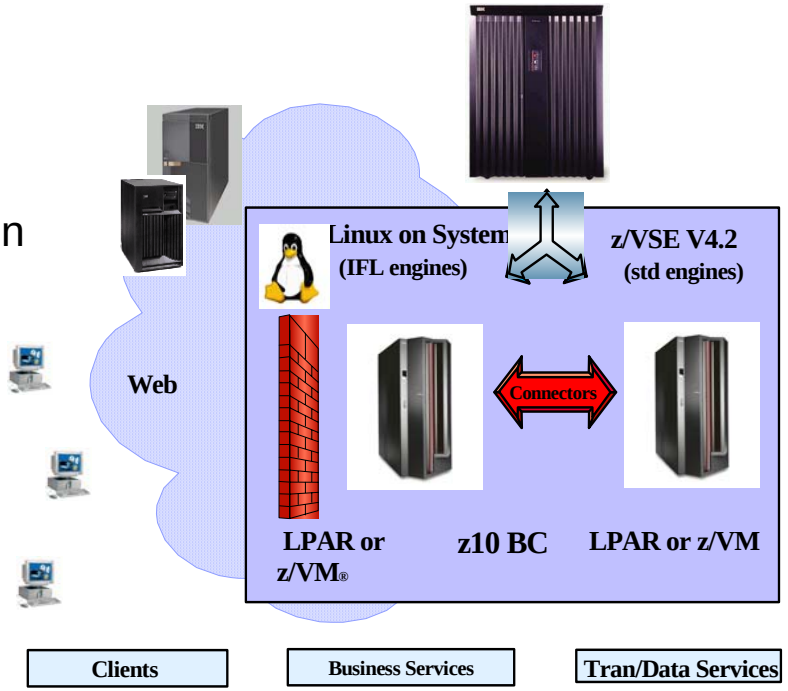
VSE/ESA Version 1 – 2.3 1990 – 1994, 1997

•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 4.1

- Previewed in 4/2006, announced 1/2007, GA 03/16/2007, **end of service 04/30/2010 (*)**
  - 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, z9 EC, z10 BC and 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, 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, z10 BC and z10 EC servers, IBM eServer zSeries 990, 890, 900, 800 servers
- 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

z/VSE V4.2 ...

- Added support for IBM System Storage
  - TS3400 Tape Library, TS7700 Virtualization Engine, IBM TS1130 Tape data encryption
  - 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
- z/VSE 4.2 packaged / delivered via 3590 / 3592 cartridges, CD-ROM or electronic delivery (ShopzSeries)
  - 3480/3490 as distribution media removed.
- FSU from z/VSE V3.1 and z/VSE V4.1

z/VSE V4.2.1

- Announced 04/28/2009, GA 07/17/2009
- Added support for IBM System Storage
  - Parallel Access Volume (PAV) feature of IBM System Storage series DS8000 / DS6000
  - IBM DS8000 Full Disk Encryption
  - IBM Virtualization Engine TS7700 Release 1.5 incl. support for the TS7720 virtual tape system
- Basic 64 bit register support
- Encryption Facility for z/VSE V1.2 supporting the OpenPGP format
  - Optional priced feature on z/VSE V4.2 (and later); MWLC enabled
- IBM Rational COBOL Runtime for z/VSE V7.5
- IBM WebSphere MQ for z/VSE V3.0

z/VSE V4.2.1 ...

- Reemphasizing the SoD:
  - z/VSE V4.2 will be the last release to offer **CICS/VSE V2.3**
  - CICS/VSE V2.3 and DL/I V1.10 will not be included in any future version or release of z/VSE
- For planning purposes:
  - Expect any future version or release of z/VSE not sooner than second half of 2010

* All statements regarding IBM's plans, directions, and intent are subject to change or withdrawal without notice.

Supported z/VSE Environments

- z/VSE Version 4 runs on the following platforms only
  - 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 Business Class (z10 BC)
  - 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 V4 requires 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 V4.3 (previewed)	**Yes**	**Yes**	**tbd**
z/VSE V4.2	**Yes**	**Yes**	**tbd**
z/VSE V4.1	**Yes**	**Yes**	04/30/2010 (1)
z/VSE V3.1	Yes	Yes	07/31/2009
VSE/ESA V2.7	Yes	Yes (2)	02/28/2007
VSE/ESA V2.6	Yes	Yes (2)	03/2006
VSE/ESA V2.5	Yes	No	12/2003
VSE/ESA V2.4	Yes	No	06/2002
VSE/ESA V2.3	No	No	12/2001

Note 1: z/VSE V4.1 EoS date may change. Note 2: latest service level + PTFs

Sub-capacity monitoring tool

- Tool can be activated on z9 BC, z9 EC, z10 BC or z10 EC models
- z/Architecture mode required -> therefore z/VSE 4.1 and z/VSE 4.2 only
- z/VSE supported in LPAR mode and as z/VM guest
- Implementation
  - System task
    - Measures CPU usage and calculates MSUs; measurement interval 30 minutes
    - Calculates 4 hour rolling average
    - Writes SMF like (SCRT89) records to dataset
  - Dataset is input for the Sub-Capacity Reporting Tool (SCRT)
- **SCRT tool with support for z/VSE 4.1 / 4.2, new release SCRT V18.1**
  - **Support for z/VSE native and guest systems whose capacities are less than one**
  - **z/VSE 4.1: APAR DY47027, z/VSE 4.2: APAR DY47029**
- Required for Midrange Workload License Charges (MWLC) with sub-capacity option
- 13 z/VSE products participate in MWLC

64 bit real

- 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

z/VSE 4.2: More Tasks

- More tasks may help to
  - Grow CICS workloads
  - Consolidate z/VSE systems
  - Ease migration from CICS/VSE to CICS TS
- Technical details:
  - Up to 512 VSE tasks
  - 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

z/VSE 4.2: More Tasks

- System option (SYSDEF) to set max. number of tasks and defaults
  - SYSDEF SYSTEM,NTASKS=(nnn|MAX),TASKS=(ANY|OLD)
  - NTASKS need to be specified in BG ASI procedure
  - TASKS defines system-wide default, can be specified any time
    - TASKS=OLD for compatibility reasons
- 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 4.2: CPU Balancing

- When CPU balancing is activated,
  the z/VSE Turbo Dispatcher will only use CPUs required for the current workload
- Can be activated and deactivated via AR/JCL command
  - SYSDEF TD,INT=0 to deactivate, default
  - SYSDEF TD,INT=nn (=1..99) to activate and “nn” interval in seconds,
    after which the CPU utilization is inspected
- Threshold can be defined after which an additional CPU is activated
  - SYSDEF TD,THR=nn (10..99) in percent, default: 50

z/VSE 4.2: CPU Balancing

- CPU balancing via stop or quiesce process
  - SYSDEF TD,INT=nn,STOP - the stop process to be used
    - May provide performance improvements for z/VM 5.4 guests
  - SYSDEF TD,INT=nn,STOPQ - the quiesce process to be use, default
- QUERY TD shows current settings
- CPU balancing may reduce multiprocessing overhead

Exploitation of IBM System Storage Products

- IBM System Storage TS1130 / TS1120 Tape Drive
- IBM System Storage TS7700 Virtualization Engine
- 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

Exploitation of IBM System Storage Products … 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 System Storage 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
- **z/VSE 4.2: IBM System Storage DS8000 FlashCopy SE (Space Efficient)**
  - **Allocates storage on target volume only "as-needed", if copied tracks from source volume**

Exploitation of IBM System Storage Products …
z/VSE 4.2.1: 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
  - Can help to consolidate small volumes to large volumes
- Multiple logical addresses to the same physical device
  = Base and up to 7 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
  - Transparent to applications
  - A VSE task can only process one I/O at a time
- AR/JCL command SYSDEF PAV=START or STOP
  - To activated or deactivated PAV
- AR command VOLUME and SIR SMF show PAV information
- Max. 1023 I/O devices, if PAV is active

New z/VSE 4.2 Base Functions

- Supervisor enhancements
  - CPU balancing
    - When active, z/VSE Turbo Dispatcher will only use CPUs required for the current workload
  - Signal Quiesce support
- EZA socket programming interface enhancements
  - Allows selection of a local TCP/IP stack
  - Support of READV and WRITEV functions
- Language Environment (LE for VSE)
  - Enhancements to address customer and vendor requirements
  - Optional language independent trace tool
  - Support of load modules provided with LE user exits
  - Attention Routine interface enhancements
  - Improved PL/I runtime support

New z/VSE 4.2 Base Functions …

- VSE/VSAM
  - IDCAMS SNAP enhancements (IXFP NOCOPY / DDSR support, BSM protection)
  - Cross-reference listing provided for backups created by IDCAMS
  - Resource owners are identified by task id in VSAM error messages
  - Meaningful cluster names
  - Duplicate candidate volumes can no longer be added to an existing cluster
- VSE/POWER
  - Enhancements to address customer requirements
  - New messages to report, when a queue entry has been processed
  - Manipulation of a queue entry based on its age
  - Queuing of list and punch queue entries without considering the form number (FNO)
- VSE/Fast Copy
  - Exploitation of IXFP NOCOPY and DDSR (delete data space release)

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**
- IBM WebSphere MQ for z/ VSE V3.0
- IBM Rational Cobol Runtime for z/VSE V7.5
  - Cobol code generated with IBM Rational Business Developer Extension for z/VSE V7.5.1
- TCP/IP for VSE/ESA V1.5.0 (Service Pack F)
  - Transparent exploitation of CPACF for symmetric encryption
  - Support 4-port configurations of OSA Express3 GbE feature

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

z/VSE 4.2: Security Enhancements

- SOA security enhancements
  - Secure Socket Layer (SSL/TLS) for HTTP communication (z/VSE as client or server)
  - Transport layer authentication using HTTP basic 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 TS1120 / 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 TS1120 / 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 re-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

- Optional priced feature for VSE Central Functions V8
  - MWLC-eligible
- Supports the use of SAM files, VSE/VSAM files, VSE library members, tapes, virtual tapes as input or output
- 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 1.1
  - 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

Encryption Facility for z/VSE ...

- EF for z/VSE 1.1
  - Announced: 10/2007, GA: 11/2007
  - Supports z/VSE 4.1 and z/VSE 4.2 (until GA of EF for z/VSE 1.2)
  - Function roughly equivalent to EF for z/OS V1.1
- EF for z/VSE 1.2
  - Announced: 04/2009, GA 07/17/2009
  - Supports z/VSE 4.2
  - Supports openPGP standard
  - Optional compression using ZIP or ZLIB algorithms
- EF for z/VSE complements z/VSE support for IBM TS1120 / TS1130 tape
  - TS1120 / TS1130 preferred solution for high volume backup/archive
  - EF option for limited backup/archive and/or exchange with partners with no TS1120 / TS1130

z/VSE V4.3 Preview

- Preview 10/2009, planned GA 4Q/2010
- Virtual storage constraint relief:
  - Move selected system programs and buffers from 24-bit into 31-bit storage (VSAM, DL/I and Supervisor programs and buffers moved above the line)
- 4-digit device addresses
- IBM System z10 technology exploitation:
  - Dynamic add of logical CPs
  - Large page (1 megabyte page) support for data spaces
  - FICON Express8 support
- Midrange Workload License Charges (MWLC) with sub-capacity mode
- FSU from z/VSE 4.1 and z/VSE 4.2

z/VSE V4.3 Preview …

- Enhanced storage options:
  - Parallel Access Volume (PAV) feature of IBM Systems Storage DS8000 and DS6000
  - DS8000 Remote Mirror and Copy (RMC) feature support through ICKDSF
  - IBM System Storage TS7700 Virtualization Engine Release 1.5
- Network, security and auditability enhancements
  - Support of z/VM Queue I/O (QIO) performance assist for z/VM guests
  - Monitoring agent based on SNMP (Simple Network Management Protocol)
  - Basic Security Manager (BSM) will allow to protect MQ resources (WebSphere MQ for z/VSE V3)
- New DL/I V1.12 release

CICS Considerations

- CICS/VSE 2.3 no longer included into the z/VSE 4.3 base
  - Coexistence environment removed which includes DL/I V1.10
- z/VSE V4.3 will continue to reduce inhibitors for migration and CICS workload growth through virtual storage constraint relief
- DOS/VS RPG II support for CICS Transaction Server for VSE/ESA (CICS TS)
  - Allows RPG programs implemented for CICS/VSE V2.3 to run with CICS TS
  - Will be available on z/VSE 4.2
- Migration from CICS/VSE 2.3 to CICS TS on z/VSE 4.2
  - Migration of online RPG programs on z/VSE 4.2

Statement of direction
Internet Protocol Version 6 (IPv6)

- z/VSE V4.3 intends to provide an IPv6 solution
  that will enable z/VSE to participate in an IPv6 network.
- IPv6 is the “next generation” protocol
  to replace the current version Internet protocol, IP Version 4 (IPv4).
- IPv6 removes the IP addressing limitation of IPv4
  - IPv6 is expected to gradually replace IPv4
- IPv6 support may help clients to meet long-term requirements of the commercial community and governmental agencies.

4 digit device addresses (cuus)

- Ease-of use configuration and infrastructure simplification
  - In mixed IT environments running z/VSE together with z/VM, Linux on System z, z/OS
  - Removes the requirement for a z/VSE specific IOCDS configuration
  - Provides more flexibility
- 4 digit device address (cuu) will be mapped to a 3 digit cuu during IPL
- z/VSE will only use 3 digit cuus after IPL complete
- Transparent to system components, vendors and user applications

IBM System z10 exploitation

- Dynamic add of logical CPs
  - Ability to dynamically add logical central processors (CPs) without preplanning
  - Logical processor add from HMC/SE
  - Allows adding CPs to LPAR without re-IPL of the z/VSE system
  - Capacity of the z/VSE V4.3 system may be in-/decreased dependent on workload needs
  - New SYSDEF TD parameters to manage the additional CPs
  - Not supported in z/VM guests

- Large page (1 megabyte page) support for data spaces
  - Better exploitation of large processor storage, may improve performance
  - No configuration options required
  - Transparent to applications
  - Not supported in z/VM guests

IBM System z10 Exploitation

Functions	**z/VSE V4.3 Plan**	**z/VSE V4.2**	z/VSE V4.1
z/Architecture mode (with 64-bit *real* addressing)	Yes	Yes	Yes
64-bit *virtual* addressing	No	No	No
ESA/390 processor support	No	No	No
Processor storage (i.e. real memory) … *up to*	32 GB	32 GB	8 GB
Large page (1 megabyte page) support for data spaces	New	No	No
Dynamic add of logical CPs	New	No	No
CP Assist for Cryptographic Function CPACF z9 extensions (i.e. AES 128-bit, etc.) CPACF z10 extensions (i.e. AES 256-bit, etc.)	Yes Yes Yes	Yes Yes Yes	Yes Yes Yes
up to 60 LPARs and 4 LCSSs	Yes	Yes	Yes
HiperSockets™ (including spanned HiperSockets)	Yes	Yes	Yes

IBM System z10 Exploitation

Functions	**z/VSE V4.3 Plan**	**z/VSE V4.2**	z/VSE V4.1
FICON Express8, Express4, FICON Express2 ('FICON' & 'FCP')	Yes	Yes	Yes
Fibre Channel Protocol (FCP) for SCSI Disks	Yes	Yes	Yes
OSA-Express3, OSA-Express2, OSA-Express features	Yes	Yes	Yes
▪ z10 OSA-Express3 - 4-port exploitation	Yes	Yes	Yes
OSA Integrated Console Controller (OSA-ICC)	Yes	Yes	Yes
Crypto Express3 – 2P & 1P	Yes	Yes	No
Crypto Express2 – 2P & 1P	Yes	Yes	Yes
▪ SSL clear key encryption assist	Yes	Yes	Yes
▪ Configurable Crypto Express3	Yes	Yes	No
▪ Configurable Crypto Express2	Yes	Yes	Yes
▪ 2048-bit RSA keys	Yes	Yes	Yes
▪ z10 Dynamic Add/Remove Cryptographic Processors	Yes	Yes	No

Note: selected FICON or OSA Express cards may not be supported on System z10 processors

More Information

- … on VSE home page: http://ibm.com/vse
- Hints and Tips for z/VSE:
  ftp://ftp.software.ibm.com/eserver/zseries/zos/vse/pdf3/zvse41/hint9mm2.pdf
- IBM Redbooks:
  - Introduction to the New Mainframe: z/VSE Basics
    http://www.redbooks.ibm.com/abstracts/sg247436.html?Open
  - Security on IBM z/VSE
    http://www.redbooks.ibm.com/redpieces/abstracts/sg247691.html