IBM

IBM z/VSE V4.3 - More capacity for growth

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Agenda

- Roadmap

- VSE strategy

- z/VSE 4.3 key functions

- Statement of Direction: 64 bit virtual addressing

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VSE Roadmap

SOD: 64 bit virtual memory objects

z/VSE 4.3   November 26, 2010

Quality

• **Virtual storage constraint relief, 4 digit cuus, hardware exploitation**

z/VSE 4.2.2 04/2010 – **IPv6/VSE 05/2010**

Connectivity

z/VSE 4.2.1 July 2009 - **PAV, EF for z/VSE 1.2**

z/VSE 4.2 October 2008

•**More tasks, more memory, EF for z/VSE 1.1, SCRT on z/VSE, SoD for CICS/VSE**

z/OS Affinity

z/VSE 4.1   March 2007, end of service 04/30/2011

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

Capacity

z/VSE 3.1   March 2005

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

VSE/ESA Version 2.4 – 2.7   1999 - 2003

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

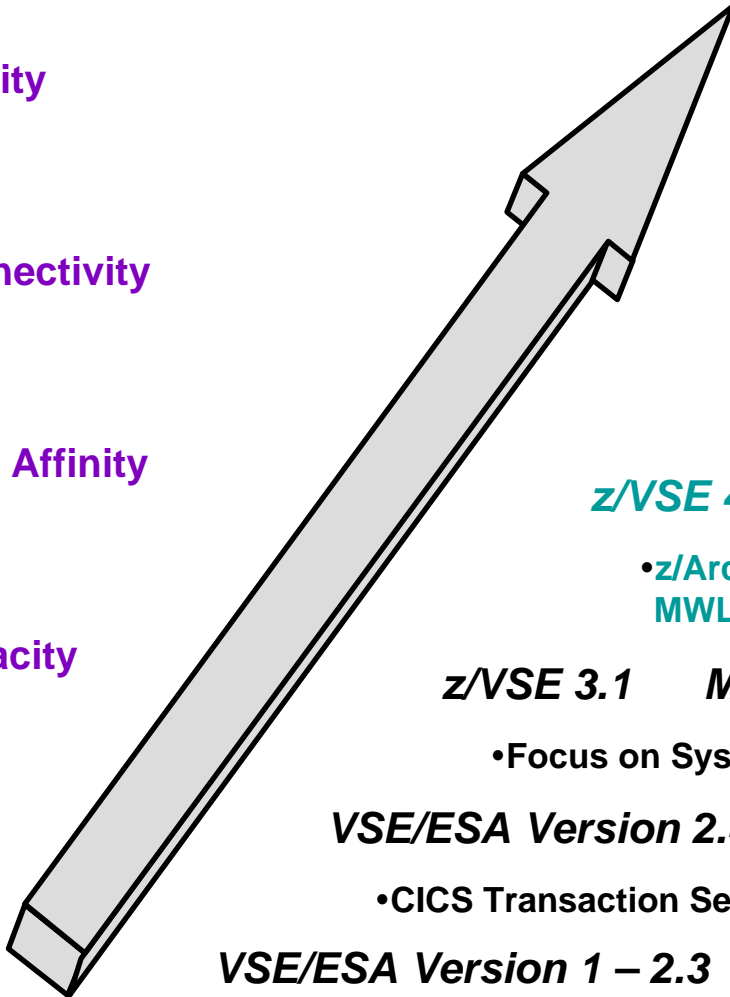*VSE/ESA Version 1 – 2.3   1990 – 1994, 1997*

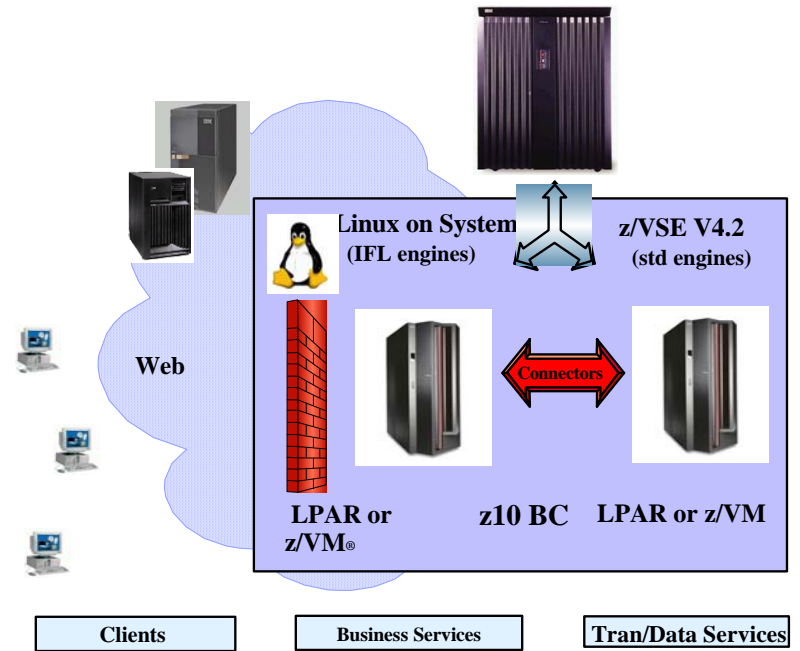•**TCP/IP based communication, N-way S/390 Servers, Investment Protection - Year 2000, Constraint Relief, ESA exploitation**

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?

Linux on System (IFL engines)

z/VSE V4.2 (std engines)

Web

Connectors

LPAR or z/VM®

z10 BC

LPAR or z/VM

Clients

Business Services

Tran/Data Services

z/VSE 4.3

- Preview: 10/2009, Announced: 10/2010, planned GA: 11/26/2010

- IBM System z10 / z196 exploitation
  - Dynamically add of CPUs
  - Large (1 megabyte) page support
  - Static power saving mode for SCRT (z196)

- Virtual storage constraint relief for 24 bit (CICS) programs

- 4 digit device addresses (CUUs)

- Basic Security Manager (BSM) will allow to protect MQ resources

- Monitoring agent based on SNMP (Simple Network Management Protocol)

- Linux Fast Path

- Midrange Workload License Charges (MWLC) with sub-capacity mode
  - Sub-Capacity Reporting Tool (SCRT) – available with z/VSE 4.1 and later (z9 / z10 / z196 only)

- FSU from z/VSE 4.1 and 4.2

Requirements addressed in z/VSE 4.3

- MR1120076646 - Provide 24-bit GETVIS-shortage relief by moving additional VSE/VSAM control blocks (including the CLWA) and executable code into 31-bit area
- MR0719046030, WAVV200413 - Move large system modules in 31-bit SVA
- WAVV200715 - Allow 4 digit cuu for compatibility
- MR0426071917 - Enhance cuu range from 3 to 4 digits
- MR0411056737 - Port z/OS LE changes to CEEFETCH Macro
- MR0511075750 - LIBR CATALOG from SYSLNK
- MR0626082059 - LIBR RENAME with DATE=OLD
- MR0729082910 - VSE Connectors - Support Numeric Decimal Data with decimal points
- MR071707545 - BSM XREF Service
- WAVV200820 - Audit enhancements - integrate DTSECTAB
- WAVV200830 - Job Control Commands (JCCs) and Job Control Statements (JCSs) whose effect extends beyond the end of the current VSE job should be subject to security checks.
- MR0071008 - Redirection of Power Punch Entries
- WAVV200721 - Cancel job output when output limit reached
- - Restart PNET TCP/IP passive connection
- WAVV200721 - Flush Power jobs when output limit is exceeded
- MR0525093425 - API for AMDSB
- MR0820095815 - Enhancement to SHOWCB macro
- WAVV200841, MR1027084841 - Summary list for record mapfile

Supported z/VSE Environments

- z/VSE 4.1, 4.2 and 4.3 (will) run 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)
  – IBM zEnterprise 196 (z196)

and supports

  ➢ uni- and multiprocessors
  ➢ Basic mode (z800, z900 only), as z/VM guest or in LPAR
  ➢ z/VSE 4.1, 4.2 or 4.3 (will) run under all supported z/VM releases, including z/VM 6.1. z/VM 6.1 requires z10 technology.

VSE Support for System z

VSE Release	z800 / z900	z890 / z990/ System z9 / z10 / z196	VSE EoS
z/VSE V4.3 (GA 11/2010)	Yes	Yes	tbd
z/VSE V4.2	Yes	Yes	tbd
z/VSE V4.1	Yes	Yes	04/30/2011
z/VSE V3.1	Yes	Yes	07/31/2009
VSE/ESA V2.7	Yes	Yes	02/28/2007
VSE/ESA V2.6	Yes	Yes	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

Hardware Support

- Crypto Express3
  - Available on z10 and z196, supported with z/VSE 4.2 or higher

- AP (adjunct processor)-queue adapter-interruption facility
  - May accelerate the SSL throughput
  - Available on Crypto Express2 or Crypto Express3 feature

- IBM XIV Storage System
  - Attached via FCP subchannels
  - XIV (SCSI) devices supported as system and data device
  - Support to be delivered for z/VSE 4.3 via PTF

- IBM System Storage SAN Volume Controller

Hardware Support

- **IBM System Storage DS8000 Series**
  - Remote Mirror and Copy feature (RMC)
    - Supported through ICKDSF, supported with z/VSE 4.1 or later
  - Full disk encryption
    - Transparent to z/VSE, supported with z/VSE 4.1 or later
  - Solid State Disks
    - Supported with z/VSE 4.1 or later
  - FlashCopy Consistency Group
    - Allows to create a consistent point-in-time copy across multiple volumes

- **IBM System Storage TS7700 Virtualization Engine**
  - z/VSE 4.1 or later supports the TS7700 Release 1.7
    - as standalone system in transparency mode
  - z/VSE 4.2 with PTFs or later supports the TS7720 disk-only virtual tape
  - z/VSE 4.3 exploits TS7700 WORM volumes

- **IBM System Storage TS7680 ProtecTIER Deduplication Gateway for System z**
  - Combines a virtual tape library solution, inline data deduplication and disk-based storage option

Large Pages for Dataspaces

- Better exploitation of large processor storage, may improve performance

- No configuration options required

- Transparent to applications

- Large pages (1 MB page frames) for dataspaces
  - Supported on z10 and z196

- Will always be used on z10 during during dataspace allocation, if enough real storage is available

- 1 MB frames are not pagable

- If real frame shortage:
  1 MB frames will be broken up into 4K frames and paged out

- Enabled SYSDEF DSPACE, query 1 MB frame usage: QUERY DSPACE, MAP REAL

- Not supported in z/VM guests

Dynamic Add of logical CPUs

- Ability to dynamically add and remove logical central processors (CPUs) without preplanning

- Logical processor add from HMC/SE

- Supported on z10 and z196 (standby CPUs)

- Allows adding CPUs 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 CPUs

- Standby CPUs are not used for the LPAR CPU share calculation

- Standby CPUs can be added to the CPU configuration
    - SYSDEF TD,STARTSBY: will set standby CPU online and active
    - SYSDEF TD,STOPSBY: CPU will set back into standby state

- Not supported in z/VM guests

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

- 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

- CPU balancing may reduce multiprocessing overhead

- Supported with z/VSE 4.2 and later

CPU Balancing …

Retrieve CPU time values: QUERY TD

```
query td
AR 0015   CPU    STATUS    SPIN_TIME       NP_TIME TOTAL_TIME NP/TOT
AR 0015   00     ACTIVE            0         63715      96636  0.659
AR 0015   01     ACTIVE            0         13668      22614  0.604
AR 0015   02     INACTIVE        210         23692      34187  0.693
AR 0015                    ------------------------------------------
AR 0015 TOTAL                    210        101075     153437  0.658
AR 0015
AR 0015                    NP/TOT: 0.658       SPIN/(SPIN+TOT): 0.001
AR 0015   OVERALL UTILIZATION:   80%        NP UTILIZATION:    53%
AR 0015
AR 0015   CPU BALANCING (STOP):  INT:   9 SECONDS     THR:    50%
AR 0015
AR 0015   ELAPSED TIME SINCE LAST RESET:           190550
AR 0015 1I40I  READY
```

TOTAL_TIME   = CPU time used by workload
 NP_TIME   = non-parallel CPU time, contained in TOTAL_TIME
 SPIN_TIME   = CPU time needed to wait for a non-parallel work unit
 All above values given in milliseconds.

NP/TOT   = ratio NP_TIME / TOTAL_TIME = non-parallel share
 SPIN/(SPIN+TOT) = spin time ratio

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

- Supported with z/VSE 4.2.1 and later

4 digit CUUs

- Ease of use and infrastructure simplification
  - In mixed environments running z/VSE together with z/VM,
    Linux on system z or z/OS
  - Removes the requirement for a z/VSE specific IOCDS configuration
  - Provides more flexibility

- 4 digit CUUs transparent to applications and most system programs
  - Implemented via mapping to 3 digit CUUs during IPL
  - z/VSE will only use 3 digit CUUs after IPL complete
  - Exception: z/VM DIAG instruction use 4 digit CUUs

4 digit CUUs

- IPL ADD extended to 4 digit CUUs, IUI dialogs allow to define mapping
  - Will provide the mapping to 3 digit CUUs,
    - e.g. ADD <4digit CUU> as <3 digit CUU>

```
BG 0000 ADD 1030 AS 004,3277
BG 0000 ADD 1810 AS 005,3490
BG 0000 ADD 1FF0 AS 006,1050A
BG 0000 ADD 3000 AS 007,ECKD
BG 0000 ADD 6400 AS 008,ECKD
```

  - QUERY Command and IUI dialogs show CUU mappings

```
query io,cuu=all
AR 0015    VSE ADDR    PHYSICAL ADDR    DEVICE CLASS
AR 0015        001            1000      TERMINAL
AR 0015        002            1010      TERMINAL
AR 0015        003            1020      TERMINAL
AR 0015        004            1030      TERMINAL
AR 0015        005            1810      TAPE
AR 0015        006            1FF0      TERMINAL
AR 0015        007            3000      DASD
```

  - z/VSE uses 3 digit CUUs after IPL complete

CICS Considerations

- z/VSE 4.3 will no longer offer CICS/VSE 2.3 as part of the z/VSE 4.3 base
    - Fulfills the statement of direction in announcement from October 9, 2007
    - Coexistence environment removed which includes DL/I V1.10
    - Migration from CICS/VSE to CICS TS on z/VSE 4.2 or earlier
    - Most migration inhibitors should be removed with recent improvements
        - Basic Security Manager (BSM) enhancements
        - More tasks
        - Virtual constraint relief

- DOS/VS RPG II compiler support for CICS TS
    - Allows RPG programs implemented for CICS/VSE V2.3 to run with CICS TS
    - Will be available on z/VSE 4.2 (z/VSE 4.1) via PTF (see Info. APAR II4447)

- New DL/I VSE 1.12 release
    - Optional product of z/VSE 4.3 (the only DL/I release)
    - Provides constraint release (DL/I resources moved above the 16 MB line)
    - Replaces DL/I VSE 1.11 and DL/I DOS/VS 1.10

Up to 512 tasks

- Introduced with z/VSE 4.2

- More tasks may help to
  - Grow CICS workloads
  - Consolidate VSE systems
  - Ease migration from CICS/VSE to CICS TS

- System and maintasks are considered as old tasks
  - Old tasks are tasks with ids from 1 to 255

- No IPL option required

- 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)

Up to 512 tasks …

- QUERY SYSTEM

  - AR, JCC and JCS
  - Example:
    - IPL SYS NPARTS=150
    - Old subtasks limit: 255 – 32 system tasks – NPARTS (maintasks)
      255 – 32 – 150 = 73
    - New subtasks limit: 512 – old tasks (255) - 1 = 256

```
query system
AR 0015    NUMBER OF TASKS TOTAL LIMIT: 512
AR 0015    OLD SUBTASKS LIMIT:          163    IN USE:   0    MAX. EVER USED:    0
AR 0015    NEW SUBTASKS LIMIT:          257    IN USE:  15    MAX. EVER USED:   15
AR 0015    DEFAULT TASK TYPE: ANY
AR 0015    PARALLEL ACCESS VOLUME (PAV):  INACTIVE
AR 0015 1I40I   READY
```

Security Enhancements

- Lightweight Directory Access Protocol (LDAP)
  - Sign-on support for CICS TS introduced with z/VSE 4.2
  - LDAP client on z/VSE, LDAP server running on a non-z/VSE system
    - Connected via TCP/IP network
  - LDAP sign-on enables users to z/VSE with long company-wide userids / 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 4.3: Sign-on support for batch jobs, new IUI dialog for the LDAP support

- Basic Security manager (BSM)
  - Security for WebSphere MQ for z/VSE V3 to protect MQ resources
  - Includes DTSECTAB resources into SMF logging and reporting
  - BSM cross reference reports
  - Selected JCL statements can be protected by BSM

Encryption Facility for z/VSE

- Optional priced feature for VSE Central Functions V8

- 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 z890, z990, z9, z10 and z196 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
  - Function roughly equivalent to EF for z/OS V1.1

- EF for z/VSE 1.2
  - Announced: 04/2009, GA: 07/2009
  - Supports z/VSE 4.2 and later
  - 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

TCP/IP Connectivity for z/VSE

- TCP/IP connectivity for IPv4 communication
  - TCP/IP for VSE/ESA 1.5 – licensed from CSI International
  - IPv6/VSE – licensed from Barnard Software, Inc. (BSI)
  - Linux fast path (LFP)
  - EZA socket interface, new function calls
  - LE/C socket API

- TCP/IP connectivity for IPv6 communication
  - IPv6/VSE
  - EZA socket interface, new function calls

- All TCP/IP stacks can run concurrently within one z/VSE system

- z/VM queue-I/O assist for real networking devices
  - Performance assist for OSA-Express adapters and HiperSockets

IPv6/VSE

- Announced: 04/06/2010, GA 05/28/2010, to be updated 11/26/2010

- Full function IPv4 (with November update) and IPv6 stack with applications
  - MWLC with sub-capacity option for IPv6/VSE product
  - Supported releases: z/VSE 4.2 plus PTFs or z/VSE 4.3
  - Optional Product of z/VSE 4.3

- IPv6 solution for z/VSE
  - Includes the IPv6 stack, IPv6 APIs and IPv6-enabled applications
    - IBM's EZA Assembler interfaces support IPv4 and IPv6 communication
  - Extends 32 bit addresses (used in IPv4) to 128 bit addresses
 - To meet requirements of governmental agencies for products

IPv6/VSE - Functionality

- IPv6/VSE's dual stack support: allows IPv6-enabled applications to transparently communicate with partners via either IPv6 or IPv4 network

- IPv6 tunneling: encapsulates IPv6 datagrams within IPv4 packets allows communication with IPv6 networks, even if local infrastructure is IPv4

- IPv4 and IPv6 enabled applications:
  - FTP server, FTP client
  - Batch FTP client
  - TN3270E server
  - NTP client / server to query time of day to synch TOD clock
  - System logger client to log e.g. z/VSE messages to Linux
  - Batch email client
  - Batch LPR + TN3270E / FTP / DIRECT printer sessions
  - Batch remote execution client
  - Batch PING
  - GZIP data compression
  - REXX automation
  - DBCS support: FTP client / server, LPR, batch email client, GZIP

Linux Fast Path (LFP)

- Provided with the z/VSE 4.3 base product – no additional charge

- LFP uses an IUCV connection between z/VSE and Linux on System z
  – Both – z/VSE and Linux – need to be z/VM guests of the same z/VM
  – Routes the socket request to Linux on System z
    • Without using the local TCP/IP stack
  – LFP daemon on Linux forwards the socket request to the Linux TCP/IP stack
  – Will run best in **z/VM mode LPAR** (z/VM 5.4 or higher)
    • Available on z10 and z196
    • Linux on System z on IFL, z/VSE on standard processors

- LFP is transparent to IBM socket APIs
  – Supported APIs: LE/C socket API, EZA socket / EZASMI interface, …
  – Transparent to IBM applications (DB2 client, Connectors, Power PNET)
  – No standard TCP/IP applications (Telnet, FTP, …) provided

- System requirements:
  – z/VM 5.4 or higher
  – Linux on System z distribution (min. SLES 10 SP3 or RHEL 5.5)
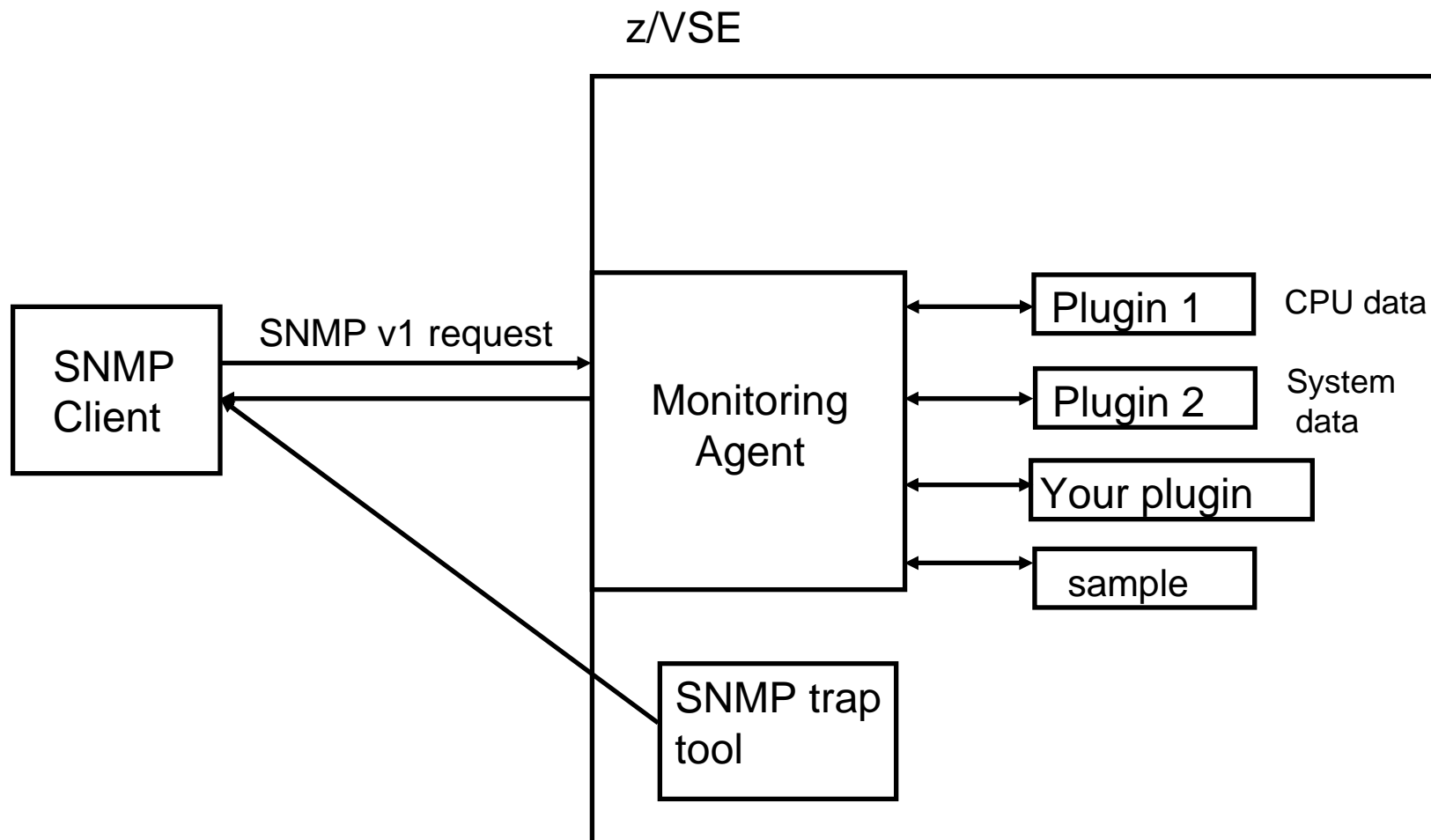
Linux Fast Path (LFP) …
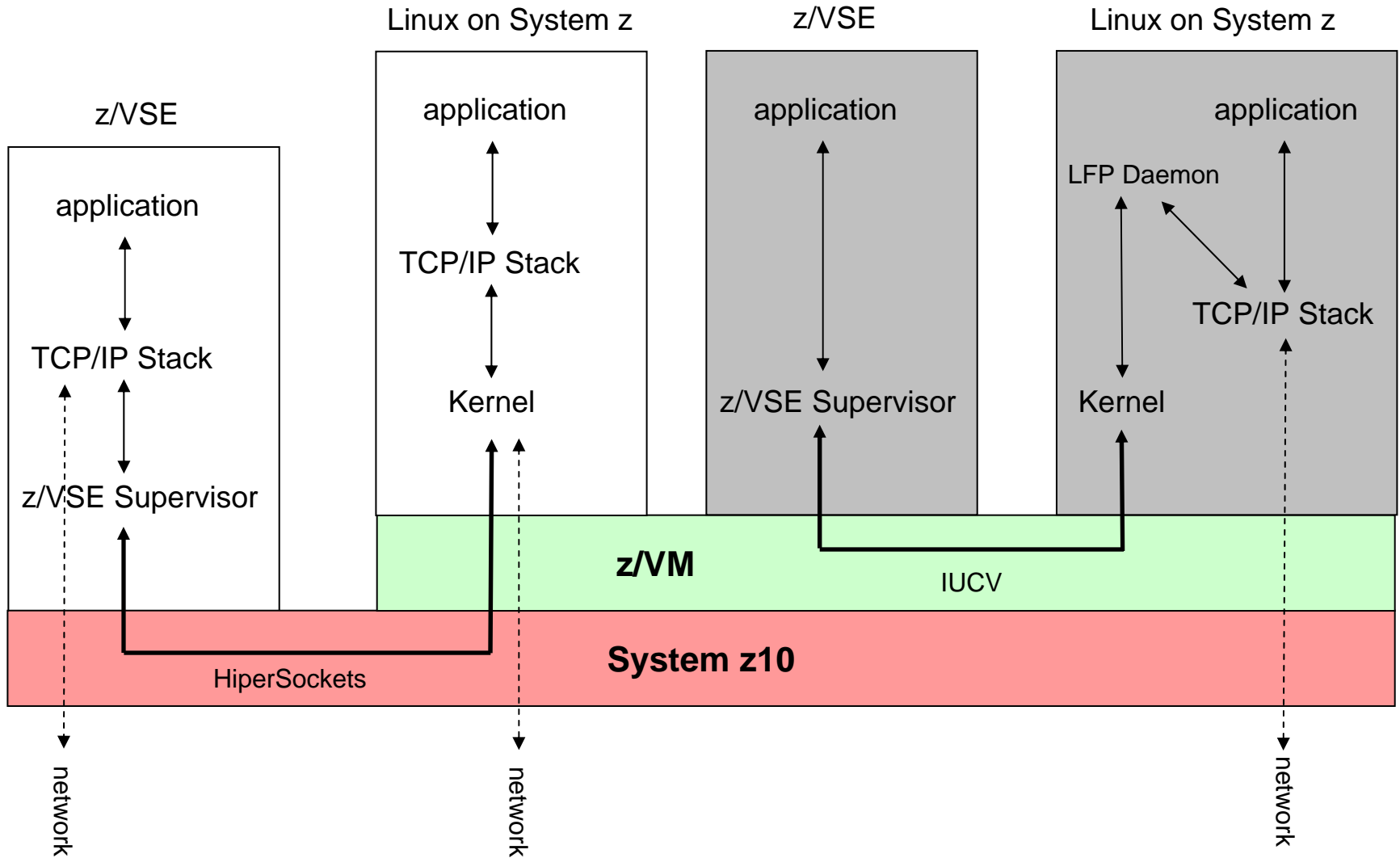
Connectors

- **E-business Connectors**
  - Supports decimal datatypes such as PACKED and ZONED with implied positions
  - VSAM redirector support for CICS TS subtasking

- **SNMP Connector**
  - SNMP (Simple Network Management Protocol) V1 protocol
  - Allows to monitor system events on a network
  - Clients can retrieve z/VSE specific system and performance data
  - Performance monitors may collect the data for planning purposes

SNMP Connector ...

z/VSE

SNMP Client	→ SNMP v1 request →	Monitoring Agent	↔	Plugin 1	CPU data
			↔	Plugin 2	System data
			↔	Your plugin	
			↔	sample	
		SNMP trap tool			

Enhancements for z/VSE Components

- Language Envionment
  - Support of BEAR (break-event-address register) feature for debugging
  - PL/I multitasking for improved performance
  - LE/C TCP/IP socket API multiplexer for multiple TCP/IP stacks

- VSAM enhancements
  - Constraint relief: control blocks and buffers moved to 31 bit storage
    - New DLBL option: BUFDAT=RMODE31
      VSE/VSAM data buffers to be allocated in 31-bit Partition Getvis
  - GETVIS subpools for VSAM storage
  - SHOWCB macro shows new fields and attributes

Enhancements for z/VSE Components ...

- POWER enhancements
  - Direct punch to VSE library
  - Allow to cancel jobs whose output exceeds a defined limit
  - New display time operand to show job start time and date
  - Restart PNET passiv TCP/IP connection

- Librarian enhancements
  - Allows to catalog OBJ-type members from SYSLINK
  - LIBR RENAME enhanced to keep to original timestamp

- Additional Floating Point (AFP) support

Virtual Storage Constraint Relief

- Control blocks and system routines moved above 16 MB
  - Transparent to applications
  - I/O control blocks moved to SVA (31 bit)
    - New IODEV parameter:
      - IODEV=1023 (default) – all I/O control blocks in SVA (24bit)
      - IODEV=1024 – I/O control blocks moved to SVA (31 bit)
        such as PUBX, channel queue entries, ...
  - VSAM: most control blocks / routines moved to 31 bit area
  - DL/I: control blocks and routines moved to 31 bit area

- SVA (24 bit): size reduced by 1 MB in z/VSE environments

64 bit Addressing in z/VSE 4.3

- Processor storage support up to 32 GB

- 64 bit real addressing only, introduced with z/VSE 4.1

- 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)
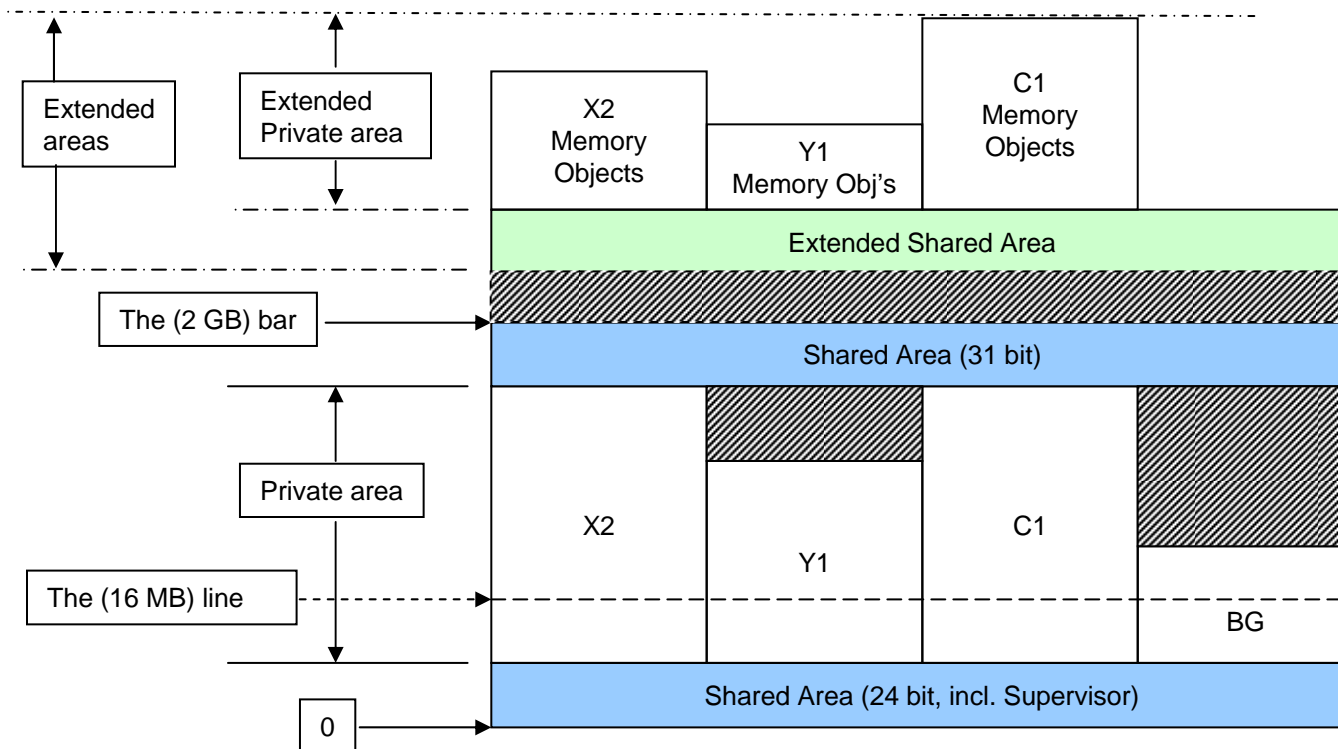
- 64 bit register support for programs

64 bit Addressing: Statement of Direction

- z/VSE intends to provide 64 bit virtual addressing for user applications

- APIs to manage 64 bit virtual memory objects
  - Memory objects are chunks of virtual storage obtained by a program
  - Allocated above the 2 GB line (above the bar)
  - Allows to keep more data in memory
  - Can improve performance
  - APIs to be ported from z/OS (Assembler APIs only)
  - Maximum VSIZE remains at 90 GB

- All statements regarding IBM's plans, directions, and intend are subjects to change or withdrawal without notice.

64 bit Addressing: Address Space Layout Example

More Information

… on VSE home page: http://ibm.com/vse

Hints and Tips for z/VSE V4.2:
  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

– z/VSE Using DB2 on Linux for System z
  http://www.redbooks.ibm.com/abstracts/sg247690.html?Open