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Enterprise2014

New Announcements for z/VSE V5

Agenda

- zEnterprise BC12
- z/VSE V5.2
- z/VSE Statements of Direction
- zBC12 Hardware & Software Pricing Strategy
- z/VSE Linux Growth Offering
- Summary

IBM zEnterprise System
- Best in Class Systems and Software Technologies:

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IBM

A system of systems that unifies IT for predictable service delivery

Unified management for a smarter system:
zEnterprise Unified Resource Manager

- Part of the IBM System Director family, provides platform, hardware and workload management
- Unifies management of resources, extending IBM System z® qualities of service across the infrastructure

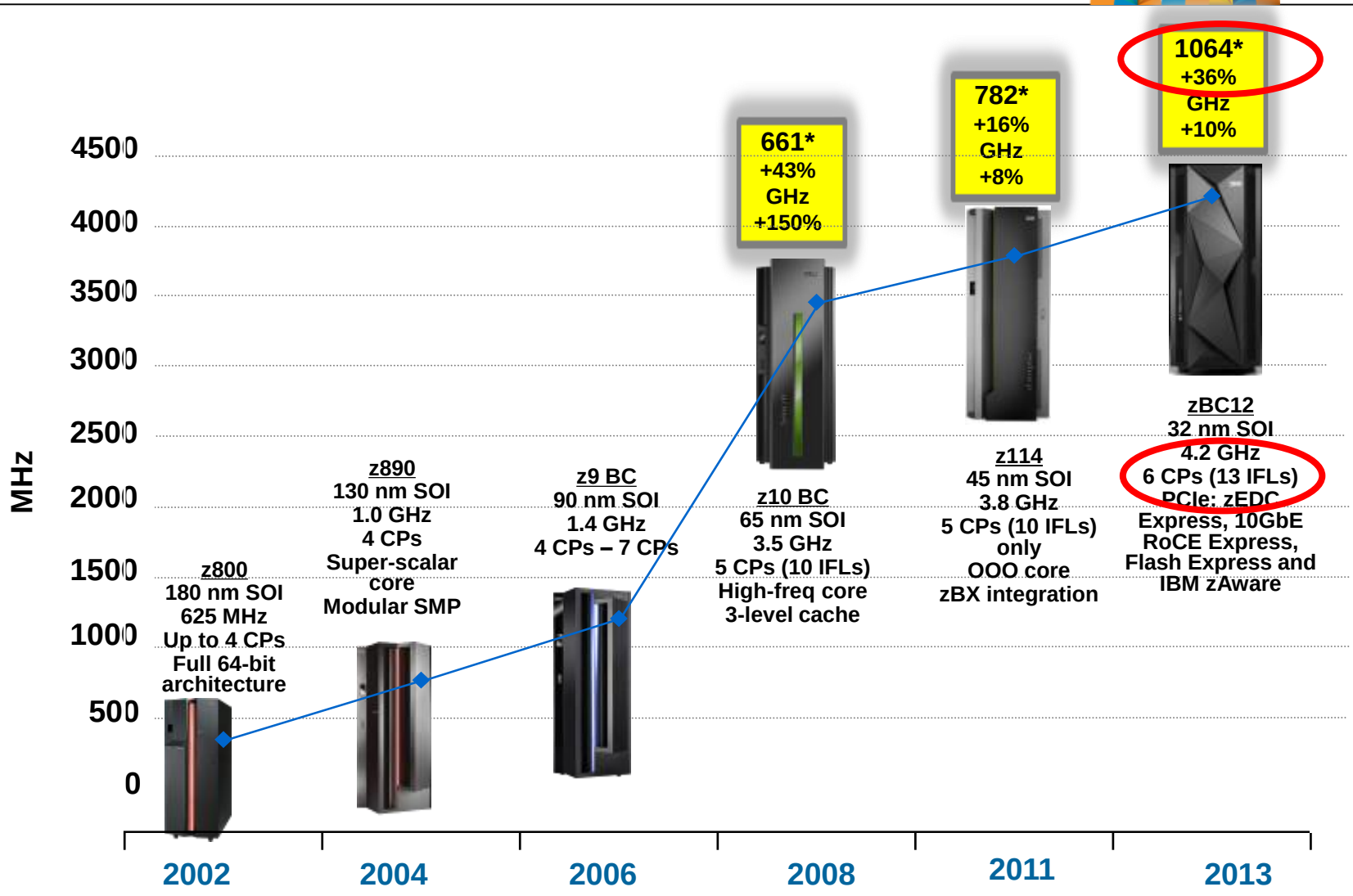
The world's fastest and most scalable system:
IBM zEnterprise™ 196
IBM zEnterprise™ 114
IBM zEnterprise™ EC12
IBM zEnterprise™ BC12

- Ideal for large-scale data and transaction serving and mission critical applications
- Most efficient platform for large-scale Linux® consolidation
- Leveraging a large portfolio of z/OS®, z/VSE™, and Linux on System z applications
- Capable of massive scale up, 26 MIPS to more than 70 BIPS

Scale out to a trillion instructions per second:
IBM zEnterprise BladeCenter® Extension (zBX)

- Selected IBM POWER7™ blades and IBM System x® Blades for tens of thousands of AIX®, Linux, and Windows applications
- High performance optimizers and appliances to accelerate time to insight and reduce cost
- Dedicated high performance private network

zBC12 continues the CMOS Mainframe heritage



*** MIPS Tables are NOT adequate for making comparisons of System z processors.**

IBM System z Business Class configuration comparisons

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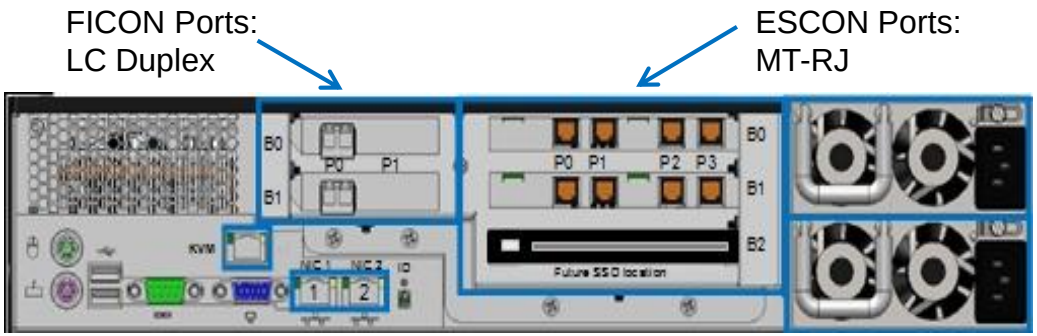
IBM

	z10 BC™ E10	z114 M05	z114 M10	zBC12 H06	zBC12 H13
Uniprocessor Performance	673 MIPS	782 MIPS		1064 MIPS	
z/OS Capacity	26-2760 MIPS	26 - 3139 MIPS		50 – 4958 MIPS	
Total System Memory	248 GB	120 GB	248 GB	240 GB	496 GB
Configurable Engines	10	5	10	6	13
Configurable CPs	0-5	0-5		0 – 6	
LPARS/LCSS	30/2	30/2		30/2	
HiperSockets	16	32		32	
I/O drawers/ PCIe I/O drawers	Up to 4	Up to 4	Up to 3	Up to 3	Up to 3
I/O slots per I/O drawer/ PCIe I/O drawer	8	8/32		8/32	
FICON® Channels	128	128		128	
OSA Ports	96	96		96	
ESCON® Channels	480	240		0	
IFB host bus Bandwidth PCIe Gen2 Bandwidth	6.0 GB/sec(IFB)	6.0 GB/sec (IFB) 8.0 GB/sec (PCIe)		6.0 GB/sec (IFB) 8.0 GB/sec (PCIe)	
ICB-4/ISC-3(8)/PSIFB	12/48/12	0/48/8 -16	0/48/16 - 32	0/32/8 -16	0/32/16 - 32
zIIP/zAAP Maximum Qty	5	2	5	4 (with Max of 2 CPs)	8 (with Max of 4/5 CPs)
IFL Maximum Qty	10	5 (3139 MIPS)	10 (5390 MIPS)	6 (4958 MIPS)	13 (8733 MIPS)
ICF Maximum Qty	10	5	10	6	13
Capacity Settings	130	130	130	156	156
Upgradeable	Upgrade to z114 or zBC12	Upgrade to zBC12 H06, H13	Upgrade to zBC12 H06, H13	Upgrade H06 to H13, H13 to zEC12 Model H20 (Radiator-based air cooled only)	

Optica PRIZM basics

- A purpose-built appliance designed exclusively for IBM System z; enables ESCON devices to be connected to FICON channels or fabrics
- Allows ESCON devices to connect to FICON channels and FICON fabrics/networks
  - Prizm also supports attachment of parallel (bus/tag) devices to FICON channels via ESBT module
- Converts FICON channels (CHPID type FC) into ESCON channels:
  - Available configurations: 1:2 (new), 1:4, and 2:8 [FICON : ESCON]
  - 1:2 configuration available for customers with 1-4 legacy device ports (in single or dual Prizm design)
  - Replace aging ESCON Directors with PRIZM (maintenance savings, and ESCD's announced as EOS)
- Qualified by the IBM Vendor Solutions Lab in POK for all ESCON devices; qualified for connectivity to Brocade and Cisco FICON switching solutions
  - Refer to: http://www.ibm.com/systems/z/hardware/connectivity/index.html
    - Products -- > FICON / FCP Connectivity -- > Other supported devices
- PRIZM is available via IBM Global Technology Services: ESCON to FICON Migration offering (#6948-97D)

Front View



Rear View

New innovations available on zBC12 (and zEC12)

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IBM

zEDC and zEDC Express	SMC-R and 10GbE RoCE Express	Flash Express	IBM zAware	Hybrid Computing
z/OS V2.1 z/VM V6.3+PTF	z/OS V2.1 z/VM V6.3+PTF	z/OS V2.1	z/OS V2.1	z/OS V2.1 z/VM V6.3 z/VSE V5.1
Compress your data 4X (efficient system data compression)* *Up to 118X reduction in CPU and up to 24X throughput improvement when zlib uses zEDC ***	*Network latency reduced up to 80% to improve service levels on web based claims and payment systems workloads**** *Up to 50% CPU savings for FTP file transfers across z/OS systems versus standard TCP/IP ***** *Up to 48% reduction in response time and 10% CPU savings for a sample CICS workload exploiting IPIC using SMC-R versus TCP/IP ****** *Up to 40% reduction in overall transaction response time for WAS workload accessing z/OS DB2 *******	*19% Reduction in total dump time for 36 GB standalone dump* *10x Faster response time and 37% increase in throughput compared to disk for morning transition* *28% Improvement in DB2™ throughput leveraging Flash Express with Pageable Large Pages (PLP)*	*Difficult or unusual problems can be found in 2 clicks not hours*	*240 Hybrid units shipped since inception* *84% Lower TCA with fit for purpose cloud architectures* *35% Lower infrastructure management costs*

* The amount of data sent to an SMF logstream can be reduced by up to 75% using zEDC compression – reducing logger overhead

** These results are based on projections and measurements completed in a controlled environment. Results may vary by customer based on individual workload, configuration and software levels

*** Based on internal IBM benchmarks of modeled z/OS TCP sockets-based workloads with request/response traffic patterns using SMC-R vs TCP/IP. The actual throughput that any user will experience will vary

**** Based on internal IBM benchmarks in a controlled environment using z/OS V2R1 Communications Server FTP client and FTP server, transferring a 1.2GB binary file using SMC-R (10GbE RoCE Express feature) vs standard TCP/IP (10GbE OSA Express4 feature). The actual CPU savings any user will experience may vary.

***** Based on internal IBM benchmarks using a modeled CICS workload driving a CICS transaction that performs 5 DPL (Distributed Program Link) calls to a CICS region on a remote z/OS system via CICS IP interconnectivity (IPIC), using 32K input/output containers. Response times and CPU savings measured on z/OS system initiating the DPL calls. The actual response times and CPU savings any user will experience will vary.

****** Based on projections and measurements completed in a controlled environment. Results may vary by customer based on individual workload, configuration and software levels.

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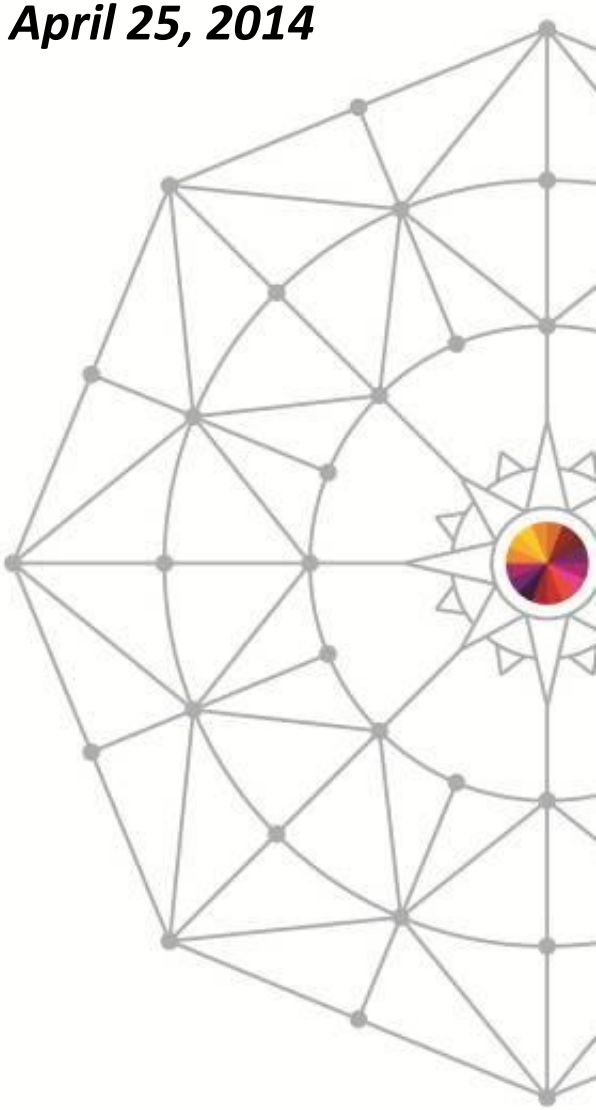
z/VSE V5.2

Announced April 7, 2014, General Availability planned for April 25, 2014

- Hardware Exploitation
  - Integration of PTFs delivered with z/VSE V5.1.2+
    - zBC12 exploitation (incl. support for Crypto Express4S, OSA-Express5S)
    - TS1140 tape drive (incl. encryption capabilities)
  - Virtual disk in 64-bit virtual memory objects
- Ease of Use
  - Install from DVD for ECKD devices
    - Tape-less system for initial install
- Networking
  - IPv6 enhancements
- Security
  - Auditing enhancements
  - OpenSSL integration
- Customer Requirements



z/VSE V5.2
– Exploitation of IBM zEnterprise EC12 and BC12

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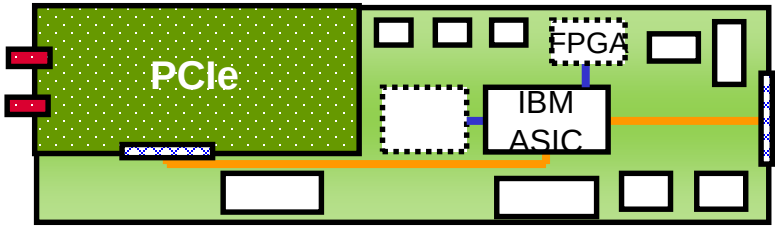
IBM

- Configurable Crypto Express4S – new with zEC12/zBC12
  - z/VSE 5.2 supports the Crypto Express4S adapter in both, IBM Common Cryptographic Architecture (CCA) coprocessor and accelerator mode.
  - It can be used both in an LPAR and z/VM guest environment.
  - Each cryptographic coprocessor includes a general-purpose processor, non-volatile storage, and specialized cryptographic electronics.
  - The Crypto Express4S feature provides tamper-sensing and tamper-responding, high-performance cryptographic operations.

- OSA-Express4S 1000BASE-T – new with zEC12
  - Auto-negotiation to 10, 100, 1000 Mbps
  - 2 ports per card



- OSA-Express5S 1000BASE-T – new with zBC12
  - 1000BASE-T supported with existing z/VSE functionality (i.e. no z/VSE PTF required)
  - Allow to configure OSA-Express5S with OSA/SF in HMC

z/VSE V5.2 – Exploitation of IBM System Storage

- **IBM System Storage** TS7700 **Virtualization Engine Release 3.1**
  - Copy Export function can be used for disaster recovery purposes
  - Multi-Cluster Grid Support enables disaster recovery or high availability solutions

TS7700

- FCP-attached SCSI disks **can be used with:**
  - IBM Storwize® V7000 Midrange Disk System
  - IBM Storwize® V5000 Midrange Disk System
  - IBM Storwize® V3700 Entry Disk System
  - IBM XIV® Storage System
  - IBM SAN Volume Controller
  - IBM FlashSystem™

FlashSystem 720 / 820

- **IBM System Storage** DS8870 **Release 7.2**
  - Newest member of the IBM System Storage DS8000 series
  - Supports FICON-attached ECKD and FCP-attached SCSI disks

- **IBM System Storage** TS1140 **with systems managed encryption**
  - Tape Drive Model 3592-E07 – fourth generation
  - Designed to provide higher levels of performance, reliability and capacity

XIV

TS1140

Storwize V7000

Midrange size system with great high-end features

High-end system with grid architecture

New IBM FlashSystem Storage extends z/VSE and ELS Offering

The new IBM SAN Volume Controller and IBM FlashSystem bundle offers an economically priced storage solution for our Enterprise Linux Server clients.

Right combination of performance and function:

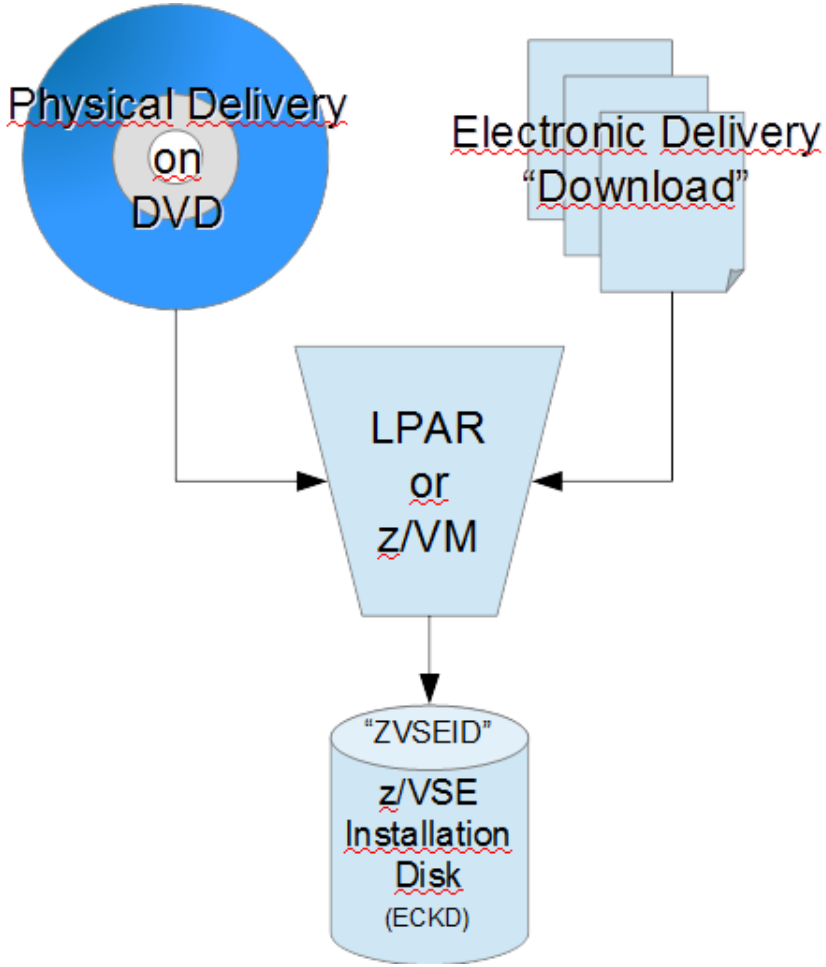
The extreme performance of IBM FlashSystem with IBM MicroLatency™

- Advanced storage functionality of IBM SVC
  - *Thin Provisioning* – allocate storage "just in time"
  - *Easy Tier* – storage efficiency
  - *FlashCopy* – point in time copies
  - *Mirroring/Copy Services* – data replication and protection
  - *Real-Time Compression* – up to 5X more data in the same physical space
- An ability to cost effectively deploy quickly and realize immediate results

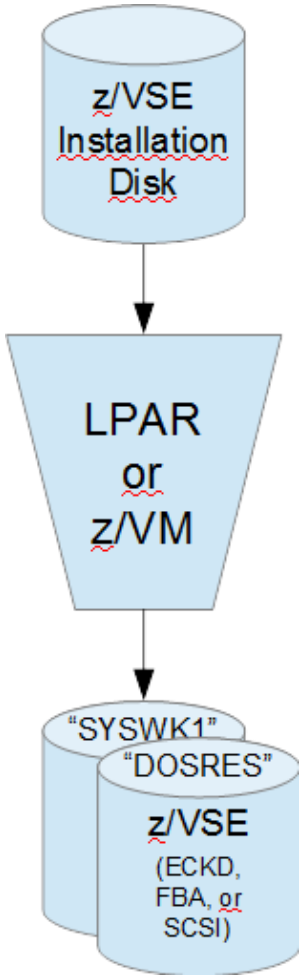
IBM SAN Volume Controller (SVC) and IBM FlashSystem bundle are supported 'out of the box' by z/VSE, z/VM and Linux on System z.

z/VSE V5.2 – Install from DVD

Step 1: Create a z/VSE Installation Disk



Step 2: Install from Disk



z/VSE V5.2 – IPv6 enabled connectors

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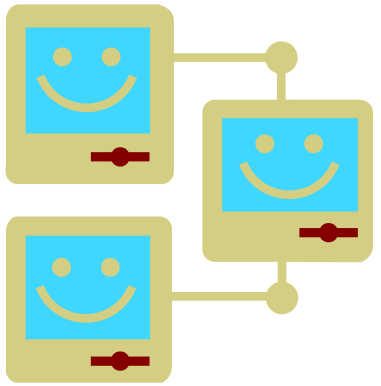
IBM

The following components have been IPv6 enabled with z/VSE V5.2:

- e-business Connectors
  - VSE Connector Server and Client
  - VSE Script Server and Client
  - VSAM Redirector Server
  - Database Connector (already IPv6 capable in z/VSE 5.1)
  - VSE HTTP Client
  - VSE SOAP Client
  - VSE LDAP Client
- SNMP Monitoring Agent and Trap Client
- VTAPE
- IUI Dialogs dealing with VTAPE



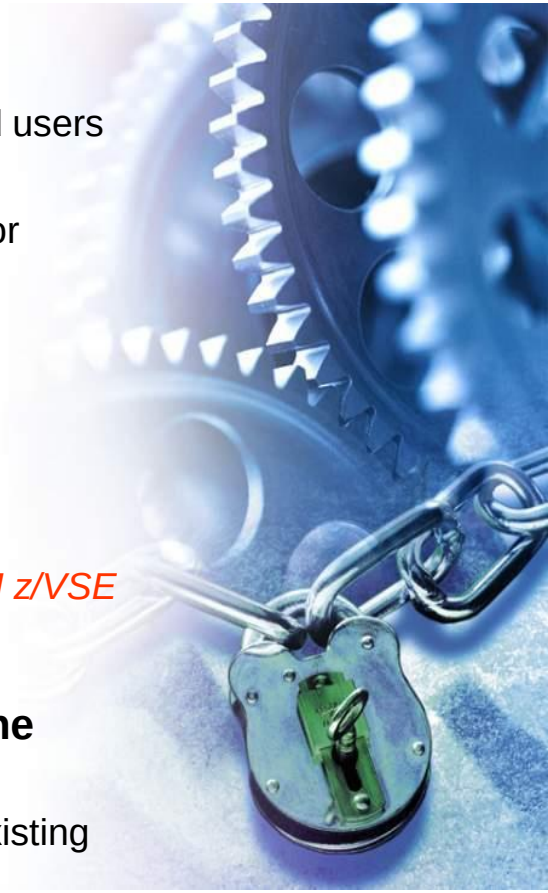
→IPv6 support is implemented in a way that it can transparently run with any TCP/IP stack on z/VSE:

→ If the TCP/IP stack supports IPv6, then you can use IPv6 addresses.

→ If the TCP/IP stack supports only IPv4, then you can use IPv4 addresses only.

→ If the TCP/IP stack supports both (dual stack), then IPv6 and IPv4 addresses can be used.

z/VSE V5.2 – Security enhancements

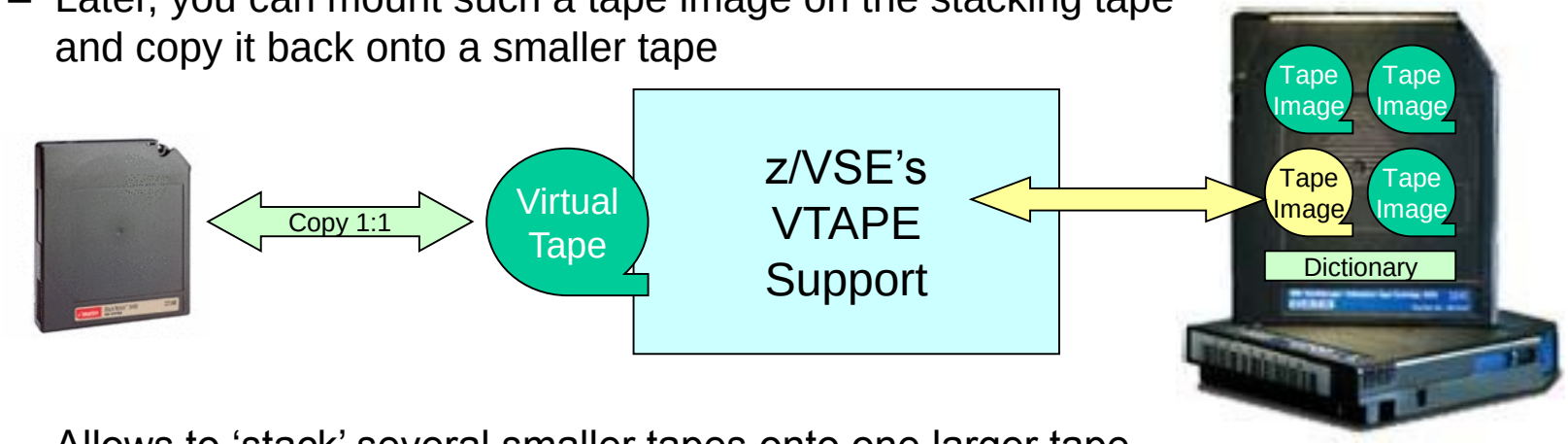


- New Auditor Authorization
  - Separation of roles: Administrator and Auditor may be separately defined users
  - New special authorization type AUDITOR
  - Exclusive BSTADMIN command 'PF AUDIT ADMINACC|NOADMACC' for Auditors
- OpenSSL integration
  - OpenSSL 1.0.1e - available via PTF (UD53983) since December 2013
  - Exploited by IPv6/VSE with PTF UK98397
  - New functionality: TLS v1.2 with new SSL cipher suites using SHA-256
  - Extensive documentation in new Redbook *Enhanced Networking on IBM z/VSE* http://www.redbooks.ibm.com/abstracts/sg248091.html?Open
- Basic Security Manager **- restriction of defining Group-Names the same as UserIds**
  - BSM rejects the definition of new groups that have the same name as existing user IDs
- z/VSE Monitoring Agent **- added IP filter**
  - Only if the source IP of an incoming packet matches a ruleset (which is part of the z/VSE Monitoring Agent's configuration file), the packet will be processed.

z/VSE V5.2 – Stacking tape support

- z/VSE V5.2 provides Stacking Tape support
  - The VTAPE function provides tape-to-tape copy on a n:1 basis
    - By stacking multiple **tape images** on a single high-capacity tape cartridge (3592)
  - Basically, it's a VTAPE-on-Tape
    - Similar to VTAPE-on-VSAM ESDS or VTAPE-on-remote file

- Allows to stack multiple (old-generation) tapes onto a single high capacity tape
  - You copy an **entire** old-generation tape onto the stacking tape
  - The stacking tape contains a **directory** of tape images contained
  - Later, you can mount such a tape image on the stacking tape and copy it back onto a smaller tape



  - Allows to 'stack' several smaller tapes onto one larger tape
  - A modern 3592 cartridge has space for dozens/hundreds of old-generation tapes

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Subject to change or withdrawal without notice, representing IBM goals and objectives only.

z/VSE continues to demonstrate IBM's commitment

Hardware Support
More Capacity
Quality
z/OS Affinity
Interoperability
Protect Integrate Extend

z/VSE V5.1 - 4Q2011
- zEnterprise exploitation
- IEDN connection to zBX
- 64-bit virtual memory objects
- ALS to System z9
- z/VSE z/VM IP Assist (VIA)

+ SoD: CICS Explorer, LFP in LPAR

z/VSE V5.1.1 - 2Q2012
- CICS Explorer Monitoring
- Universal database connector
- Linux Fast Path in LPAR

z/VSE V5.1.2 - 2Q2013
- 64-bit I/O for applications
- Networking enhancements
- Security enhancements

+ SoD: CICS Explorer Update, DVD Install, IPv6/VSE Price Reduction

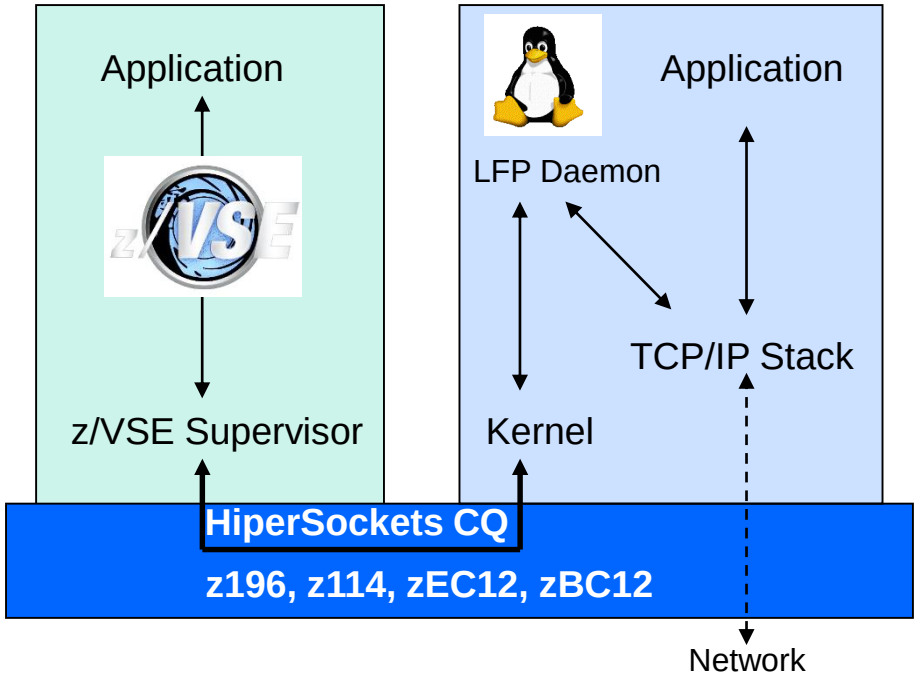
z/VSE V5.2 - 2Q2014
- Additional zEnterprise exploitation
- DVD install
- Networking and security enhancements

+ SoD: New version of z/VSE, ALS to System z10, support for channels & containers in CICS TS for z/VSE

Linux Fast Path in LPAR

IBM intends to provide the Linux Fast Path function for LPAR environments exploiting the zEnterprise HiperSockets Completion Queue. For more information see the statement of direction in Hardware Announcement AG11-0139, dated July 12, 2011.

- SOD launched in 10/2011
- Fulfilled with z/VSE V5.1.1 in 6/2012



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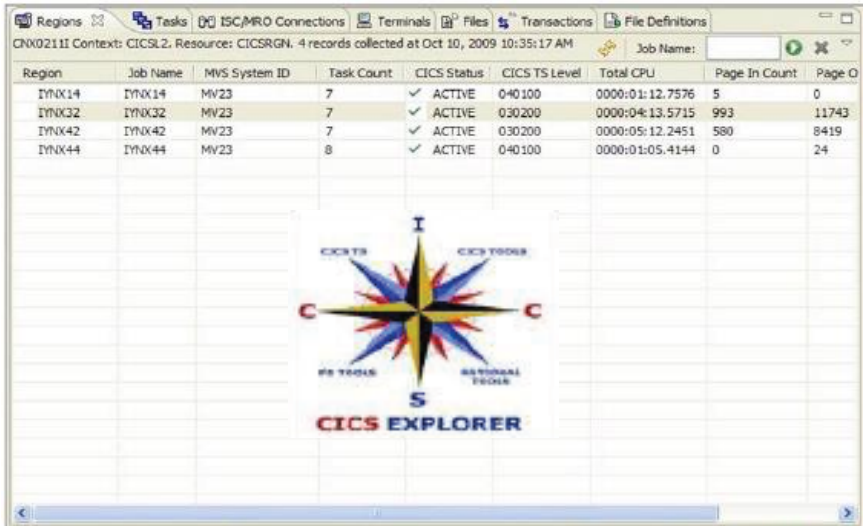
CICS Explorer for z/VSE

IBM intends to provide CICS Explorer capabilities for CICS TS for VSE/ESA to deliver additional value.

- SOD launched in 10/2011
- Fulfilled with z/VSE V5.1.1 in 6/2012



CICS Explorer Monitor

- New systems management framework for CICS TS
- Consists of client and server part
- Based on the Eclipse Rich Client Platform (RCP)
- Scalable and intuitive way to monitor CICS TS systems on z/VSE
- Can be extended via plug-ins
- Client part of CICS Explorer common for z/OS and z/VSE
- Server part requires CICS TS and z/VSE V5.1

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CICS Explorer for z/VSE – Update capability

IBM intends in the future to enhance IBM CICS Explorer for IBM Transaction Server for VSE/ESA to provide updates to CICS resources.

- SOD launched in 4/2013

CICS Explorer Update

- Update CICS resources as you would do with transactions on your CICS terminal
- Enable / disable CICS resources
- Change selected CICS definitions
- etc.

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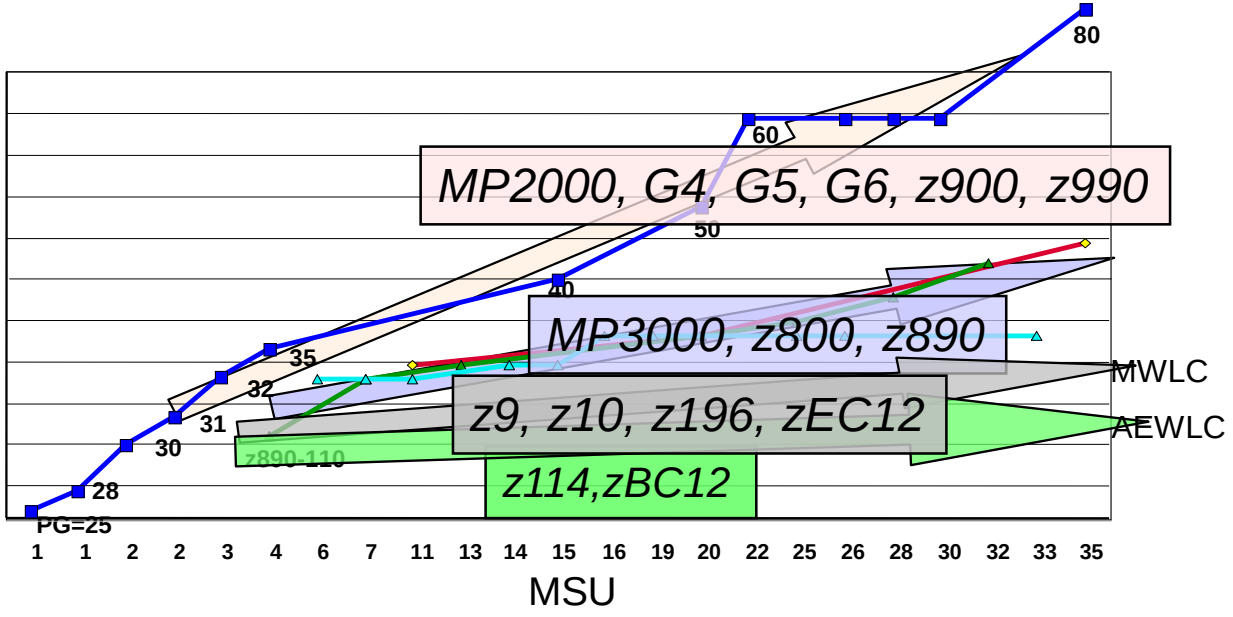
IPv6/VSE price reduction

It is planned to reduce the AEWLC and MWLC list price of IPv6/VSE V1.1.

- SOD launched in 4/2013
- Fulfilled with IPv6/VSE V1.1 in 7/2013



- Announced approx. 28% price reduction for the base price of IPv6/VSE V1.1 on all tiers

http://www-01.ibm.com/common/ssi/cgi-bin/ssialias?subtype=ca&infotype=an&appname=iSource&supplier=897&letternum=ENUS313-026

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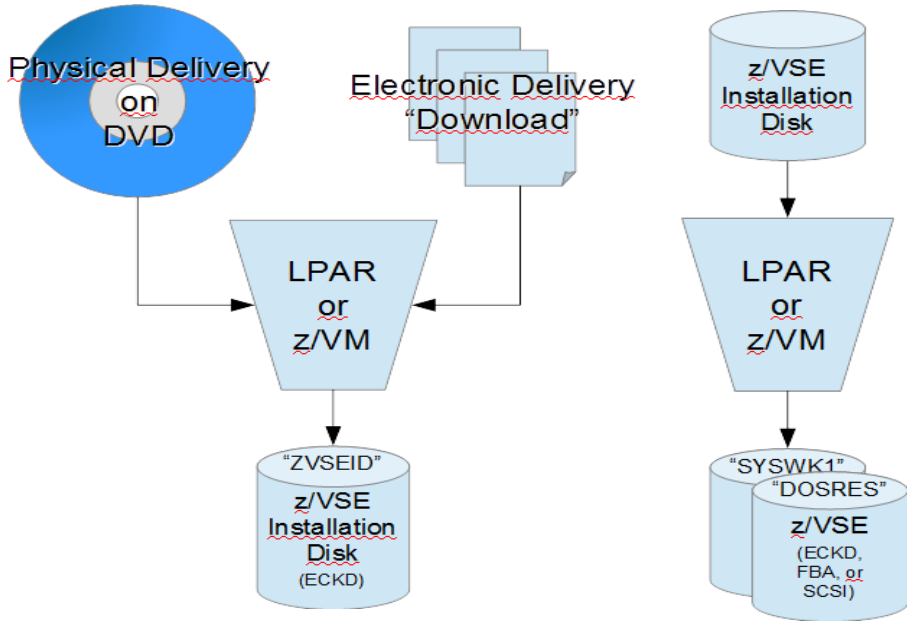
Install from DVD

IBM intends to add functionality that allows initial installation of z/VSE without requiring a physical tape. Clients who use a tape for initial installation only, may no longer be forced to include a tape in the z/VSE configuration. With this ease of use function IBM will fulfill client requirements.

- SOD launched in 4/2013
- Fulfilled with z/VSE V5.2 in 4/2014



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z/VSE Central Functions becomes z/VSE

IBM intends to rename the product z/VSE Central Functions to z/VSE in a new z/VSE version.

- SOD launched in 4/2014

- Today:
  - z/VSE CF V7 is contained in z/VSE V3
  - z/VSE CF V8 is contained in z/VSE V4
  - z/VSE CF V9 is contained in z/VSE V5

- Future:
  - z/VSE CF Vx will be eliminated and renamed into z/VSE Vnext

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ALS to IBM System z10

z/VSE V5.2 will be the last release that supports IBM System z9. Future releases of z/VSE will support IBM System z10 and higher.

- SOD launched in 4/2014
- Remember:
  - z/VM V6 requires System z10 and higher

IBM Servers	z/VSE Vnext	z/VSE V5.2	z/VSE V5.1	z/VSE V4.3
IBM zEnterprise EC12 & BC12	✔	✔	✔	✔
IBM zEnterprise 196 & 114	✔	✔	✔	✔
IBM System z10 EC & z10 BC	✔	✔	✔	✔
IBM System z9 EC & z9 BC	✘	✔	✔	✔
IBM eServer zSeries 990 & 890	✘	✘	✘	✔
IBM eServer zSeries 900 & 800	✘	✘	✘	✔

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CICS TS for z/VSE

IBM intends to provide new capability in a future release of IBM CICS Transaction Server for z/VSE to provide:

i. Updates to CICS resources for CICS Explorer, and

ii. Channels and Containers to enable the transfer of large amounts of data between CICS applications.

- SOD launched in 4/2014
- Constraint Relief
  - Channels & Containers for passing data from one CICS program to another without being limited by 32K size of z/VSE COMMAREA
- Foundation for additional functional enhancements to CICS TS for z/VSE

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CICS DDM stabilization

Support for CICS Distributed Data Management (DDM) is stabilized in CICS TS for VSE/ESA V1.1.1. In a future release of CICS TS for z/VSE, IBM intends to discontinue support for CICS DDM.

- SOD launched in 4/2014

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Agenda

- zEnterprise BC12
- z/VSE V5.2
- z/VSE Statements of Direction
- zBC12 Hardware & Software Pricing Strategy
- z/VSE Linux Growth Offering
- Summary

z114 pricing strategy

Our customers are focused on ...	*IBM taking action ...*
Price performance on the stack, pricing linked to increased capability and performance	▪ Deliver price performance on Hardware, Software, and Maintenance ▪ Introduce $75k z114 Hardware Entry Price (down 25% from z10 BC) ▪ z114 Unified Resource Manager priced per connection
TCA and short term ROI and cost savings	▪ Memory - Cutting prices by 75% versus z10 BC, and instituting upgrade charge ▪ Specialty Engines - Cutting IFL prices by 27% (zIIP's/zAAP's by 16%) versus z10 BC, and instituting upgrade charge
MLC software savings and unit cost improvement	▪ Announcing new metric "Advanced Entry Workload License Charges" (AEWLC) ▪ Providing price performance of up to 18% versus z10 BC for z/OS workloads, and up to 5% versus z10 BC for z/VSE workloads
Competitive pricing for new workloads versus off-platform alternatives	▪ Continue Solution Edition strategy to aggressively compete for new workloads & applications
Financial benefit when growing capacity on the platform	▪ Providing incremental stack savings for stack capacity growth

Note: Items marked in 'blue' are of relevance to z/VSE, z/VM, and/or Linux on System z. All prices are US prices, will vary by GEO.

z114 pricing strategy – changes with zBC12

Our customers are focused on ...	*IBM taking action ...*
Price performance on the stack, pricing linked to increased capability and performance	▪ Deliver price performance on Hardware, Software, and Maintenance ▪ Introduce $75k z114 Hardware Entry Price (down 25% from z10 BC) **– flat w/ zBC12, up from 26 to 50 MIPS** ▪ z114 Unified Resource Manager priced per connection
TCA and short term ROI and cost savings	▪ Memory - Cutting prices by 75% versus z10 BC, and instituting upgrade charge **– flat w/ zBC12** ▪ Specialty Engines - Cutting IFL prices by 27% (zIIP's/zAAP's by 16%) versus z10 BC, and instituting upgrade charge **– flat w/ zBC12, 36% more capacity**
MLC software savings and unit cost improvement	▪ Announcing new metric "Advanced Entry Workload License Charges" (AEWLC) **– same metric w/ zBC12** ▪ Providing price performance of up to 18% versus z10 BC for z/OS workloads, and up to 5% versus z10 BC for z/VSE workloads **– add'l up to 5% versus z114**
Competitive pricing for new workloads versus off-platform alternatives	▪ Continue Solution Edition strategy to aggressively compete for new workloads & applications **– new z/VSE Linux growth offering w/ zBC12**
Financial benefit when growing capacity on the platform	▪ Providing incremental stack savings for stack capacity growth **– flat w/ zBC12**

Note: Items marked in 'blue' are of relevance to z/VSE, z/VM, and/or Linux on System z. All prices are US prices, will vary by GEO.

zBC12 pricing strategy

- Gain MLC price performance (p/p) for zBC12 via enhanced AEWLC pricing
  - *"Technology Update Pricing for AEWLC"*
  - Maintain existing AEWLC software metric, prices and existing AEWLC contract
- Deliver 4% - 5% MLC p/p on average coupled with targeted GPA (General Price Action) on EWLC metric
  - Price performance compared to AEWLC on z114 (flat capacity assumed)
  - Targeted price performance tied to capacity
- EWLC GPA +3% increase effective January 1, 2014
  - GPA will impact z10 BC and older machines only
- Increased p/p at very low-end aligned with new HW entry point of 50 MIPS
  - Historical mainframe entry point was 26 MIPS, is now 50 MIPS with zBC12
  - Maintain zELC model A01 pricing for zBC12 entry machine
- Hold Linux engine (IFL) PVU rating flat at 100 PVUs
  - Projected engine performance improvement approximately 36%

Note: Items marked in 'blue' are of relevance to z/VSE, z/VM, and/or Linux on System z. All prices are US prices, will vary by GEO.

Technology Update Pricing for AEWLC leverages the existing AEWLC pricing metric

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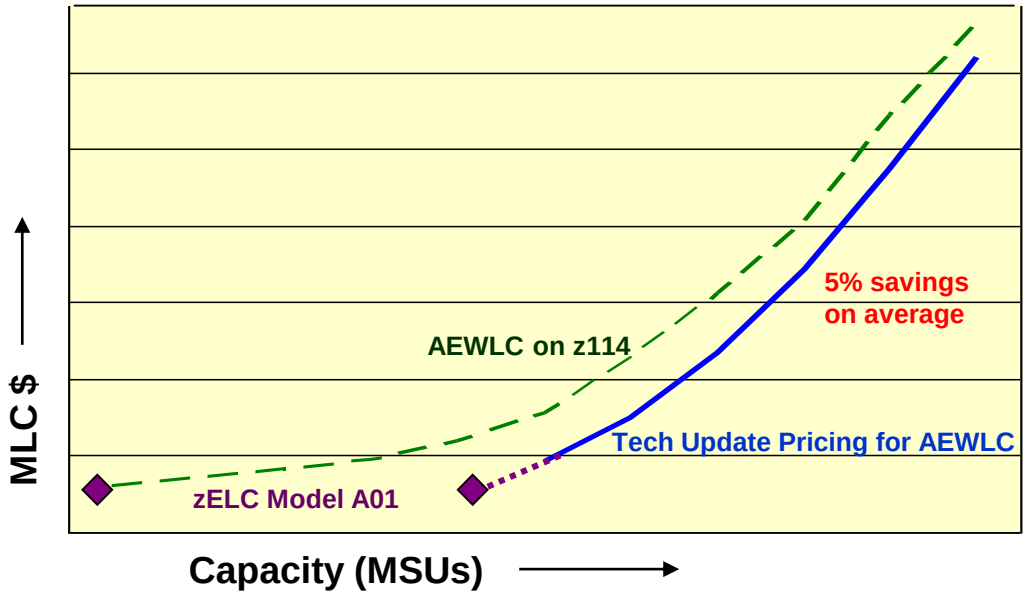
… while offering price performance for zBC12

Illustration of Technology Update Pricing for AEWLC & entry price points on zBC12 vs. existing on z114



Technology Update Pricing for AEWLC
zBC12 Pricing

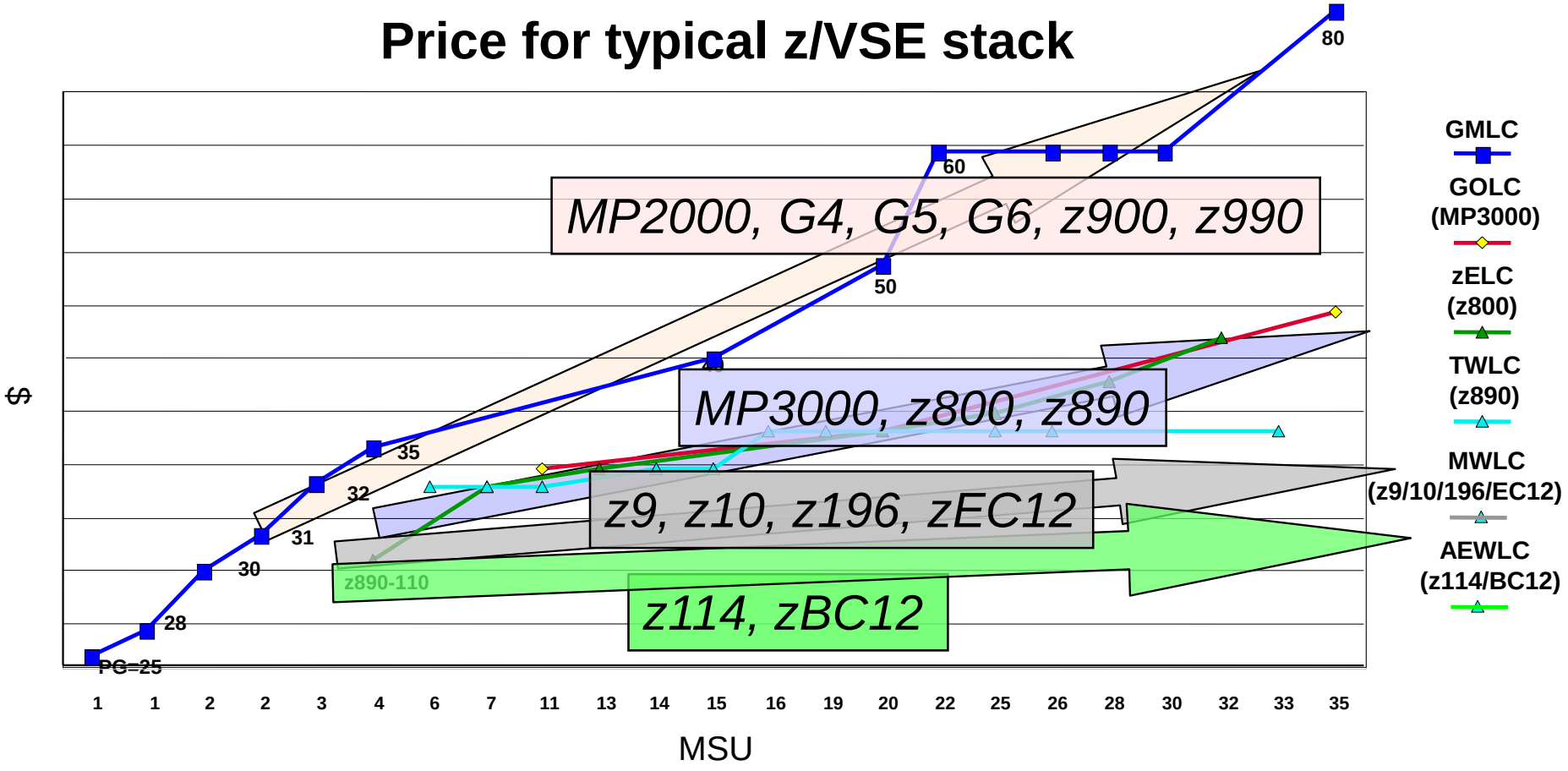
Machine Rated MSU Range	Reduction to AEWLC
1-7 MSU	5.0%
8-17 MSU	5.0%
18- 30 MSU	5.0%
31-45 MSU	5.0%
46-87 MSU	4.0%
88-175 MSU	4.0%
176-260 MSU	4.0%
261 - 315 MSU	4.0%
316 - 390 MSU	4.0%
390 + MSU	4.0%

* Reductions to AEWLC calculated using the Full Capacity MSUs of zBC12 machines. Sample stack includes z/OS, DB2, CICS and WMQ.

Benefits of the Technology Update Pricing for AEWLC:

- Technology Update Pricing for AEWLC provides visible customer savings
- Enables very targeted price performance aligned to capacity
- Applies to MLC pricing only with no impact to OTC price points
- Delivers with reduced complexity – no new pricing metric to learn
- Same AEWLC agreement as already used for z114
- Extending zELC A01 pricing to zBC12 entry also provides increased p/p at zBC12 entry model

MWLC on z9/z10/z196 and zEC12, AEWLC on z114 and zBC12



Typical z/VSE stack consists of z/VSE Operating System, LE, CICS TS, VTAM, TCP/IP, DB2

MLC Price Performance across HW generations for z/VSE

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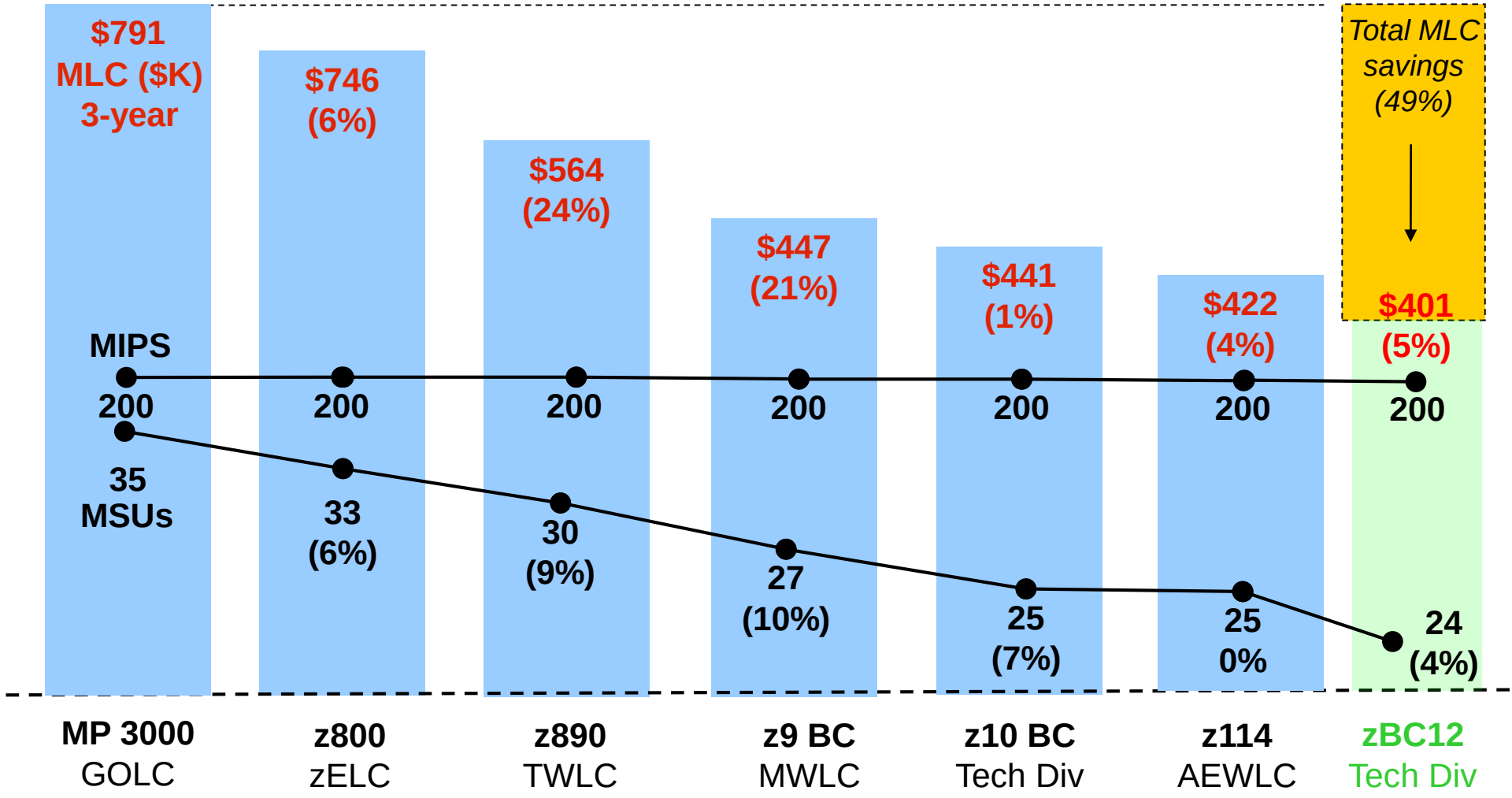
**** 200 MIPS example for a typical z/VSE stack***

* All prices are US prices, will vary by GEO.



* MLC savings will vary significantly by customer - actual customer configuration must be priced out to be accurate.

* A typical z/VSE stack includes z/VSE CF, CICS TS, VTAM, TCP/IP, DB2, Ditto, Cobol, HLASM

MLC price performance across HW generations for z/OS

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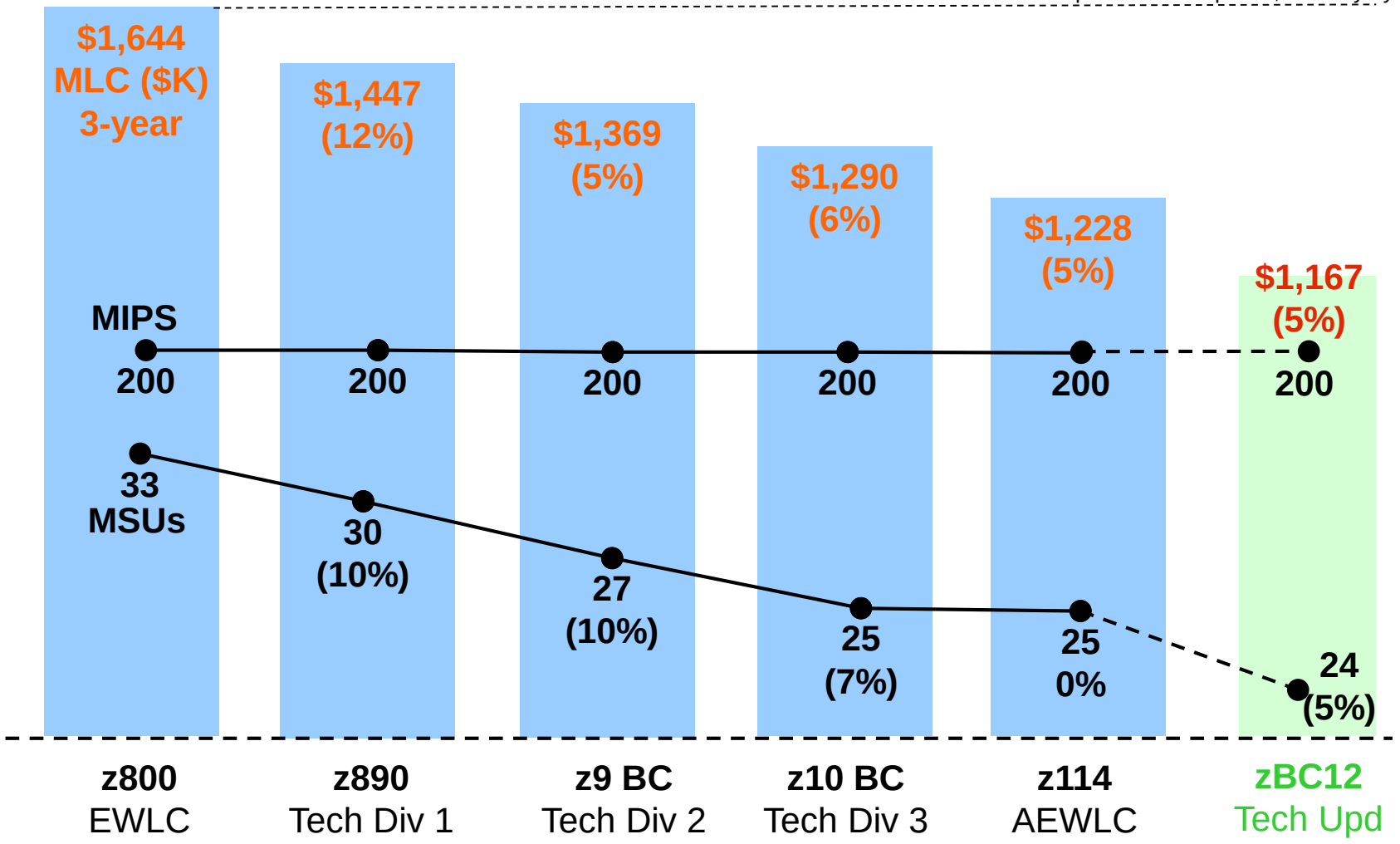
**** 200 MIPS example for a typical z/OS stack***

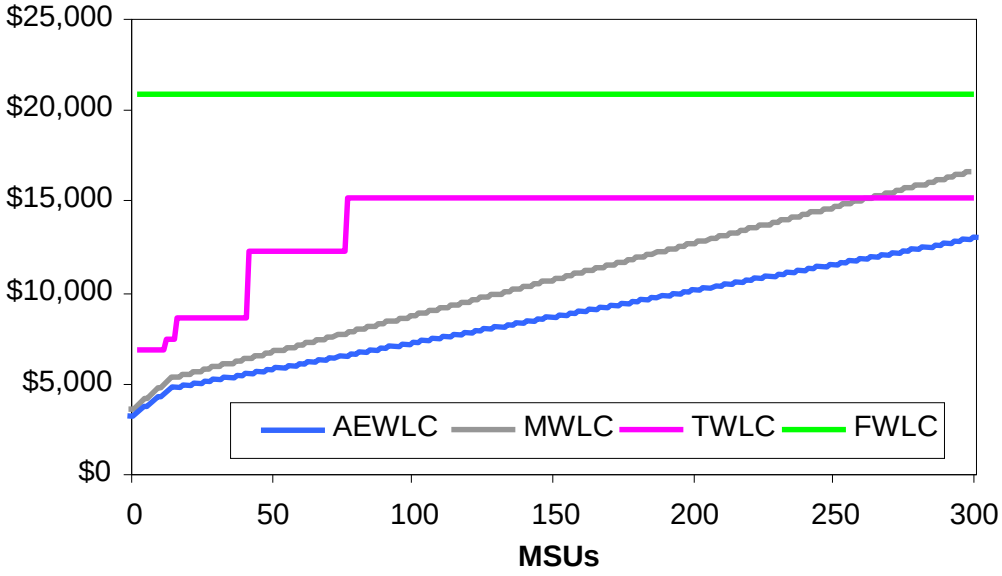
* All prices are US prices, will vary by GEO.



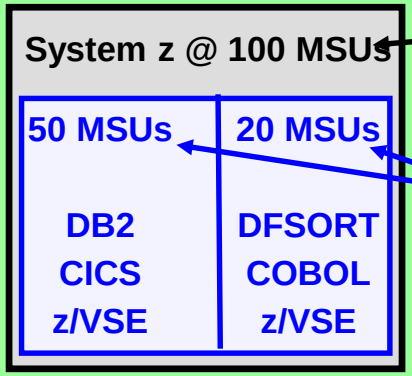
* MLC savings will vary significantly by customer - actual customer configuration must be priced out to be accurate.

Additional MLC savings are possible through sub-capacity pricing

- z/VSE price/performance through attractive new pricing metrics*
  - Midrange Workload License Charge (**MWLC**)
  - MWLC requires z9 EC/BC, z10 EC/BC, z196 or zEC12 and current z/VSE software (i.e. z/VSE V4 or V5)
  - Advanced Entry Workload License Charge (**AEWLC**)
  - AEWLC requires z114 or zBC12 and current z/VSE software (i.e.. z/VSE V4 or V5)



- Additional price/performance through sub-capacity option
  - Some hardware footprint **consolidations** more attractive now
  - Presence of z/VSE V3 or VSE/ESA™ forces full-capacity pricing



Full-capacity pricing metrics rely on the total rated capacity of the MACHINE where a product executes.

Sub-capacity pricing metrics rely on the utilization of the LPAR(s) where a product executes.

(*) z9 BC A01, z10 BC A01, z114-A01, zBC12 entry model are priced zELC.

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z/VSE Linux Growth Offering – CAMS Solution Examples

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Cloud

zBC12

CP | IFL

z/VSE V5

VSE Connectors

Linux on System z

IBM Wave for z/VM

LPAR z/VM

z/VM V6.3 xCAT

LPAR

Analytics

zBC12

CP | IFL

z/VSE V5

DB2/VSE (Client)

VSE Connectors

Linux on System z

Cognos

InfoSphere Warehouse

DB2 LUW

LPAR z/VM

z/VM V6.3

LPAR

Mobile

zBC12

CP | IFL

z/VSE V5

Web Service (SOAP Server)

VSE Connectors

Linux on System z

Worklight in WebSphere Liberty

DB2 LUW

LPAR z/VM

z/VM V6.3

LPAR

Security

zBC12

CP | IFL

z/VSE V5

Encryption Facility

OpenSSL

LDAP (Client)

VSE Connectors

Linux on System z

Firewall

LDAP Server

LPAR z/VM

z/VM V6.3 RACF

LPAR

and many more ....

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The z/VSE evolution continues

z/VSE Vnext
- ALS to System z10 (and higher)
- Channels & container in CICS TS for z/VSE
- CICS Explorer enhancements

z/VSE V5.2 — **April 25, 2014**
- zEnterprise exploitation, DVD base install
- Networking & security enhancements
- SoD for CICS TS enhancements, z/VSE Vnext

z/VSE V5.1.2 — **Jun 14, 2013**
- 64-bit I/O, security & DBCLI enhancements
- SoD for IPv6/VSE pricing, DVD base install

z/VSE V5.1.1 — **Jun 15, 2012**
- CICS Explorer Monitoring
- LFP in LPAR, DBCLI connector

z/VSE V5.1 — **Nov 25, 2011**
- z196 / z114 exploitation
- ALS to System z9 (and higher)
- 64-bit virtual addressing, LFP w/ z/VM
- SoD for CICS Explorer, LFP in LPAR

z/VSE V4.3 — **Nov 26, 2010**
- Virtual storage (24-bit) constraint relief
- 4-digit device addressses, IPv6/VSE
- Security / Crypto / Networking enhancements

z/VSE V4.2 — **Oct 17, 2008**
- More tasks, PAV, SVC, SCRT, LDAP Client
- SoD for CICS/VSE, RBD V7, WMQ V3

z/VSE V4.1 — **March 16, 2007**
- z/Architecture only / 64-bit real addressing
- MWLC full & sub-cap pricing

z/VSE V3.1 — **March 4, 2005**
- selected zSeries features, FCP/SCSI
- 31-bit mode only

VSE/ESA V2.7 — **March 14, 2003**
- enhanced interoperability
- ALS2 servers only

Protect
Integrate
Extend

Hardware Support
Capacity
Quality
z/OS Affinity
Interoperability

* IPv6/VSE is a registered trademark of Barnard Software, Inc.

[1]) z/VSE V3 is 31-bit mode only. It does not implement z/Architecture, and specifically does not implement 64-bit mode capabilities. z/VSE is designed to exploit select features of IBM System z10, System z9, and zSeries hardware.
[2]) z/VSE V4 is designed to exploit 64-bit real memory addressing, but will not support 64-bit virtual memory addressing

Questions?

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