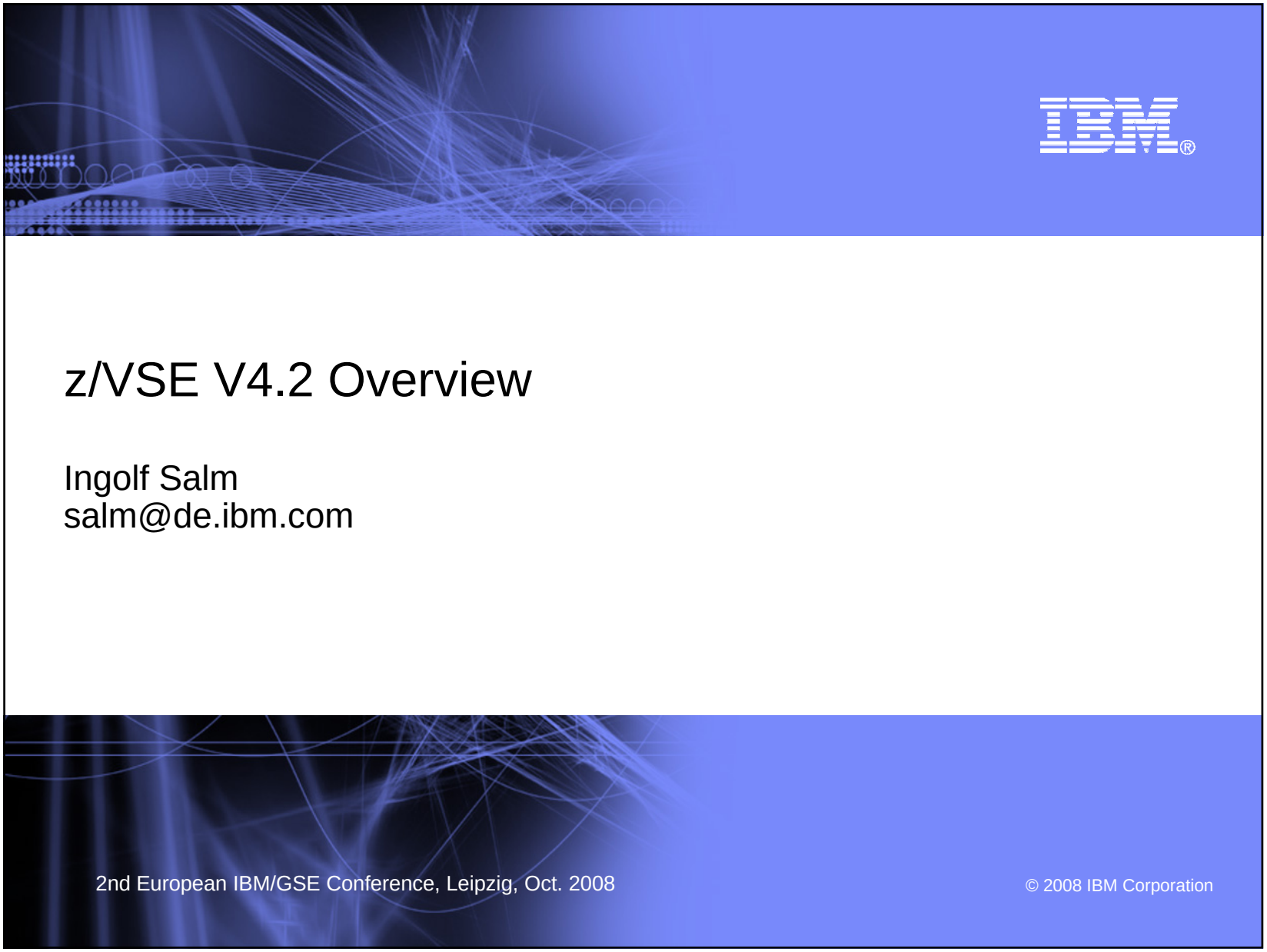
IBM
z/VSE V4.2 Overview
Ingolf Salm
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2nd European IBM/GSE Conference, Leipzig, Oct. 2008
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Agenda

- Roadmap
- VSE strategy
- z/VSE releases
- Hardware support
- Enhancements in z/VSE components / products
- Security / Encryption enhancements
- Encryption Facility for z/VSE V1.1

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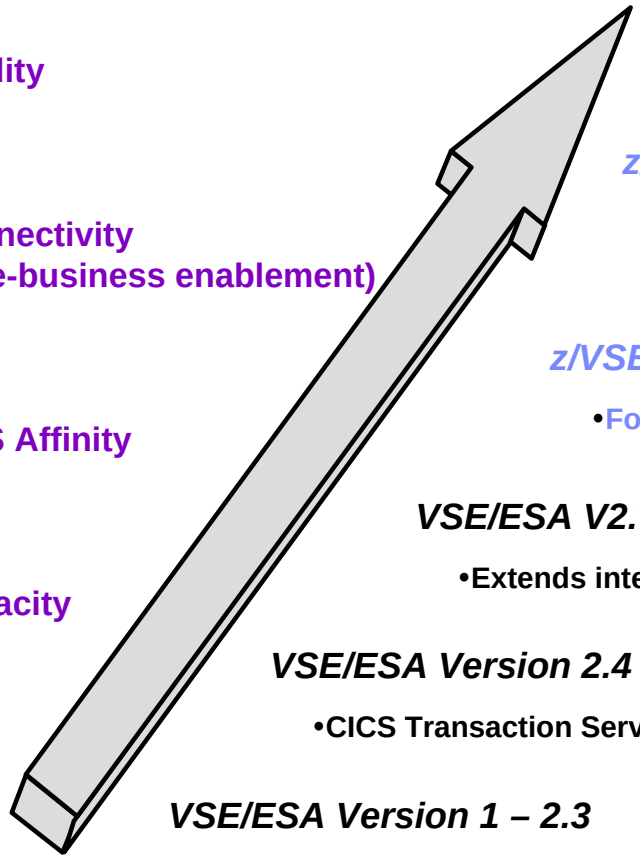
VSE Roadmap



Quality

Connectivity (e-business enablement)

z/OS Affinity

Capacity

z/VSE 4.2 Preview October 2007, GA 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**

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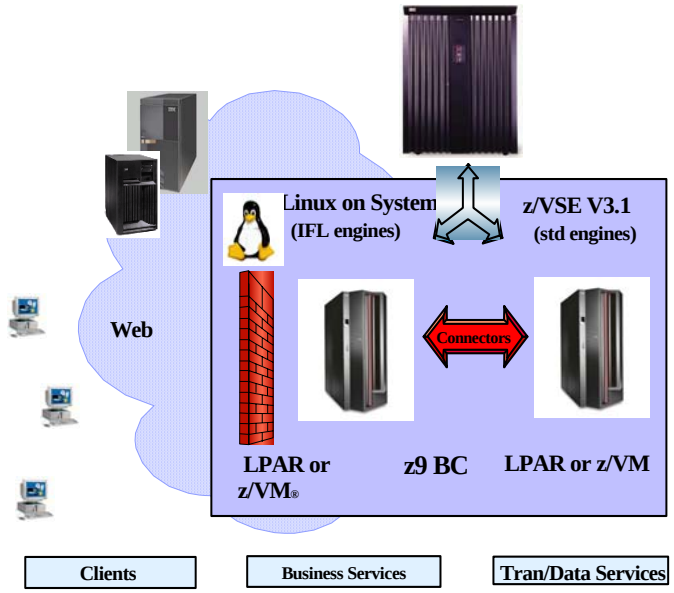
VSE Strategy

- 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?



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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)

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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**

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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

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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 still supported with z/VSE V4.2
  - Statement of Direction (SoD) for CICS/VSE
- FSU from z/VSE V3.1 and z/VSE V4.1

More than 30 customer/vendor requirements implemented !

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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 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 4.1 and 4.2 require z/VM 5.2 or later

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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

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Sub-capacity monitoring tool

- Tool can be activated on z9 EC, z9 BC, z10 EC, z10 BC 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 to be executed on z/VSE 4.1 / 4.2
- Required for Midrange Workload License Charges (MWLC)
  - Sub-capacity option
- 13 z/VSE products participate in MWLC

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64 bit real

- z/VSE 4.1 and z/VSE 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)

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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

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OSA Express3 Support

- OSA Express3 – new Open Systems Adapter card for z10
  - Successor of OSA Express2
- OSA Express3 1000BASE-T Ethernet
  - Integrated Console Controller, QDIO, non-QDIO, Open Systems Adapter for NCP
- Gigabit Ethernet (GbE), 10 Gigabit Ethernet (10 GbE)
  - Exploited by TCP/IP via DEFINE LINK,TYPE=OSAX command
  - OSA Express3 10 GbE (2 ports), GbE (z/VSE 3.1: 2 ports, z/VSE 4.1/4.2: 4 ports)
- Port specification for TCP/IP
  - OSA Express2 and OSA Express3 10 GbE features: only one port per CHPID to connect to the network
  - OSA Express3 GbE: two ports per CHPID – port 0 and port 1
    - To use port 0, no port specification is necessary
    - To use port 1, the port needs to be specified, e.g.:
      - DEFINE LINK,TYPE=OSAX,DEV=D00,DATAPATH=D02,OSAPORT=1

	z/VSE 3.1	**z/VSE 4.1**	**z/VSE 4.2**
OSA Express3 10 GbE	APAR DY46745 or z/VSE 3.1.3	APAR DY46717 or z/VSE 4.1.1	supported
OSA Express3 GbE, port 0	APAR DY46745 or z/VSE 3.1.3	APAR DY46717 or z/VSE 4.1.1	supported
OSA Express3 GbE, port 1	Not supported	APAR DY46717 or z/VSE 4.1.1, TCP/IP APAR PK66817	supported, TCP/IP APAR PK66817

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Exploitation of IBM System Storage Products

- IBM System Storage TS1120 Tape Drive
- **z/VSE 4.2: 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

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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 (DS6000, DS8000, ESS)
  - 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 SCSI disks in DS8000, DS6000, DS4000 and ESS series as well as disk subsystems from other manufacturers supported by SVC**

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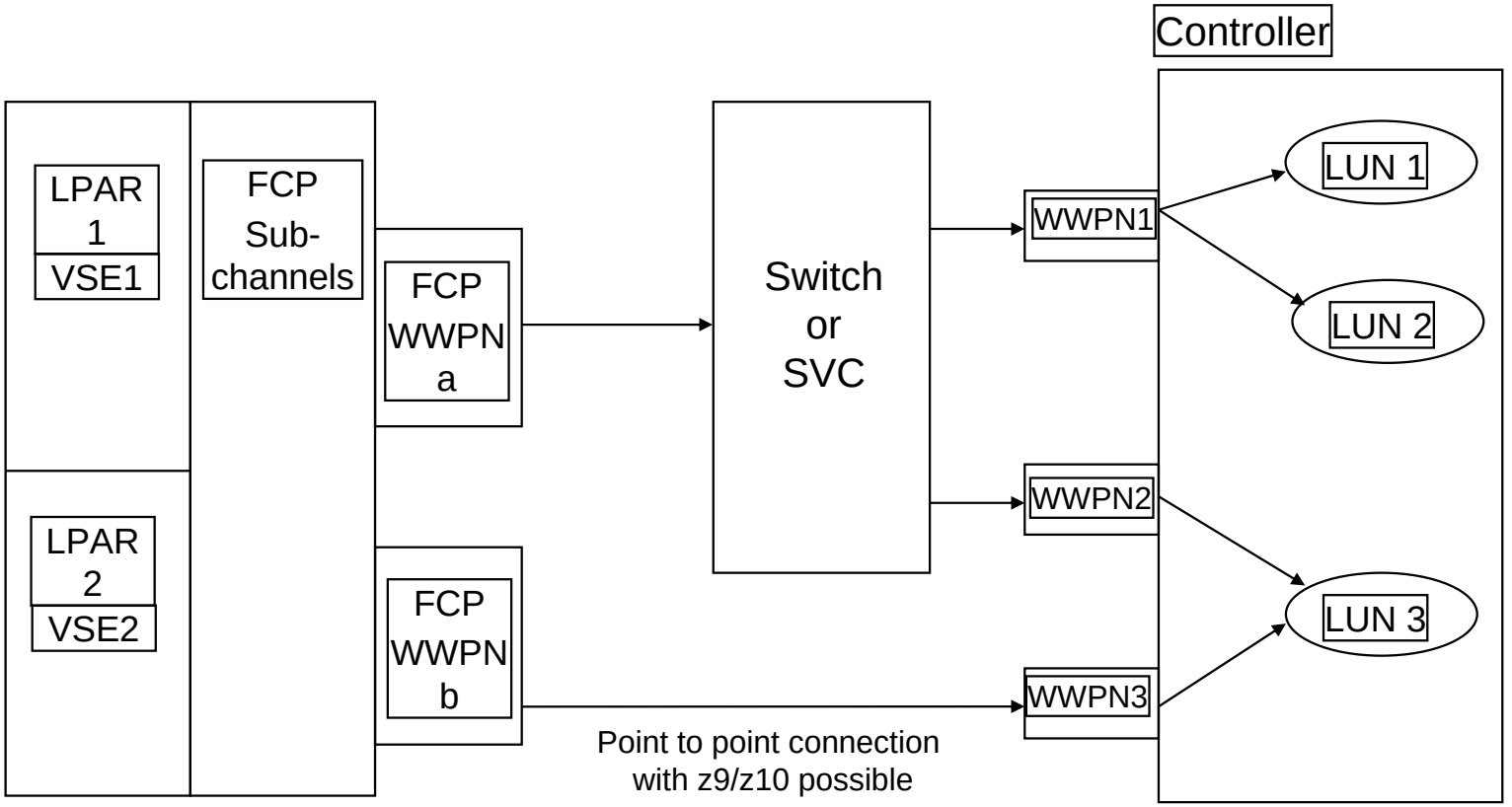
SCSI Support - Configuration



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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 target volume**
  - **Designed for temporary copies**
  - **Not supported in z/VM guests**

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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
- Multiple z/VSE jobs can transfer data to or from the same physical volume in parallel
- Can provide enhanced throughput
- Can help to consolidate small volumes to large volumes
- Is completely transparent to applications
- Multiple logical addresses to the same physical device
  = Base and up to 7 alias volumes for concurrent processing of I/O operations
- All I/O interfaces use the cuu of the base device only
- In z/VSE PAV processing can be dynamically activated or deactivated via
  the AR/JCL command SYSDEF PAV=START or STOP
- QUERY SYSTEM, VOLUME and “SIR SMF,VSE” provide PAV status information
- Delivered later via PTF

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z/VSE 4.2: PAV Examples

sysdef system,pav=Start

```
AR 0028 1K01I ALIAS DEVICE 778 FOR BASE 777 ESTABLISHED
AR 0028 1K01I ALIAS DEVICE 77E FOR BASE 777 ESTABLISHED
AR 0028 1K01I ALIAS DEVICE 779 FOR BASE 777 ESTABLISHED
AR 0028 1K01I ALIAS DEVICE 77A FOR BASE 777 ESTABLISHED
AR 0028 1K01I ALIAS DEVICE 77B FOR BASE 777 ESTABLISHED
AR 0015 1I40I READY
```

VOLUME

```
AR 0015 CUU   CODE DEV.-TYP   VOLID       USAGE    SHARED    STATUS    CAPACITY
.....
AR 0015 261    6E     2107-900       VIS001      UNUSED                          20 CYL
AR 0015 262    6E     2107-900       VIS002      UNUSED                          20 CYL
AR 0015 777    6E*B 2105-000        FRA740     UNUSED                       10017 CYL
```

VOLUME 777,DETAIL

```
AR 0015 CUU   CODE DEV.-TYP   VOLID       USAGE    SHARED    STATUS    CAPACITY

AR 0015 777    6E*B 2105-000        FRA740     UNUSED                       10017 CYL
AR 0015                      BASE TO 778,77E,779,77A,77B
```


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z/VSE 4.2: up to 512 tasks

- More tasks may help to
  - Grow CICS workloads
  - Ease migration from CICS/VSE to CICS TS
  - Consolidate VSE systems
  - Schedule more partitions
- Technical details:
  - System and maintasks are considered as old tasks
    - Old tasks are tasks with ids from 1 to 255, new tasks with ids >255
    - IPL SYS NPARTS=n defines number of partitions = number of maintasks
    - 32 tasks reserved for system
  - Still max. 32 tasks per partition (maintask + 31 subtasks)
  - No IPL option required
  - System option (SYSDEF) to set max. number of tasks and defaults
    - SYSDEF SYSTEM,NTASKS=(nnn|MAX),TASKS=(ANY|OLD)
      - Available subtasks = NTASKS-NPARTS-32
  - 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

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z/VSE 4.2: up to 512 tasks …

- Retrieve z/VSE task statistics

```
QUERY SYSTEM

AR 0015 NUMBER OF TASKS TOTAL LIMIT: 400
AR 0015 OLD SUBTASKS LIMIT:          163    IN USE: 3          MAX.  EVER USED:   4
AR 0015 NEW SUBTASKS LIMIT:          145    IN USE: 40         MAX. EVER USED:  50
AR 0015 DEFAULT TASK TYPE:           ANY
AR 0015 PARALLEL ACCESS VOLUME (PAV): INACTIVE
```


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

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z/VSE 4.2: CPU Balancing …

- Retrieve CPU time values: QUERY TD

```
CPU   STATUS      SPIN_TIME      NP_TIME   TOTAL_TIME  NP/TOT
 00   ACTIVE            0       237100       416698    0.568
 01   ACTIVE            0       157556       415229    0.379
 02   QUIESCED          0            0            0    *.***
 03   INACTIVE
                ------------------------------------------------------------------------
TOTAL                   0       394656       831927    0.474

                NP/TOTAL:  0.474      SPIN/(SPIN+TOT):  0.000
     OVERALL UTILIZATION:  179%        NP UTILIZATION:  85%

     CPU BALANCING (STOPQ):  INT:  10 SECONDS     THR:  50%

     ELAPSE TIME SINCE LAST RESET:        463433
```

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

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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
  - **IBM intends to deliver a new version of WebSphere MQ ***
- 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

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

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z/VSE 4.2 Enhancements

- EZA socket programming interface enhancements
  - Allows selection of a local TCP/IP stack
  - Support of READV and WRITEV functions
- Signal shutdown (signal quiesce) support
  - Initiated on HMC or SE
  - Will trigger a z/VSE console message:
    - `AR+0030 0W01D CONTINUE SYSTEM SHUTDOWN ? REPLY 'YES' OR 'NO'`
- 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
  - Task id of lock owner will be displayed in VSAM message, if lock request was not granted

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z/VSE 4.2 Enhancements …

- Language Environment (LE/VSE)
  - Enhancements to address customer and vendor requirements
  - High Level Language (HLL) user exit can now be a load module
  - New LE attention routine commands for runtime options
  - New trace (CEETRACE) functionality
  - LEVSE_Control_Center (LECC) = LE resource center
- **IBM plans to deliver an extension to Rational® Business Developer that enables the generation of EGL as COBOL source that can be compiled and deployed to z/VSE ***
- VSE/POWER
  - Enhancements to address customer requirements, such as
    - Manipulation of queue entries based on age (**hours and minutes** since creation)
    - Omit forms (FNO) grouping for list and punch
    - Display / Alter FCB (Forms Control Buffer) names
- VSE/Fast Copy
  - Exploitation of IXFP NOCOPY and DDSR (Delete Dataspace Request)
- z/VSE Connectors
  - Java-based e-business connectors updated to support JDK 1.6

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z/VSE 4.2: Security Enhancements

- Lightweight Directory Access Protocol (LDAP)
  - LDAP support enables users to sign-on 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
    - Not supported for batch jobs
  - z/VSE provides the LDAP client only
  - LDAP server running on a non-z/VSE system (e.g. Linux, z/VM)
  - z/VSE connected via the TCP/IP network to the LDAP server
  - Allows centralized management of userids
    - Password rules and password renewal can be enforced via LDAP server
  - Allows to integrate z/VSE into identity management systems
    e.g. provided by IBM Tivoli (IBM Tivoli Identity Manager, …)

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z/VSE 4.2: Security Enhancements

- Web Services – Simple Object Access Protocol (SOAP) 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)

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Data Encryption

- IBM TS1120 / TS1130 Tape Drive with encryption feature
  - TS1120 supported by z/VSE 3.1, z/VSE 4.1, z/VSE 4.2, **TS1130 supported by z/VSE 4.2 only**
  - 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 encrypt data key of encrypted tape cartridge available for TS1120 / TS1130**

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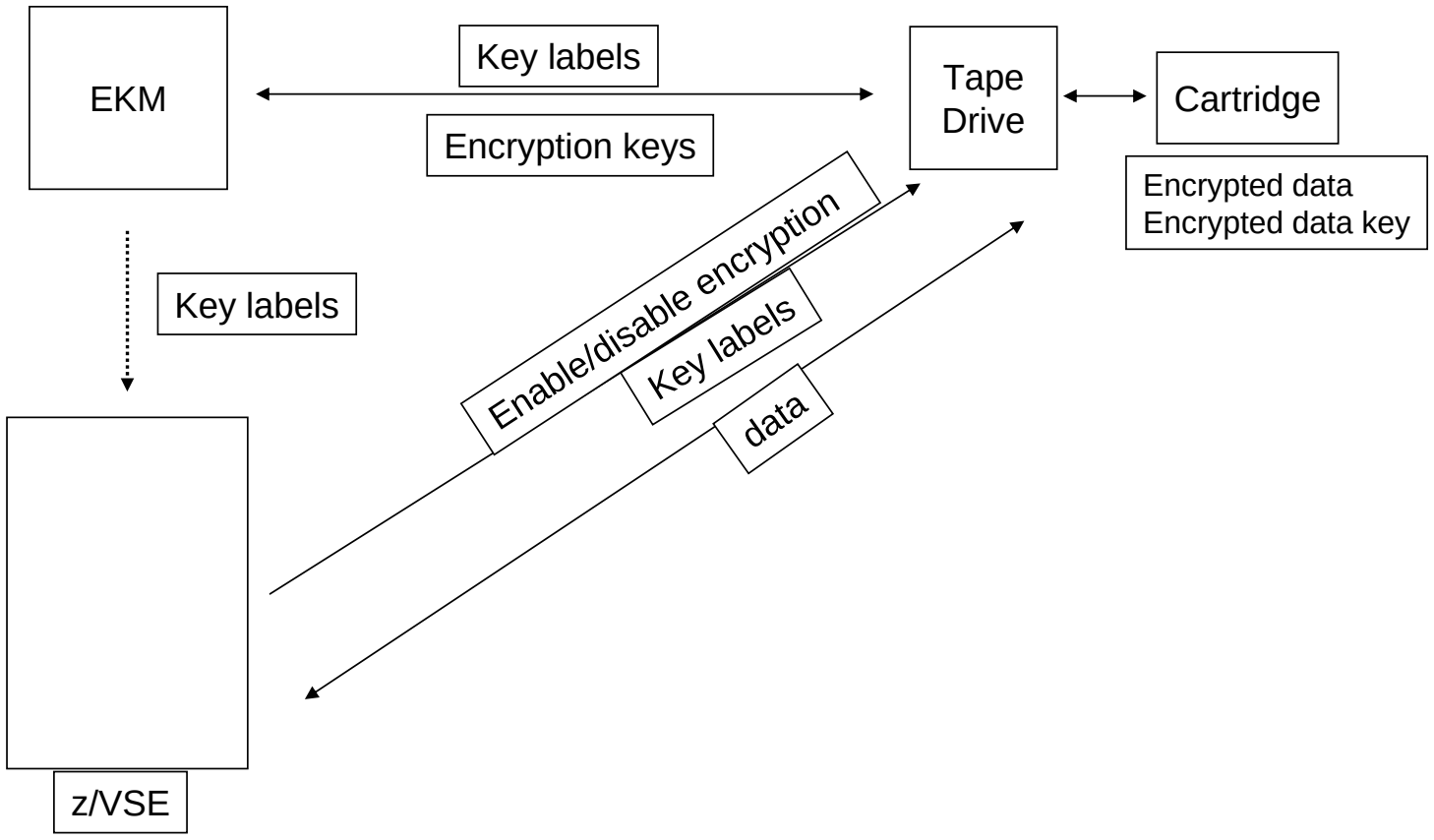
Data Encryption …



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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

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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
  - TS1120 / TS1130 preferred solution for high volume backup/archive
  - EF for z/VSE for limited backup/archive and/or exchange with partners with no TS1120 / TS1130

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More Information

- **… on VSE home page:**

http://ibm.com/vse

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