Klaus Goebel
z/VSE Systems Manager
IBM Research & Development, Böblingen, Germany

50 Years of z/VSE

– Getting stronger Year by Year!

Tom Rosamilia, Senior Vice President, IBM Systems

Video message, Oct 2015

“z/VSE has seen a lot of enhancements and extensions, with a focus on protecting investments in our clients‘ applications and data.“

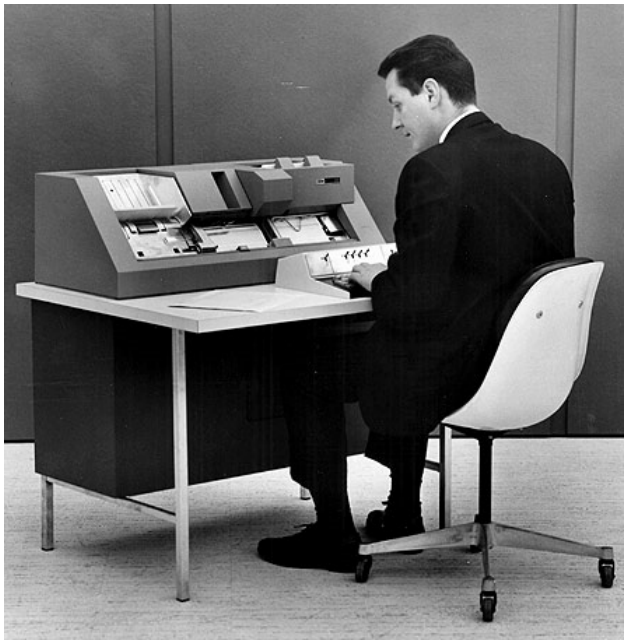
“z/VSE has been – and continues to be – an important part of our portfolio, and we continue to build on the mainframe‘s rich heritage of innovation for exceptional quality of service.“

“IBM remains committed to addressing the requirements for growing z/VSE workloads.“

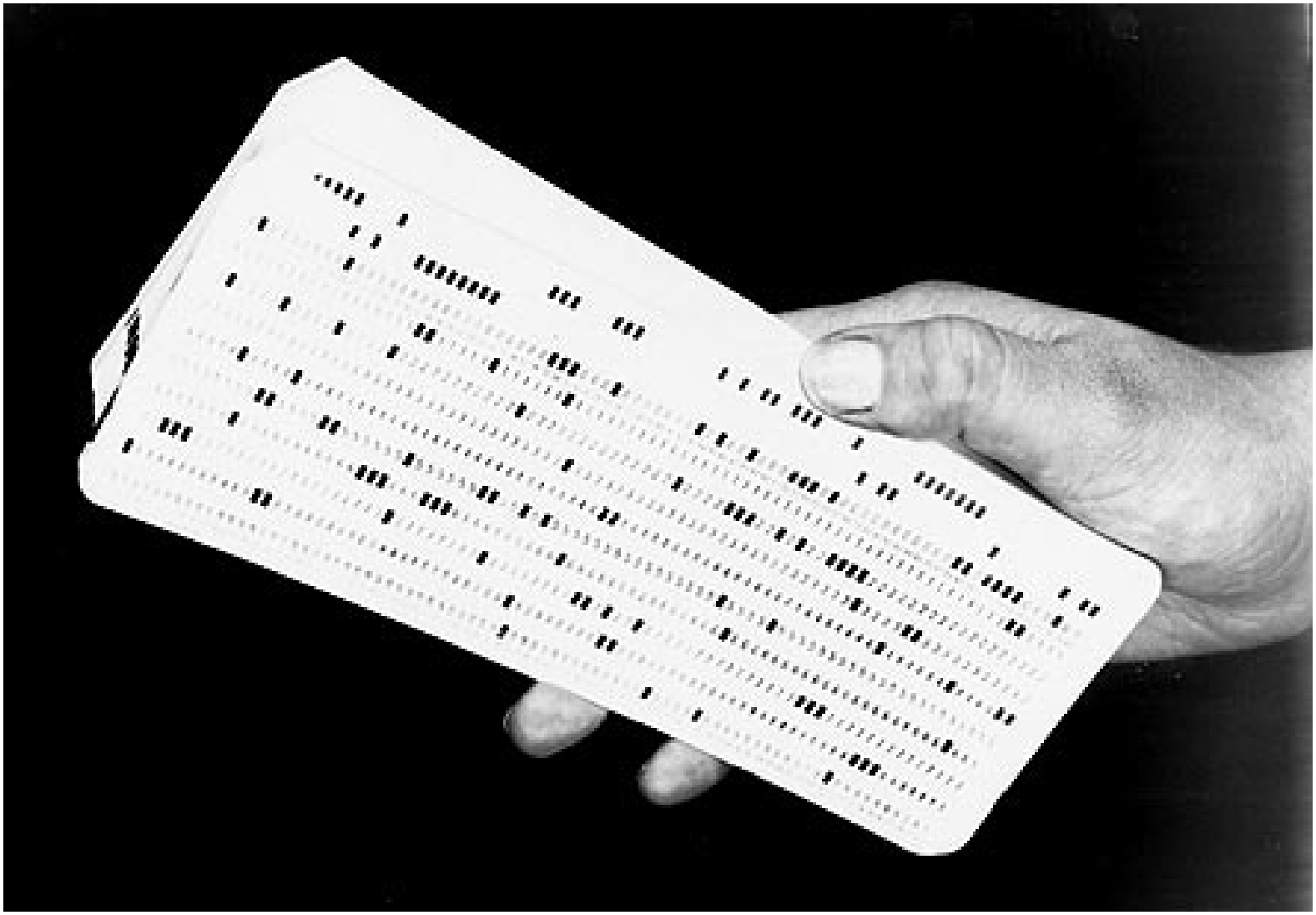
“Together with Linux on z Systems and our leading virtualization technology z/VM, z/VSE can support the transformation of your business to adapt to the ever-increasing digital disruptions in the marketplace – including mobile, analytics and of course the hybrid cloud.“

The VSE history

- **DOS/360 – How it begun**
- **DOS/VS – Added virtual storage capability**
- **DOS/VSE – Extended version of DOS/VS**
- **SSX/VSE – Small System Executive**
- **VSE/SP – System Product**
- **VSE/ESA – 31-bit VSE version**
- **z/VSE – Today's VSE**



It all started with Herman Hollerith‘s punch cards



System/360 – Announced April 7, 1964

In the most important product announcement in company history to date, IBM introduces the IBM System/360 - a new concept in computers which creates a "family" of small to large computers incorporating IBM-designed Solid Logic Technology (SLT) microelectronics and uses the same programming instructions. The concept of a compatible "family" of computers transforms the industry.

Fortune Magazine called S/360 a “$5 Billion Gamble“

“(System/360) was the biggest, riskiest decision I ever made, and I agonized about it for weeks, but deep down I believed there was nothing IBM couldn’t do.”

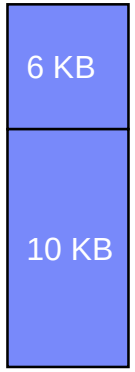
Father, Son & Co. 1990
Tom Watson, Jr.
IBM President 1952
IBM President and CEO 1956
IBM Chairman and CEO 1961-1971

DOS/360 – How it begun

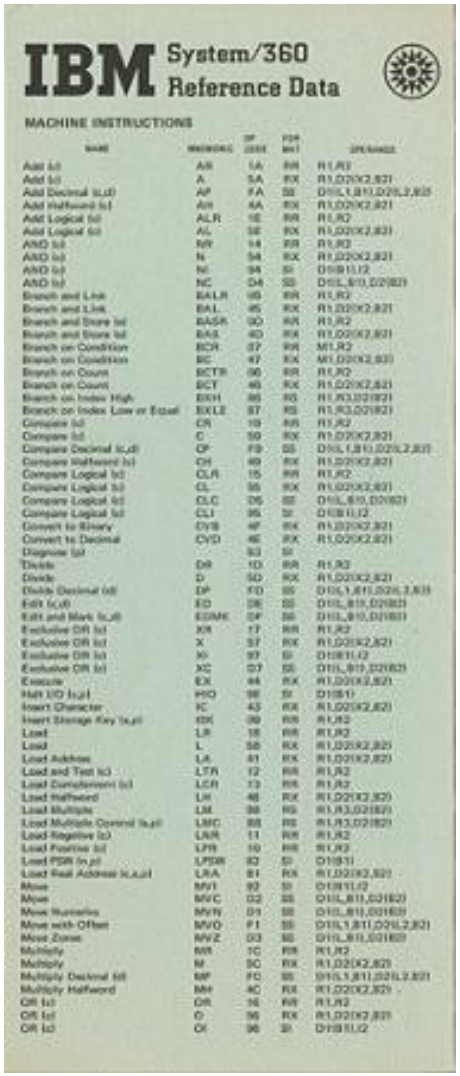
- **IBM's plan was to deliver**
  - a durable hardware architecture, S/360
  - a single operating system, OS/360
- **OS/360 project falling behind schedule**
  - When finally released, a year late, it required a minimum of 64 KB of memory
- **IBM System/360 Model 30**
  - Announced April 7, 1964
  - Approx. 30-35 KIPS (.03 MIPS)
  - Solid Logic Technology
  - 8 to 64 KB main storage
    - ferrite core memory technology
- **DOS/360 created as interims only**
  - Designed for 16-32 KB systems
  - Developed at IBM Endicott, NY

DOS/360 Release 1 – The first S/360 operating system in 1965

- **Required approx 6 KB for system residence**
  - Supervisor
- **Required approx 10 KB for dynamically loadable system programs and user applications**
  - JCL, Sort,…
- **Storage overlays**
- **One batch partition**
  - Up to three with Release 3
- **IOCS (Input/Output Control System) access methods**
  - Sequential (DTFSD), Direct (DAM), Index-Sequential (ISAM)
- **BTAM for telecommunications**
  - Added with Release 3
- **User programming in**
  - Macro Assembler
  - RPG (Report Program Generator)
  - COBOL
  - Fortran
  - PL/I



- **A typical minimum configuration would consist of**
  - S/360 Model 30 with 16 KB memory, IBM 1052 printer keyboard, printer, card reader, card punch, one IBM 2311 disk drive (7.25 MB removable pack)


IBM System/360 Reference Data

MACHINE INSTRUCTIONS

How were things back in 1965

- **Relative worth of $ 1.00 from 1965 to 2014 is $ 7.50**
  - According to Consumer Price Index
- **Dow Jones Industrial Average = 969**
- **Average cost of new house = $ 13,600**
- **Average income per year = $ 6,450**
- **Average cost of a new car = $ 2,650**
  - Gas per gallon = 31 Cent

Ladies High Fashion mid 1960's Boots
From $9.77 to $13.70

Sixties Pocket Transistor Radios
$14.95

- **The Mini Skirt appears in London**

- **Popular films**
  - Mary Poppins
  - The Sound of Music
  - Goldfinger
  - My Fair Lady
- **Popular songs**
  - Beatles “Help“
  - Rolling Stones “Satisfaction“

DOS/VS = DOS/360 with Virtual Storage support (early 70's)

- **Releases 28 à 34**
- **Up to 16 MB virtual storage**
  - Later known as "the line"
- **5 partitions**
  - Up to 7 partitions in Release 34
- **Linkage Editor**
  - Relocation Loader for effective multiprogramming
- **POWER for I/O spooling**
  - (Priority Output Writers, Execution Processors, and Input Readers)
- **New VSAM file system**
- **'DBDC' à CICS and DL/I**

VSE mission transferred from Endicott, NY to Böblingen, Germany

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DOS/VSE = “Extended” version of DOS/VS

- **Up to 12 partitions**
- **ICCF - Interactive Interface as an integral part of DOS/VSE**
- **ACF/VTAM became a component of DOS/VSE**
- **Maintain System History Program (MSHP)** to install programming packages, APAR/local fixes, and service tapes
- **Support of FBA disk devices**

- **Last free version of DOS/VSE**

- **In 1979, an imaginary DOS/VSE customer might have**
  - 1 IBM 4331 system with 512 KB main memory
  - 6 IBM 3310 FBA disk drives (65 MB per drive) or
  - 4 IBM 3340 CKD disk drives (35/70 MB removable packs)
  - 2 IBM 8809 reel-to-reel tape drives
  - 1 IBM 3203 line printer

- **Use of punched cards began to fade**


4331


3340 CKD


3310 FBA

April 11, 1980

Hard Wait of all DOS/VSE systems, worldwide

“Can‘t be us. We didn‘t change anything!“

TOD max field length = X‘8FFFFFFFFFFF‘

Fix: modify ‘8‘ into ‘F‘

Be prepared for reoccurance on
September 17, 2042,
11:53:47 MET

SSX/VSE – Small System Executive

- **A pre-generated, pre-configured VSE operating system for the 4321, 4331, 4341, and 4361 systems**
- **Designed for ease of installation, operation and use**
- **SSX/VSE consists of VSE components and unique prompters and aids**
- **Tested as a single product including**
  - Assembler, POWER, CICS/VS, ICCF, IPF, ACF/VTAM, VSE/VSAM, Sort/Merge, DITTO, Fast Copy, OCCF, IPCS, COBOL
  - plus optional products
- **SSX integration approach was too rigid for most customers**
- **VSE/SP refined the concept – and got overwhelmingly successful**

VSE/SP = VSE System Package

- **Integrated, pre-packaged VSE system**
- **'SIPO' concept (System Installation Productivity Option)**
- **Fast Service Upgrade (FSU)**
  - Making release-to-release migration simpler

VSE/SP V3 (1987)

- **Packaging concept of 'Base' and 'Optional' products**
  - 'Base' = integrated package containing commonly used core products
  - 'Optional' = coordinated and shipped and serviced with the base
- **12 partitions**
- **Virtual Address Extensions (VAE)**
  - Supporting up to 9 address spaces
- **New Librarian**
- **Interactive User Interface (IUI)**
- **Conditional JCL**
- **Capacity based software pricing**

```
BG 0000 * STEP 0 EXECUTED
BG 0000 * STEP 1 EXECUTED
BG 0000 * STEP 2 EXECUTED
BG 0000 * STEP 1 EXECUTED
BG 0000 * STEP 2 EXECUTED
BG 0000 * STEP 3 EXECUTED
BG 0000 EOJ DPPETE
```

Figure 3: Console Listing Showing the Order of Program Execution

```
CATALOG PROC2.PROC REPLACE=YES DATA=YES
// GOTO &STEP
/. STEP0
* STEP 0 EXECUTED
/. STEP1
* STEP 1 EXECUTED
/. STEP2
* STEP 2 EXECUTED
// IF $RC EQ '0000' THEN
// SETPARM STEP=STEP5
// IF $RC EQ '0000' THEN
// GOTO END
/. STEP3
* STEP 3 EXECUTED
/. END
/+
CATALOG PROC3.PROC REPLACE=YES DATA=YES
// GOTO &STEP
/. STEP4
* STEP 4 EXECUTED
/. STEP5
* STEP 5 EXECUTED
/. STEP6
* STEP 6 EXECUTED
/. END
/+
```

Figure 4: Branch Forward Procedure

IBM ES/9370 – My first involvement with VSE in 1985

- **Designed to operate in an office environment**
- **Packaged for 19-inch racks**
- **Main memory ranged from 4 MB to 16 MB**
- **Different models with 0.5 to 1.4 MIPS**
- **New rack mounted devices**
  - IBM 9332 or 9335 FBA disk
  - IBM 9347 Tape

- **In 1987 new CMOS technology based IBM ES/9370 models were announced**
  - 0.7 MIPS to 1.3 MIPS
  - Replacing bipolar technology with CMOS at the low-end
- **First CMOS implementation on mainframe**

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The begin of the VSE crisis

§ IBM introduced Extended Architecture (XA) to S/370 in early 1983

- 31-bit architecture expanding address range to 2 GB
- Delivered first with the IBM 3081
- IBM 4381 supported XA
- MVS/XA and VM/XA

§ VSE/SP was still S/370 mode only (24-bit architecture)

- Customer concerns: ***Is VSE left behind by IBM ?***

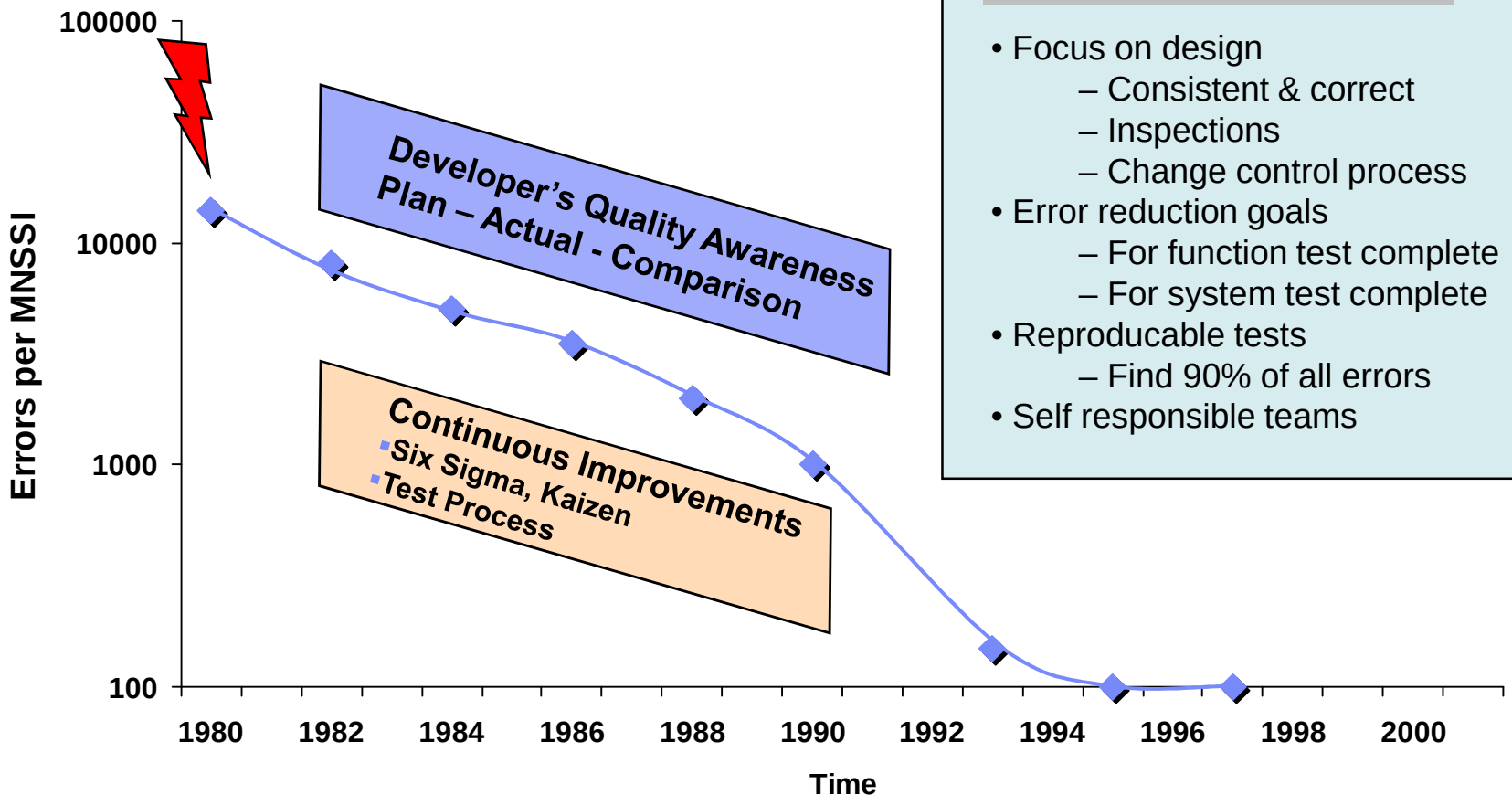
§ Many "industry experts" ridiculed the mainframe

- The PC and client / server represent the future

Stewart Alsop

"I predict that the last mainframe will be unplugged on March 15, 1996."

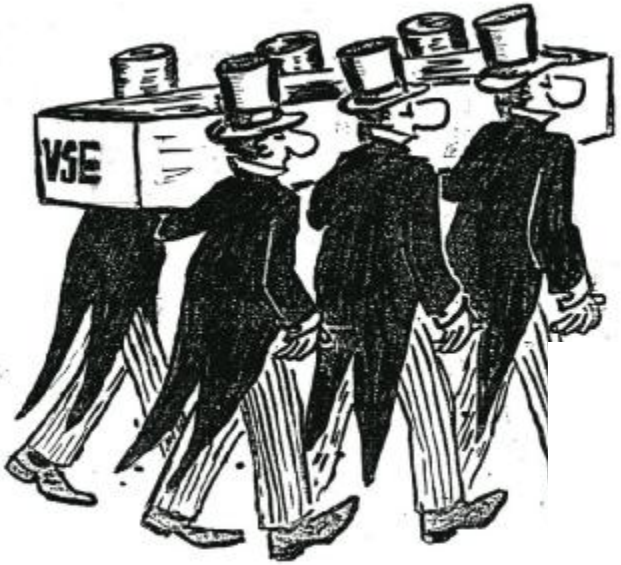
VSE code quality was not acceptable



Critical Success Factors:

- Focus on design
  - Consistent & correct
  - Inspections
  - Change control process
- Error reduction goals
  - For function test complete
  - For system test complete
- Reproducable tests
  - Find 90% of all errors
- Self responsible teams

The VSE crisis at its peak in 1987



Ed Altman

IBM Data Products Division President

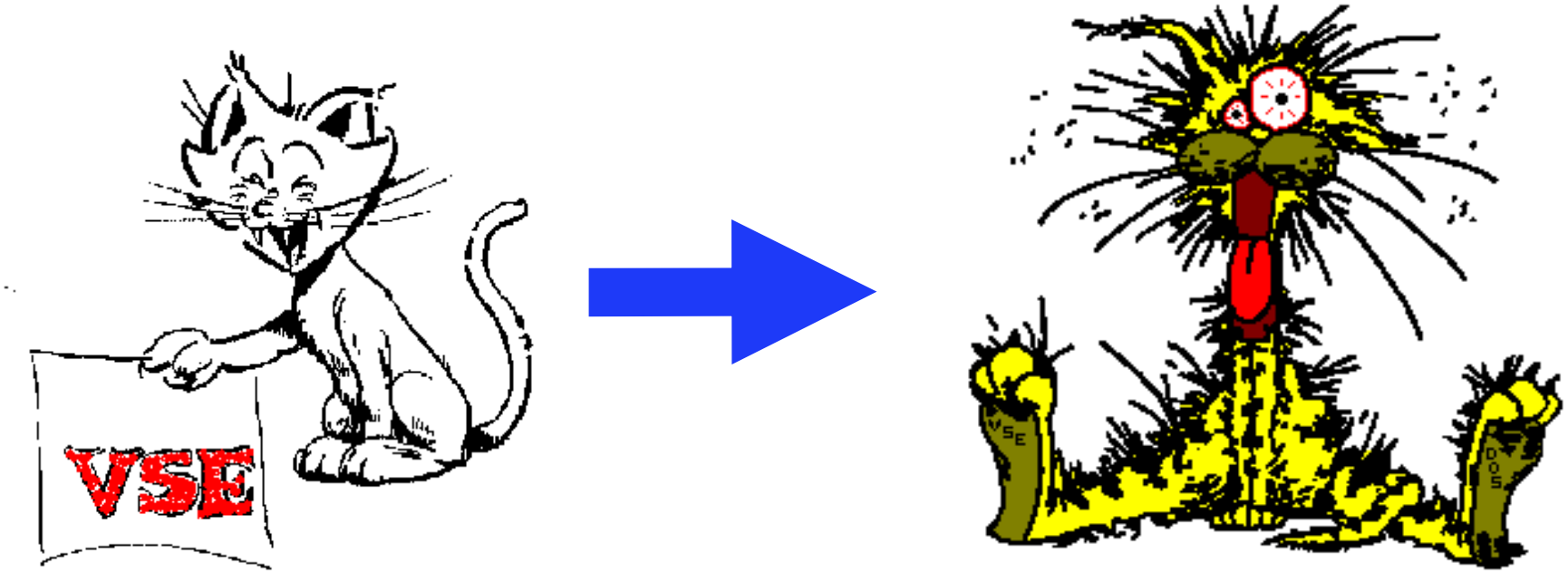
“VSE is DEAD!!”

The original VSE mascot – Invented by GUIDE in New Orleans, LA

The original

Enforced by IBM

The VSE mascot – Turning from lucky to ugly



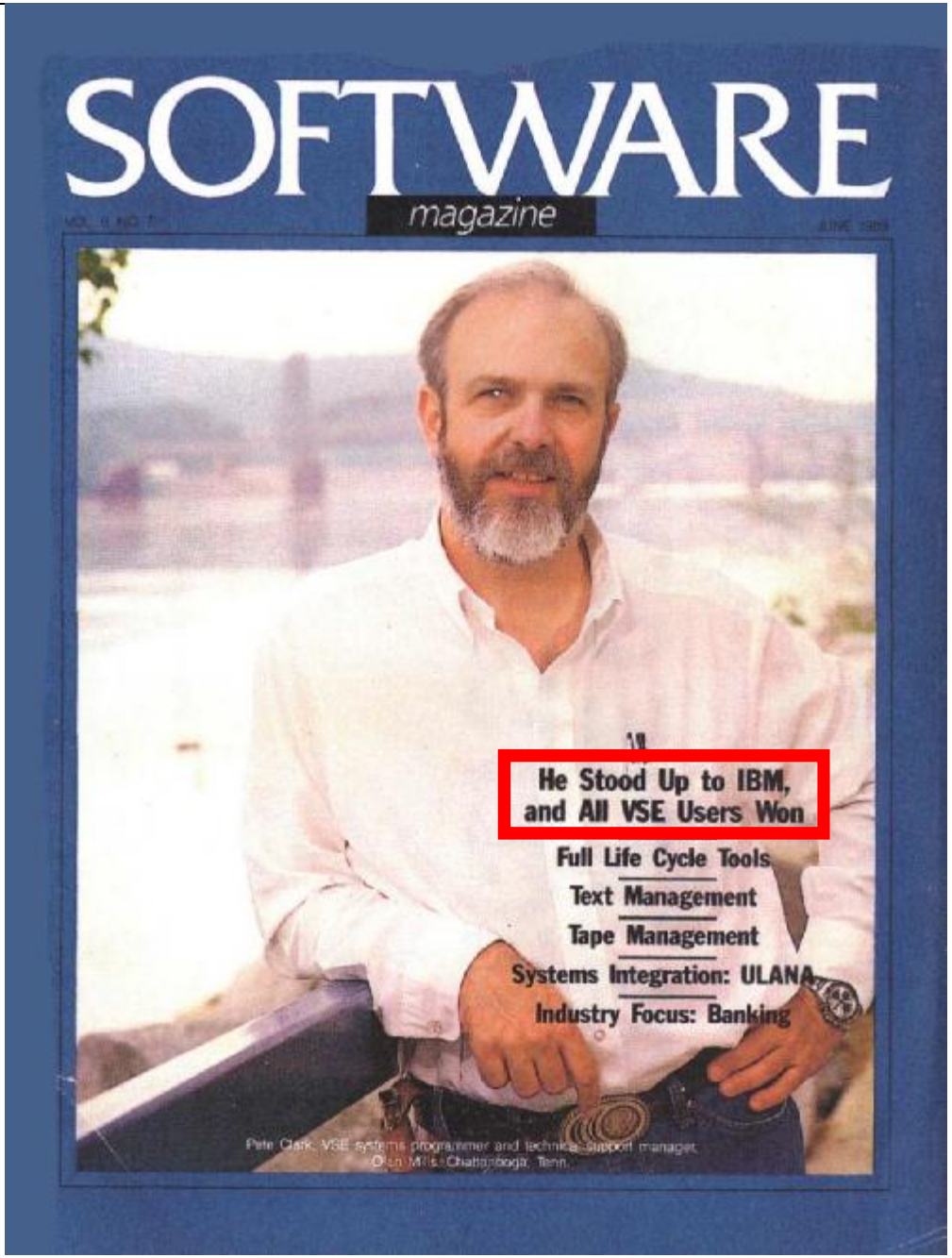
Pete Clark, Olan Mills

Letter to IBM, April 1987:

"YOU [IBM] are a vendor and WE are a user but there seems to be some confusion coming from your side as to which is which."

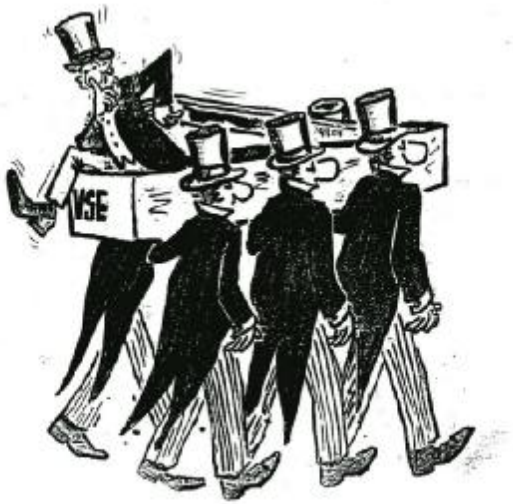
"YOU market to us, WE make purchases of software and equipment."

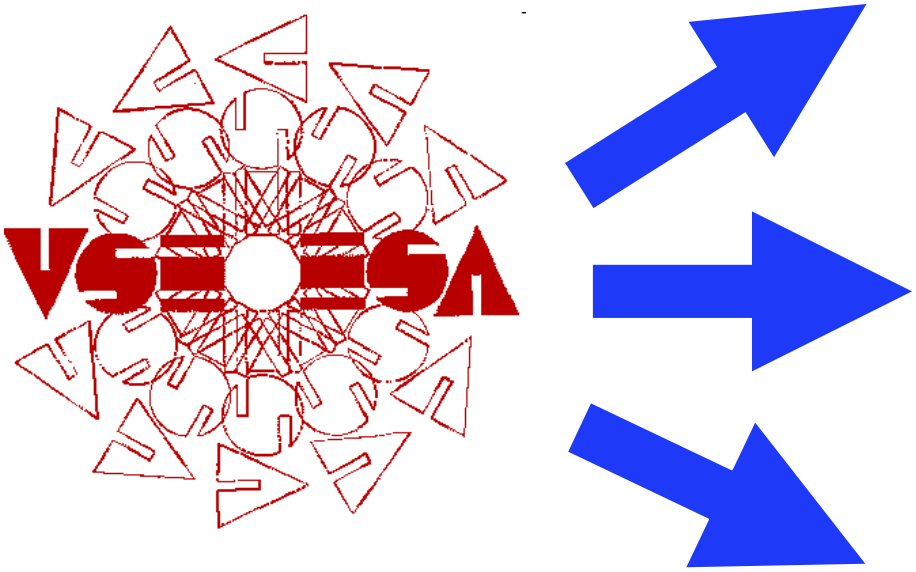
"If YOUR product is considered inappropriate (expensive in dollars or performance, poorly supported, technically incorrect, wrong strategic direction), WE must certainly look elsewhere for a solution."



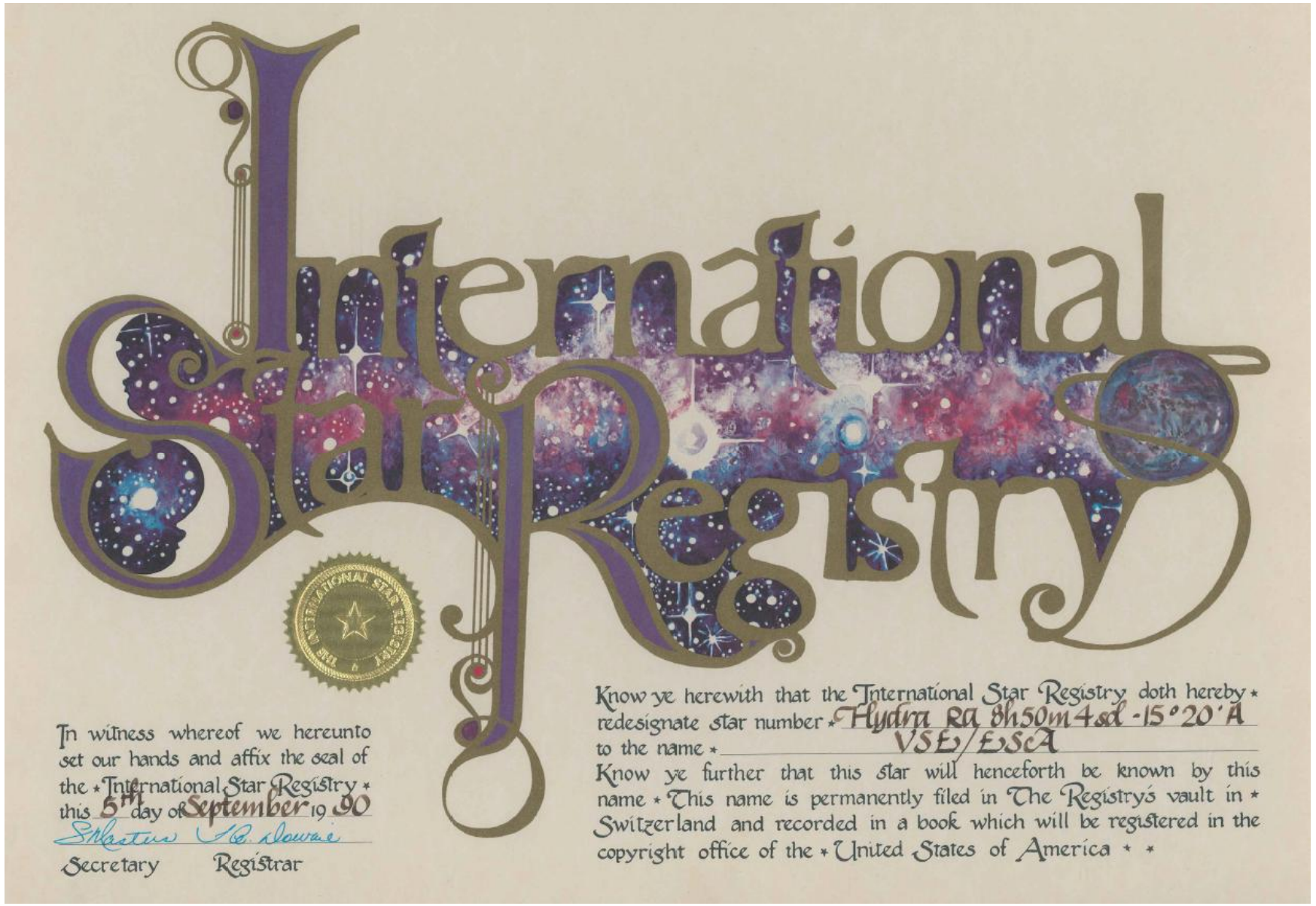
Software Magazine, June 1989

VSE reborn in early 90‘s





VSE/ESA – Our star in the universe



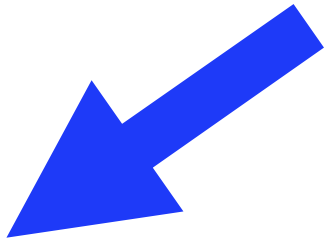
VSE/ESA = Extended Systems Architecture

VSE/ESA V1 (1990)

- 31-bit real memory support, then added 31-bit virtual addressing
- Dynamic partitions
- Virtual storage constraint relief (VSCR)
  - Move ACF/VTAM and POWER out of shared partitions
  - Dynamic channels (XA channel subsystem)
  - Up to 1024 devices for added I/O bandwidth
- ESA exploitation (later releases)
  - ESA data spaces
  - Virtual disk in storage
  - ESA access registers
- New versions of CICS/VSE, ACF/VTAM, VS COBOL II
  - For greater MVS affinity

VSE/ESA V2 (1994)

- Turbo dispatcher (= VSE's N-way support)
- Year 2000 ready
- VSAM KSDS > 4GB
- TCP/IP for VSE/ESA, offered under agreement with CSI
- ACF/VTAM V4.2
- LE and LE-based languages: COBOL, PL/I, C for VSE/ESA
- CICS Transaction Server (TS) V1.1
  - Affinity with OS/390 CICS
  - CICS/VSE V2.3 still shipped until z/VSE 4.2
- Connectors (Java-based components)



PIE Strategy

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z/VSE PIE strategy – Invented in Year 2000, still valid today and into the future

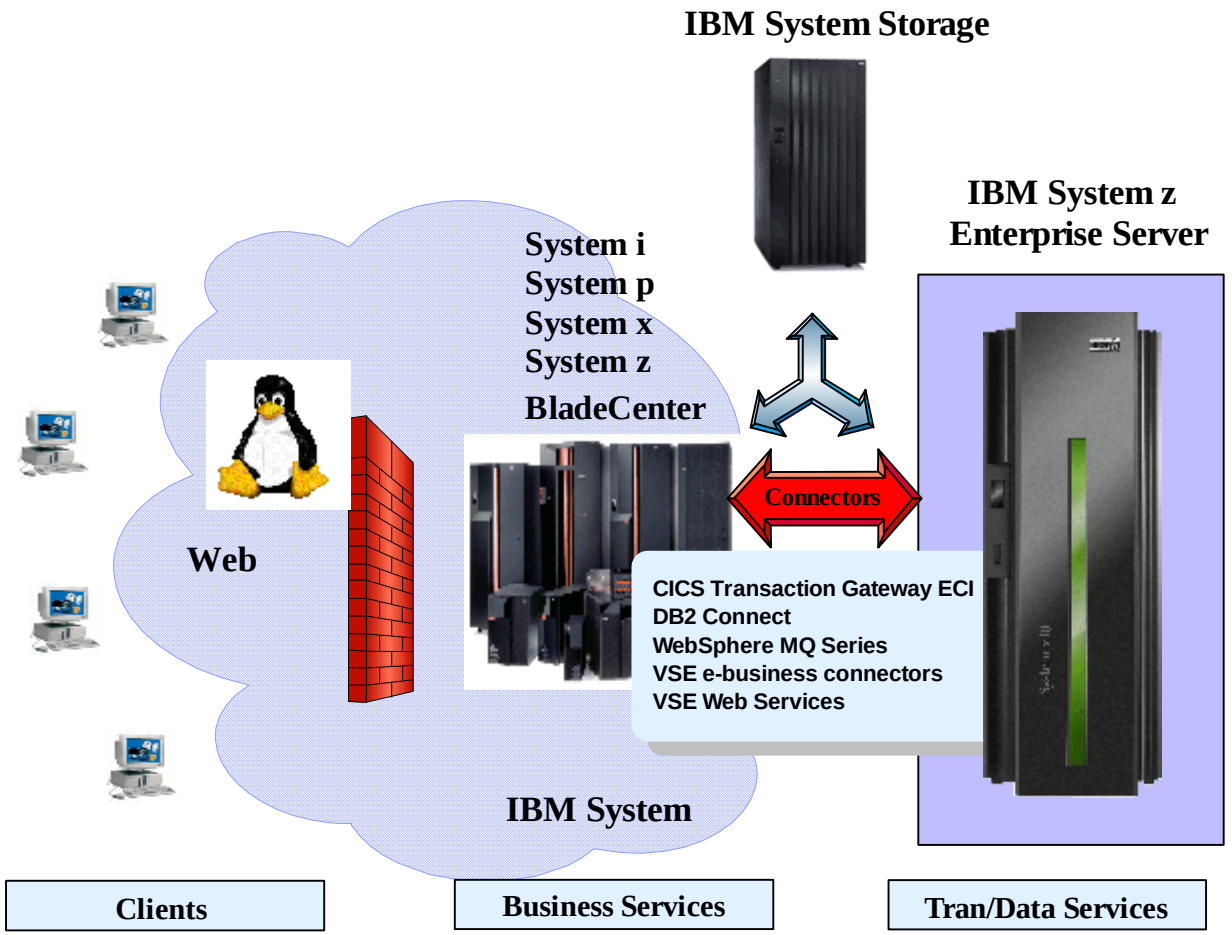
alias

- 3-tier Strategy
- Hybrid Strategy
- Connector Strategy
- Migration Strategy
- Coexistence Strategy
- Linux Surround Strategy
- **PIE Strategy**

Protect existing investments

Integrate with other systems

Extend for new workloads



z/VSE in the 21st century

§ z/VSE V3 (2005)

- 31-bit addressing only
  - No z/Architecture, no 64-bit mode
- FCP/SCSI support

§ z/VSE V4 (2007)

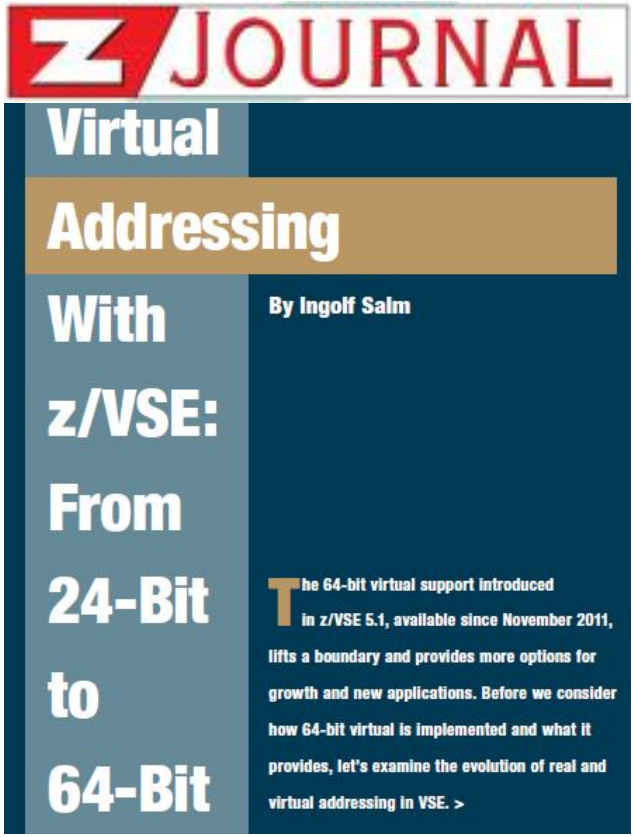
- 64-bit real memory addressing
  - No support of 64-bit virtual memory addressing
- MWLC pricing
- IPv6/VSE
- Fast Path to Linux on System z

§ z/VSE V5 (2011)

- 64-bit virtual memory addressing
- CICS Explorer

§ z/VSE V6 (2015)

- New CICS TS for z/VSE
- Firewall



[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

[3]) IPv6/VSE is a registered trademark of Barnard Software, Inc

z/VSE – Getting stronger year by year!

Crypto Express
Ficon Express
OSA Express

ECKD
FBA FCP/SCSI PAV
DS8k Flash System
Flashcopy XIV
Storwize

PL/I Cobol
Fortran C
LE
RPG

64-bit
DVD Install
Data Spaces
FSU

CICS TS
CICS Explorer
Channels & Container
Health Checker
Navigator

MWLC SCRT
CMT
AEWLC SVC
MPO

Encryption Facility
OpenSSL CPACF
Tape Encryption
Keyman/VSE

DB2
VSAM
DL/I

LDAP Client LFP VIA
DBCLI VSAM Redirector
MQ Trigger Monitor DB2 Connect
Web Services SNMP CTG VTAPE
CICS2WS GDPS Client
SOAP
XML

TCP/IP
IPv6/VSE
Firewall
GPS
BSM

New and/or enhanced with z/VSE V6.1

50 Years of zVSE – Voices from the z/VSE Team in Böblingen

Happy Anniversary, z/VSE!

zVSE50 – Customer trinkets

sponsored by SUSE, Velocity, BSI, SVA, Olio Carli, ITC, IBM

History@IBM – Pictures can be taken!

z/VSE

50 years of innovation

IBM