z/VSE

Modernisierung am Beispiel von z/VSE
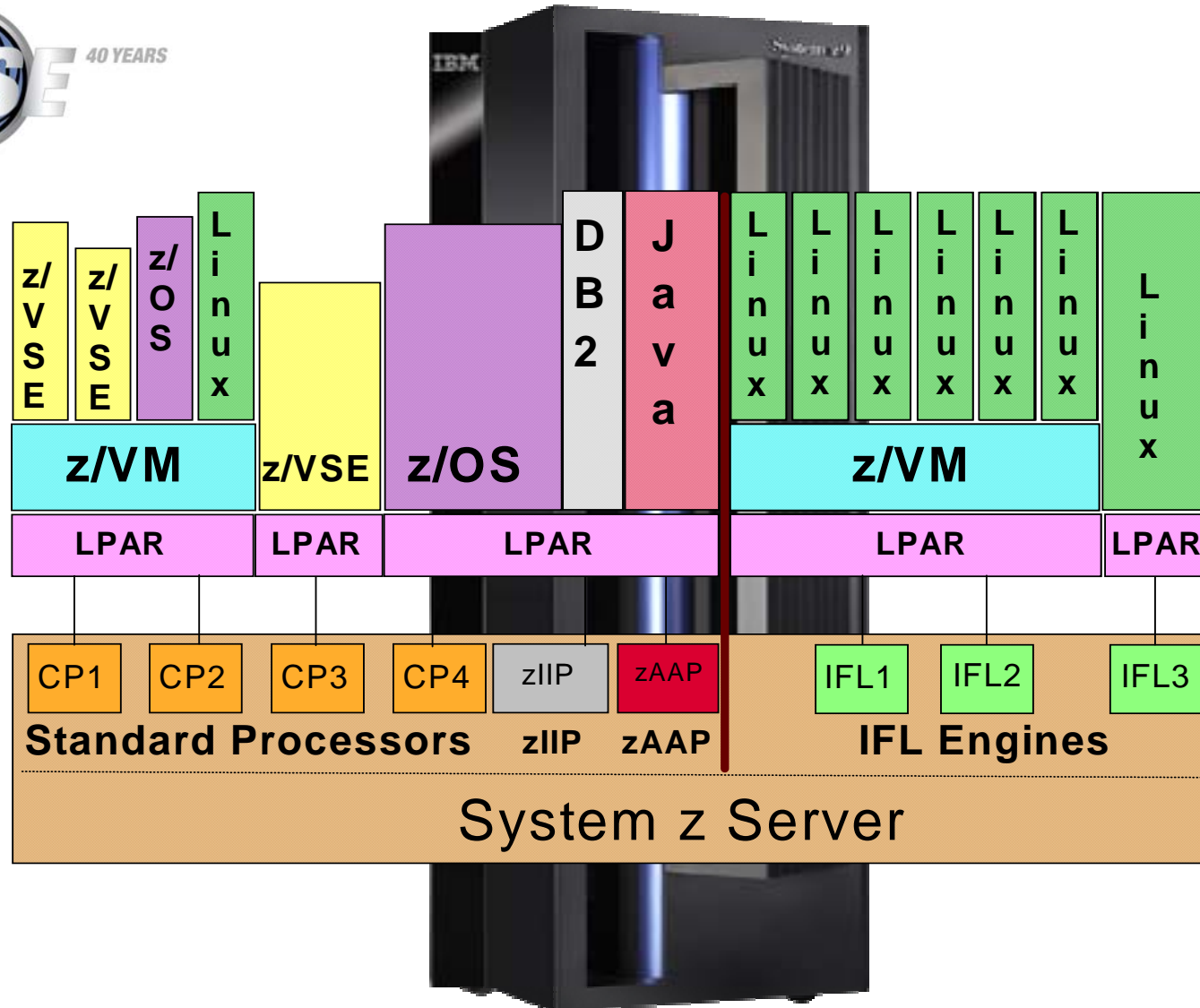
Dr. Klaus Goebel

Executive Project Mgr. & z/VSE Systems Mgr.

IBM Entwicklung & Forschung, Böblingen
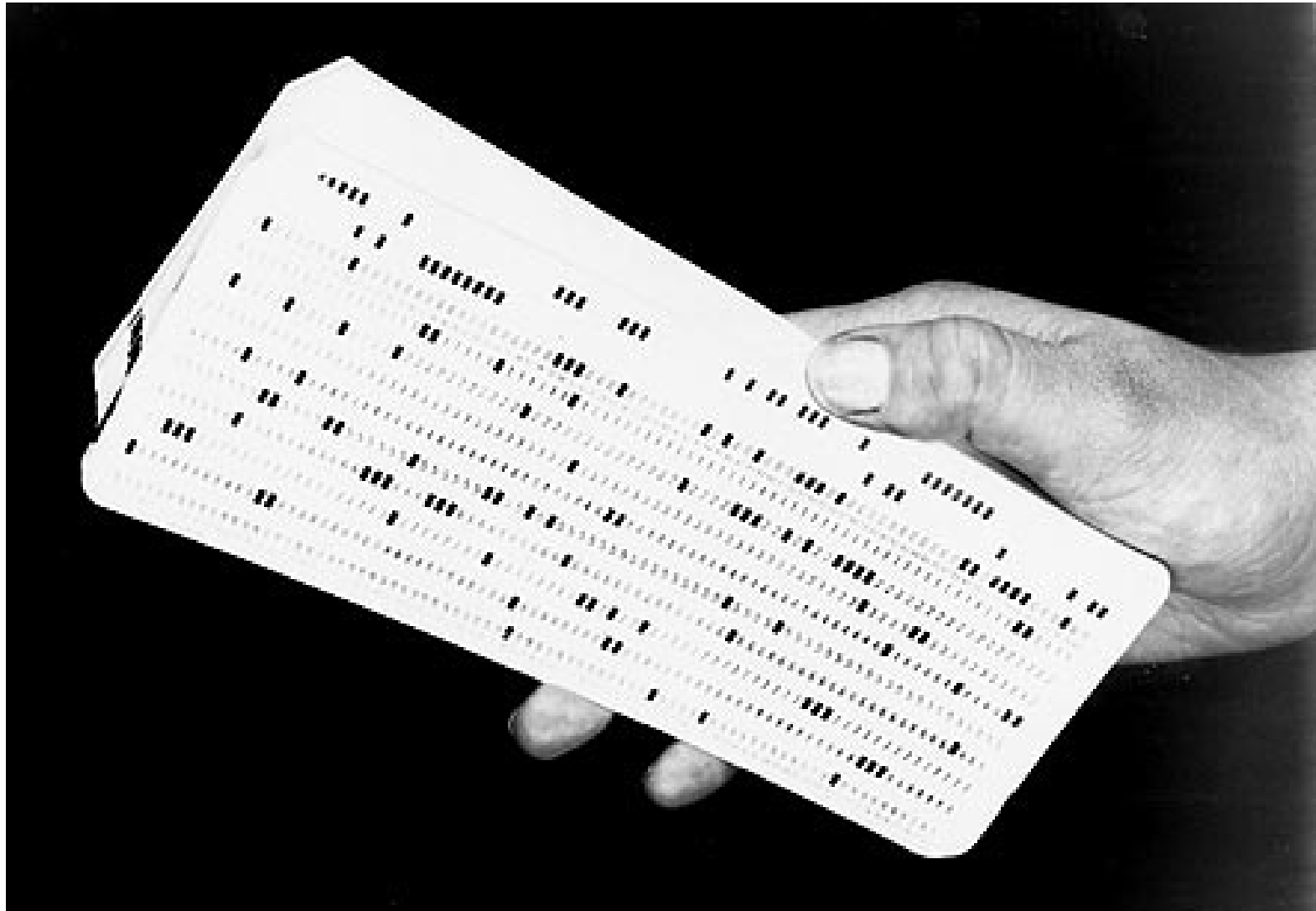**kgoebel@de.ibm.com**

System z and its Operating Systems

In the beginning was the card…..

the key punch ….

and the Hollerith Tabulator ….

The 1950's
….. OK - no VSE yet, but one must start somewhere

The IBM family tree – 1952 to 1964

- Several mainframe families, each uniquely designed for different applications
- Each family had a different, incompatible architecture
- Even within families, moving from one generation to the next involved a migration
  - although the advent of 'common' compilers (i.e. COBOL and FORTRAN) made migration a bit easier
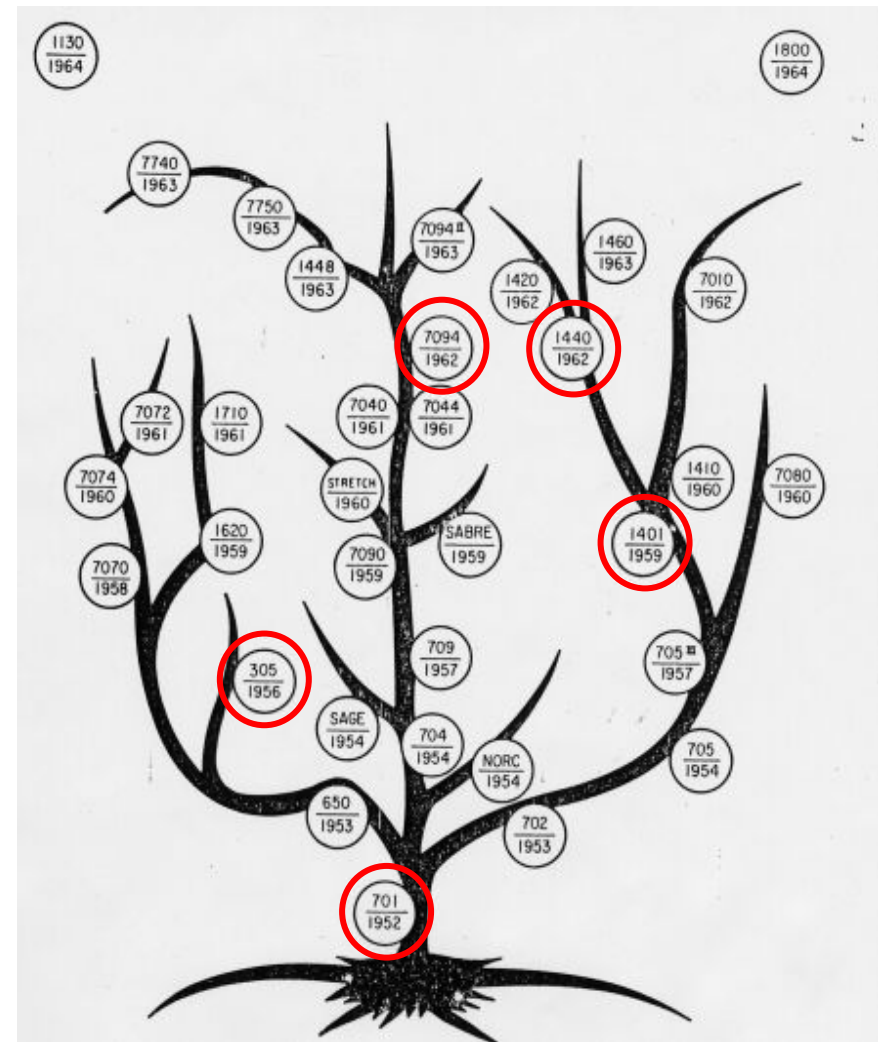
IBM 701 – 1952
1ˢᵗ generation

- ***First*** IBM large-scale electronic computer manufactured in quantity
- IBM's ***first*** commercially available scientific computer
- The ***first*** IBM machine in which programs were stored in an internal, addressable, electronic memory
- Key to IBM's transition from punched card machines to electronic computers
- The beginning of the pioneering line of IBM 700 series computers, including the 702, 704, 705 and 709

IBM 1401 – 1959
2nd generation

- The all-transistorized IBM 1401 Data Processing System offered features found in electronic data processing systems to **smaller businesses**, previously limited to the use of conventional punched card equipment.

- Features included: high speed card punching and reading, magnetic tape input and output, high speed printing, stored program, and arithmetic and logical ability

The 1960's

……a mainframe revolution begins with IBM System/360 *and* IBM System/360 Disk Operating System (DOS/360)

IBM System/360 – 1964
3rd generation

- Customers were frustrated with the migration costs that came with each processor upgrade
- IBM developed a family of processors using the same durable architecture
  - published in the S/360 Principles of Operations
  - 24-bit addressing (32-bit architecture)
- Solid logic circuit cards
- Common peripheral devices
- One operating system - *initially*
  - Operating System/360 (OS/360)

1965

- S/360 - Model 30 System
  - Approx. 30-35 KIPS (.03 MIPS)
  - Solid Logic Technology
  - 8 to 64 KB main storage
    - ferrite core memory technology
  - 2311 Disk Storage Drive
    - 7.25 MB/removable pack
    - 75 ms average access time
  - 2401 Magnetic Tape Unit
    - 9 track, 1600 bpi
    - Up to 180,000 bps
  - 2540 Card Read/Punch
    - 1000 cpm read
    - 300 cpm punch
  - 1403-N1 Line Printer
    - up to 1100 lpm

- Disk Operating System/360
  - Releases 1 => 27
    - designed for 16-32 KB systems
    - disk used for program libraries, transient supervisor functions, etc.
  - 1 partition
    - up to 3 beginning in Release 3
    - batch multiprogramming in R16
  - BTAM for telecommunications
    - added in Release 3
  - User programming in Macro Assembler, COBOL, Fortran, PL/1, and RPG

What were things like in 1965?

- US President: Lyndon B. Johnson
- Value (in 2005$) of $1 = $6.01
- Average income = $7,704
- Average price of a car = $2,350
- Average price of a house = $21,500
- Dow Jones Industrial Average = 969
- Some Top Songs
    – Beatles 'Help'
    – Sonny & Cher 'I Got You Babe'
    – Rolling Stones 'Satisfaction'
- Some Top TV Shows
    – I Dream of Jennie
    – Batman
    – Daniel Boone
- Best Picture
    – The Sound of Music

The 1970's

……introduction of System/370 and DOS/VS

1972

- **S/370 - Model 135 System**
  - Compatible upgrade from S/360
  - Integrated Circuit technology
  - 96 to 256 KB Processor Storage
    - 'monolithic' storage technology
    - virtual storage
  - 3330 Direct Access Storage
    - 100 MB/removable pack
  - 3420 Magnetic Tape Subsystem
    - 9 track, 1600 bpi
    - up to 320,000 bps
  - 3505 Card Reader/3525 Card Punch
    - 1200 cpm read
    - 300 cpm punch
  - 3211 Printer
    - up to 2000 lpm

- **DOS/VS**
  - Releases 28 => 34
  - up to 16 MB virtual storage
  - 5 partitions (up to 7 in R34)
  - Linkage Editor, Relocating Loader
  - VSAM
    - balanced sequential/random
  - POWER (first a Type III in 1968)
    - short for "**P**riority **O**utput **W**riters, **E**xception Processors, and Input **R**eaders"
  - 'DBDC' => CICS and DL/I

Starting to look like something
that's recognizable as VSE

What were things like in 1972?

- US President: Richard Nixon
- Value (in 2005$) of $1 = $4.53
- Average income = $12,625
- Average price of a car = $3,879
- Average price of a house = $30,500
- Dow Jones Industrial Average = 1020
- Some Top Songs
    - Don McLean 'American Pie'
    - Sammy Davis, Jr. 'The Candy Man'
    - Johnny Nash 'I Can See Clearly Now'
- Some Top TV Shows
    - Bob Newhart Show
    - The Waltons
    - Monday Night Football
- Best Picture
    - The Godfather

The 1980's

……decade began with the successful 4300 and DOS/VSE
……later, the pace picked up with the 9370 and VSE/SP

1979

- **IBM 4331 System**
  - Large Scale Integration (LSI) technology
  - 512 and 1024 KB Processor Storage
    - 64K bit memory chip technology
    - Integrated I/O adapters
    - optional ECPS ('e' mode)
  - 3310 Direct Access Storage
    - Fixed Block Architecture (FBA)
    - 64.5 MB/fixed (non-removable) media
  - 8809 Magnetic Tape Subsystem
    - 9 track, 1600 bpi
    - up to 160,000 bps
  - 3505 Card Reader/3525 Card Punch
    - 1200 cpm read
    - 300 cpm punch
  - 3262 Printer
    - up to 650 lpm

- **DOS/VSE**
  - 7 partitions
    - up to 12 in Release 2
  - Fixed Block Architecture (FBA)
  - Misc. Enhancements
    - ASI procedures, channel switching, DASD sharing, add statements, missing interrupt handler, etc.
  - MSHP
  - ICCF (based on ETSS Type III)
  - ACF/VTAM
  - Priced Components

What were things like in 1979?

- US President: Jimmy Carter
- Value (in 2005$) of $1 = $2.61
- Average income = $22,316
- Average price of a car = $6,847
- Average price of a house = $71,800
- Dow Jones Industrial Average = 839
- Some Top Songs
    - Rupert Holmes 'Escape' (Pina Colada song)
    - Donna Summer 'Hot Stuff'
    - Rod Stewart 'Do Ya Think I'm Sexy'
- Some Top TV Shows
    - Dallas
    - All in the Family (Archie Bunker)
    - Knot's Landing
- Best Picture
    - Kramer vs. Kramer

1987

- IBM 9375 – Model 60 System
  - Modular, 19" rack-mounted
  - 8 or 16 MB Processor Storage
    - Integrated I/O adapters
    - office environment
  - 9332 Direct Access Storage
    - Fixed Block Architecture (FBA)
    - 400 MB/2 actuator fixed media
  - 9347 Magnetic Tape Subsystem
    - 9 track, 1600 bpi
    - up to 160,000 bps

- VSE/SP V3
  - 12 partitions
  - Virtual Address Extensions (VAE)
    - up to 9 address spaces
  - New Librarian
  - Interactive User Interface (IUI)
  - Conditional JCL
  - Packaging
    - base and optional products
    - base was designed, developed, tested, shipped, and serviced as if it were a single integrated system
  - Capacity-based Pricing

What were things like in 1987?

- US President: Ronald Reagan
- Value (in 2005$) of $1 = $1.67
- Average income = $36,884
- Average price of a car = $13,386
- Average price of a house = $127,200
- Dow Jones Industrial Average = 1939
- Some Top Songs
  – Los Lobos 'La Bamba'
  – Starship 'Nothing's Gonna Stop Us Now'
  – U2 'With or Without You'
- Some Top TV Shows
  – ALF
  – The Wonder Years
  – In the Heat of the Night
- Best Picture
  – The Last Emperor

The 1990's

……the decade began with ES/9000 and VSE/ESA V1

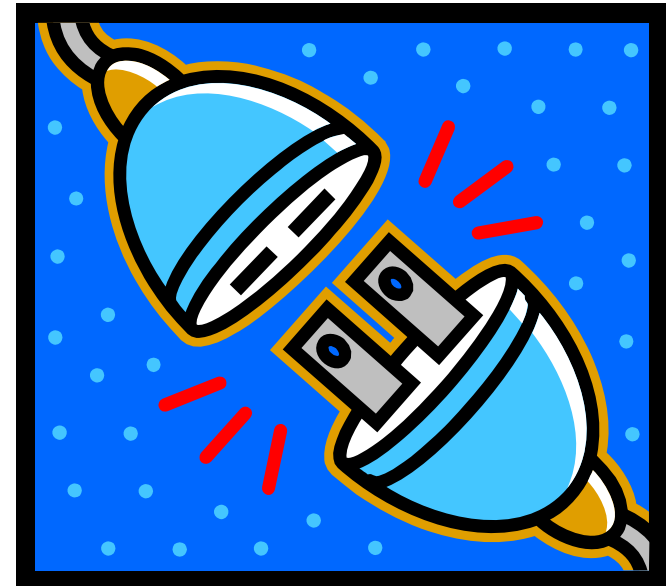……followed by IBM's CMOS Transition and VSE/ESA V2

The 1990's –

…. However, many industry 'experts' ridiculed the mainframe. They said PCs and 'client/server' alone represent the future of IT.

One well known example….

- "I predict that the last mainframe will be unplugged on March 15, 1996."
  - Stewart Alsop, March 1991

Source: IBM Annual Report 2001

1993

- ES/9221 – Model 150 System
  - 16 to 256 MB Processor Storage
    - Modular, 19" rack-mounted
    - Integrated I/O adapters
    - PR/SM
    - Parallel and ESCON Channels
  - 9336 Direct Access Storage
    - Fixed Block Architecture (FBA)
    - 857 MB/fixed media
  - 3490 Magnetic Tape Subsystem
    - 200 MB cartridges
    - up to 4.5M bps

- VSE/ESA V1.3
  - 31-bit real and virtual addressing
  - Dynamic partitions
    - number limited only by tasks
    - 1 partition per address space
  - Access Registers
  - Data Spaces
  - Virtual Disk
  - Virtual Storage Constraint Relief
  - Dynamic (XA) Channel Subsystem
  - ESCON Channels

What were things like in 1993?

- US President: William Jefferson Clinton
- Value (in 2005$) of $1 = $1.31
- Average income = $47,221
- Average price of a car = $17,698
- Average price of a house = $147,700
- Dow Jones Industrial Average = 3754
- Some Top Songs
    – Mariah Carey 'Hero'
    – Meat Loaf 'I'd Do Anything for Love'
    – Janet Jackson 'That's the Way Love Goes'
- Some Top TV Shows
    – Frasier
    – Homicide: Life on the Streets
    – N.Y.P.D. Blues
- Best Picture
    – Schindler's List

1998

- ## Multiprise 2000 System
  - based on G3 CMOS technology
  - 1 to 5-way Processing Units
  - 128 MB to 4 GB Processor Storage
  - Parallel and ESCON Channels
  - Integrated DASD
    - a portion of main memory for cache
    - emulate 3380/3390 ECKD
    - up to 288 GB capacity
  - and/or RAMAC External DASD
  - Open Systems Adapter (OSA)
  - 3490E Magnetic Tape Subsystem
    - 2.4 GB/cartridge with IDRC

- ## VSE/ESA V2.3
  - Year 2000 ready
  - optional Turbo dispatcher
    - support for n-way processors
  - VSAM KSDS > 4GB
  - set timezone/daylight savings time
  - TCP/IP for VSE/ESA (native)
    - offered under agreement with CSI
  - ACF/VTAM V4.2
  - LE and LE-based languages
    - COBOL for VSE/ESA
    - PL/1 for VSE/ESA
    - C for VSE/ESA
 - Improved console support

What were things like in 1998?

- US President: Bill Clinton
- Value (in 2005$) of $1 = $1.16
- Average income = $59,589
- Average price of a car = $19,560
- Average price of a house = $181,900
- Dow Jones Industrial Average = 9027
- Some Top Songs
    - Shania Twain 'You're Still the One'
    - Destiny's Child 'No, No, No'
    - Third Eye Blind 'How's It Going to Be?'
- Some Top TV Shows
    - Ally McBeal
    - Everybody Loves Raymond
    - 60 Minutes II
- Best Picture
    - Shakespeare In Love

The 2000's

…a new century begins with Multiprise 3000 and VSE/ESA V2

…looking to the present with IBM zSeries and z/VSE V3 & V4

IBM TotalStorage®

Linux on zSeries

Integration

z/VSE

IBM @server zSeries
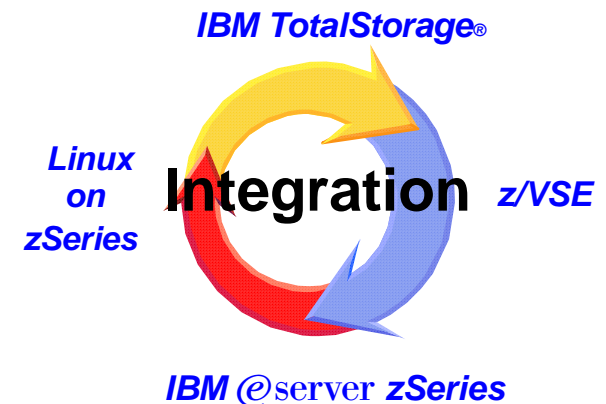
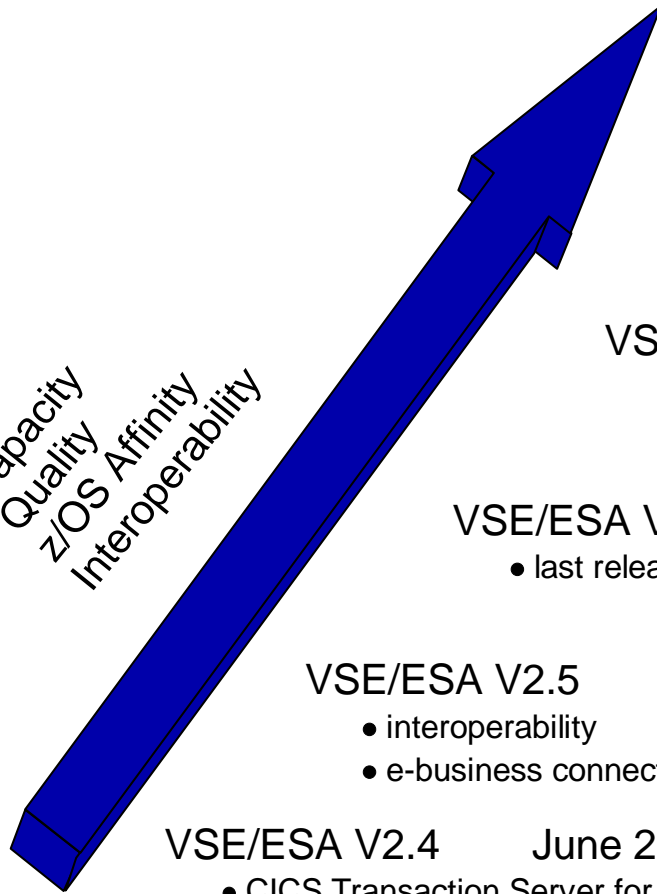# Reports of the death of the mainframe ….were premature

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

  – Stewart Alsop, March 1991

- "It's clear that corporate customers still like to have centrally controlled, very predictable, reliable computing systems— exactly the kind of systems that IBM specializes in."

  – Stewart Alsop, February 2002

Source: IBM Annual Report 2001
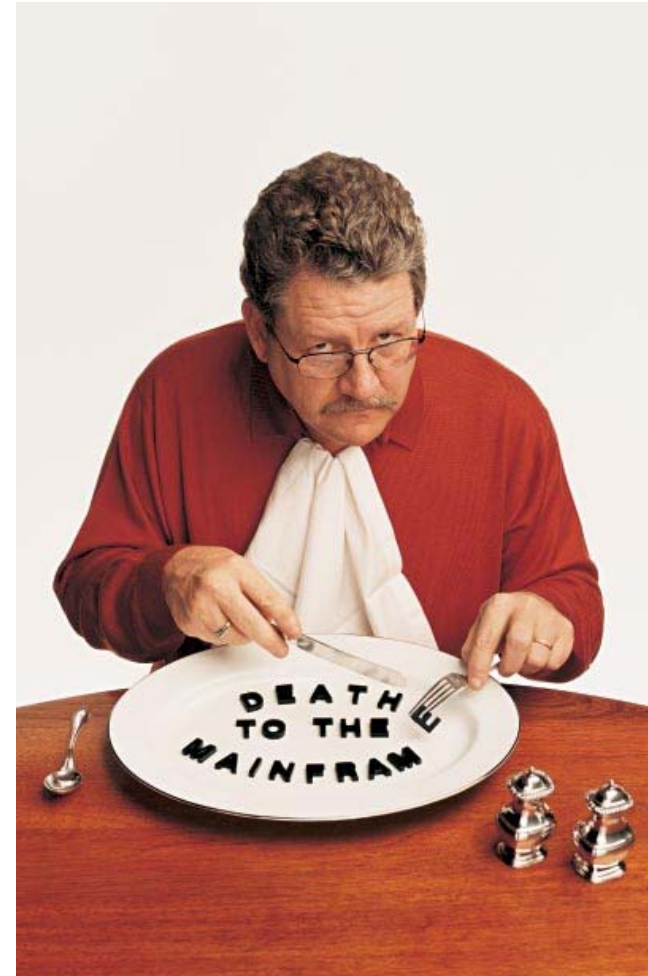
Recent z/VSE Innovation

z/VSE V4.1 - March 16, 2007
- z/Architecture only
- 64-bit real addressing
- MWLC incl. sub-capacity pricing

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

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

VSE/ESA V2.6   Dec 14, 2001
- last release to support pre-G5 servers

VSE/ESA V2.5   Sept 29, 2000
- interoperability
- e-business connectors

VSE/ESA V2.4   June 25, 1999
- CICS Transaction Server for VSE/ESA
- e-business

Capacity
Quality
z/OS Affinity
Interoperability

2007

- **IBM System z9 Business Class**
  - based on innovative System z9 technology
  - 2 models, 73 capacity settings
    - 1 to 4 Processing Units (PUs)
    - 26 to 1750 MIPS
  - 8 to 64 GB Processor Storage
  - HiperSockets
  - ESCON, FICON Express, FCP Channels
  - PCICA encryption assist
  - OSA Express & OSA-ICC
  - Integrated Facility for Linux (IFL)
  - IBM Enterprise Storage Server (Shark)
    - high availability, high performance
    - Flashcopy and PPRC
    - 1 to 55.9 TB capacity
  - IBM 3592 TotalStorage Enterprise Tape
    - 900 GB/cartridge at 3:1 compression
    - up to 40 MB transfer rates

- **z/VSE V4.1**
  - 64-bit real addressing
  - Turbo dispatcher
    - support for n-way processors
  - CICS Transaction Server
    - availability and z/OS affinity
  - TCP/IP
    - offered under agreement with CSI
  - VSE Navigator
  - VSE e-business connectors
  - VSE Web services SOAP/XML
  - HiperSockets
  - PCICA encryption assist
  - TS1120 tape encryption support
  - Shark Flashcopy and PPRC
  - FCP-attached SCSI disks
  - Sub-capacity pricing

A typical z/VSE User Panel

```
IESADMSL.IESEAND          z/VSE FUNCTION SELECTION
                                                APPLID:DBDCCICS
    Enter the number of your selection and press the ENTER key:


        1   Installation
        2   Resource Definition
        3   Operations
        4   Problem Handling
        5   Program Development
        6   Command Mode
        7   CICS-Supplied Transactions










 PF1-HELP                    3-SIGN OFF                  6-ESCAPE(U)
                             9-Escape(m)
```

Figure 4-2   Primary selection panel for administrators

A modern User I/F: z/VSE Navigator

A typical CICS Screen in z/VSE

Modern Applications use Browser Technology

WM
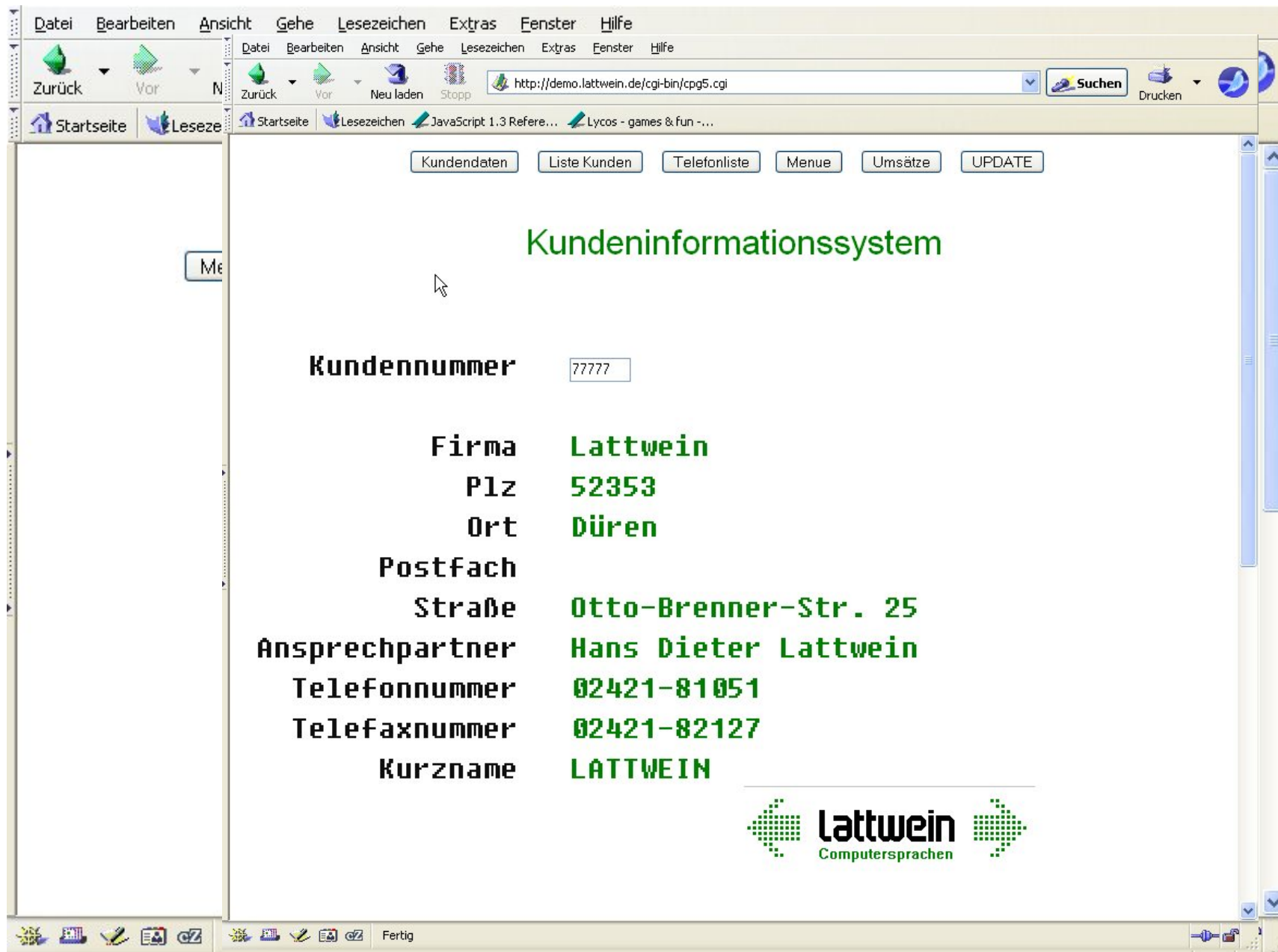
Kunde **465.00.16**
Benutzer **faber**

Menü
Home
Teilekatalog
Benutzer
Bestellhistorie
Warenkorb anzeigen
abmelden

WM AG
Homepage der WM AG
Kontakt

Warenkorb anzeigen

Folgende Positionen stehen in Ihrem Warenkorb:

[Aktualisieren] [Warenkorb bestellen]

	WM-Artikel	Bestellnummer	Bezeichnung	Menge	Listenpreis	EK-Preis	Summe
			Bestellhinweis	Verfügbarkeit			Anlieferung
☐	312.21.57		OELFILTER VAG	1,00	5,45	4,09	4,09
				ab Lager lieferbar			Tour
☐	375.04.03		SCHALLD.H.GOLF/SCIR. 3.75-7.83	1,00	56,50	45,20	45,20
				ab Lager lieferbar			Tour
☐	198.42.77		CB-FUNK-DACHANTENNE	1,00	90,86	90,86	90,86
				Lieferzeit auf Anfrage			Tour
☐	198.43.76		ANTENNE GLASKL.	1,00	31,30	31,30	31,30
				Lieferzeit auf Anfrage			Tour
☐	111.37.52		SCHEINW.RE.H4 XSARA 7.97-8.00	1,00	90,00	72,00	72,00
				ab Zentrallager lieferbar (ca. 24h)			Tour

Es befinden sich 5 Positionen im Warenkorb.

[Aktualisieren] [Warenkorb bestellen]

Änderungen an markierten Positionen:

Bestellhinweis: [ ]
Menge: [ ]
Anlieferung: [nicht ändern ▼]

[Aktualisieren]
[Position(en) löschen]

[Warenkorb bestellen]

Position manuell einfügen:
(WM-Nummer bitte **ohne** Punkte eingeben!)
WM-Artikelnummer: [ ]
Menge: [ ]

[Einfügen]

NGK **ZÜNDHAFT GUT**

2006

Maske: *ZSC00100.HTM*   Porgramm: *ZSC001*

Stahl: Artikelstamm

Artikelnummer: [6000050]   [weiter]

Stahl Prospekt

Stahl Artikelstamm

Startseite

Artikelnr.:	Bezeichnung:	Gruppe:
6000001	ACHSE	60
6000002	WELLE	70
6000003	ACHSE	60
6000004	ACHSE	60
6000005	WELLE	70
6000006	PROFILSTAB	30
6000007	PROFILSTAB	30
6000008	PROFILSTAB	40
6000009	PROFILSTAB	40
6000010	PROFILSTAB	40
6000011	PROFILSTAB	40
6000012	KEILLEISTE	20
6000013	KEILLEISTE	30
6000014	KEILLEISTE (GEZAHNT)	30

1998

UK / ZVK Maler
Wiesbaden

1999

Betriebskonto-Nummer

010022

Jahr

Arbeitnehmer-Nummer

Paginiernummer

00	
01	**Stammdaten**
02	**Beitrag**
03	**Erstattung**
04	**Kontoauszug**
05	**Zwischenbereiche**
06	**Arbeitnehmer**
07	**LNK/BN**
08	**ADABAS**
09	**Klage**
10	**Suchen**
11	**Info**
12	**Ende**

10 Arbeitgeberbeitrag, Buchungen - Lfd.Jahr -   12.09.01 14.50UH

010022/6 Mustermann GmbH   04711 Musterstadt

Status: Gewerbliche 0A   Angestellte 0A   LAT Nein

Saldo: Soll   8.007,03 Euro/   15.660,39 DM

Wert-stel-lung	Buch-ungs-datum	Maschi-nen-datum	Ka	MM	JJ	B	Beleg	Soll €	Haben €	Betrag in DM
	1.01.99	1.01.99	Üb.	00	98			4.326,67	0,00	8.462,23
	19.01.99	21.01.99	310	12	98		2956015	4.891,90	0,00	9.567,72
	19.01.99	21.01.99	311	12	98		2956015	0,00	0,00	0,00
	8.02.99	16.02.99	320	11	98	2	103136	0,00	4.326,67	8.462,23
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	8.04.99	8.04.99	310	02	99		99315603	3.410,47	0,00	6.670,30
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	18.05.99	18.05.99	320	15	99	8		0,00	13.536,76	26.475,60
	25.05.99	27.05.99	310	04	99		99054817	4.237,36	0,00	8.287,56
	25.05.99	27.05.99	311	04	99		99054817	0,00	0,00	0,00
	22.06.99	28.06.99	310	05	99		99070010	3.621,35	0,00	7.082,74

KARMANN

CICS über Domino

INTRANET

Hauptmenü

A Kfm.T.Dienste

E Eink.+MaWi

O Orga/Systeme

P Personal+Recht

T Fahrzeugbau

V Vertrieb

Behälterstammdaten

Beh.Nr.   :   4007   Kun.Beh.Nr.:   004314   Typ:

Bezeichnung: VDA - KLT 4314   Art: KUMS

Länge a :	400	mm	Länge i :	334	mm	Eig.Gew. :	1,6	kg
Breite a :	300	mm	Breite i :	247	mm	Zul.Nutzlast :	50	kg
Höhe a :	147	mm	Höhe i :	104	mm	Zul.Ges.Gew. :	51,6	kg
Beh.-Fläche :	0,12	qm	Fas.Verm. :	8,6	l	Zul.Auflast :	257	kg
Beh.-Vol. :	0,02	cqm	Falthöhe :		mm	Stapelbar :	6	-fach

Für autom. Einlagerung (XG02)
Zonen   :   123456789ABC-KU
LE-Typ : C

ANZBEH2

2001

KARMANN

CICS über Domino

INTRANET

Hauptmenü

A Kfm.T.Dienste

E Eink.+MaWi

O Orga/Systeme

P Personal+Recht

T Fahrzeugbau

V Vertrieb

Büromaterial-Stammdatei

2003

Schlüssel (FamFaMatnr): 3001985571   Suchen/blättern

Schlüssel	Familie	MatNr	LGR	GKBEZ	GKZUS	GKZEI	Bild
3001985521	300	985521	560	HEFTAPPARATE	BIGRAPH 93.1100	NOVUS B4	
3001985522	300	985522	560	PACKUNG HEFTKLAMMERN	BIGRAPH 93.1502	24/6 VZ	
3001985557	300	985557	560	LINEALE PLASTIC 20 CM	BUERO ACTUELL	/	
3001985558	300	985558	560	LINEALE PLASTIK 30 CM	BUERO ACTUELL	/	
3001985561	300	985561	560	LEITZ LOCHER 5008	BIGRAPH 93.0202		
3001985562	300	985562	560	LOCHVERSTAERKUNGSRINGE	CLASSIC 1700	PVC-FOLIE	
3001985567	300	985567	560	PLASTIK-MARKIER-NADELN	BLAU SCHACHTEL=50 ST.	BRAUSE 8116	
3001985568	300	985568	560	PLASTIK-MARKIER-NADELN	GRUEN SCHACHTEL=50 ST.	BRAUSE 8116	

Document: Done

BRUNATA
METRONA

BRUNATA Wärmemesser-Gesellschaft Schultheiss GmbH + Co.
Max-Planck-Straße 2, 50354 Hürth

2003

Willkommen bei BRUNATA - Online

Benutzeridentifikation [   ]

Passwort [   ]

[Start BRUNATA Online]

Zurück zur BRUNATA-Homepage

Erfahrung die zählt !

BRUNATA
METRONA

BRUNATA METRONA

BRUNATA Wärmemesser-Gesellschaft Schultheiss GmbH + Co.
Max-Planck-Straße 2, 50354 Hürth

Heizkostenaufstellung
- Online -

metrona
2845
TELMETRIC *pro*

ı neuen Heizkostenverteiler "Telmetric-Pro" -- Rufen

Liegenschaftsnummer: [   ] EINGABE

zurück zum Hauptmenu

2003

BRUNATA METRONA

BRUNATA Wärmemesser-Gesellschaft Schultheiss GmbH + Co.
Max-Planck-Straße 2, 50354 Hürth

Kostenaufstellung Online

2003

Liegenschaftsnummer:	9100000	**Liegenschaftsanschrift:** Musterstrasse 601
		55555 Musterstadt

Ihr zuständiger Vertreter:

BRUNATA WAERMEMESSER-GES.
SCHULTHEISS GMBH + CO.
MAX-PLANCK-STR 2
50354 HUERTH

Telefon: (02233) 500
Telefax: (02233) 50169

Hilfe Angaben zur Kostenaufstellung

Abrechnungszeitraum Alt: 01.05.1999   30.04.2000

Abrechnungszeitraum Neu:

WICHTIGE ANGABEN:

                               DM   **EUR**

Die Abrechnung soll in folgender Währung erstellt werden: ◉   ○
(Die Betragsangaben sind in der entsprechenden Währung anzugeben)

Die Betragsabgaben sind: Brutto

Brennstoff Alt: Oel   Liter

Brennstoff Neu

                                    DM   **EUR**   Hilfe zur Angabe der Brennstoffkosten

Brennstoffkosten	**Datum**	**Menge**	**Betrag**
Restbestand Vj:		2191,000	933,71
Anfangsbestand:		2191,000	933,71

z/VSE System Structure

Shared Virtual Area SVA (31)						
T C P / I P	U s e r A p p l	V T A M	P O W E R	C I C S Transaction Server	B a t c h	D y n. P a r t.
Shared Virtual Area SVA (24)						
Supervisor						

DB2

DL/I
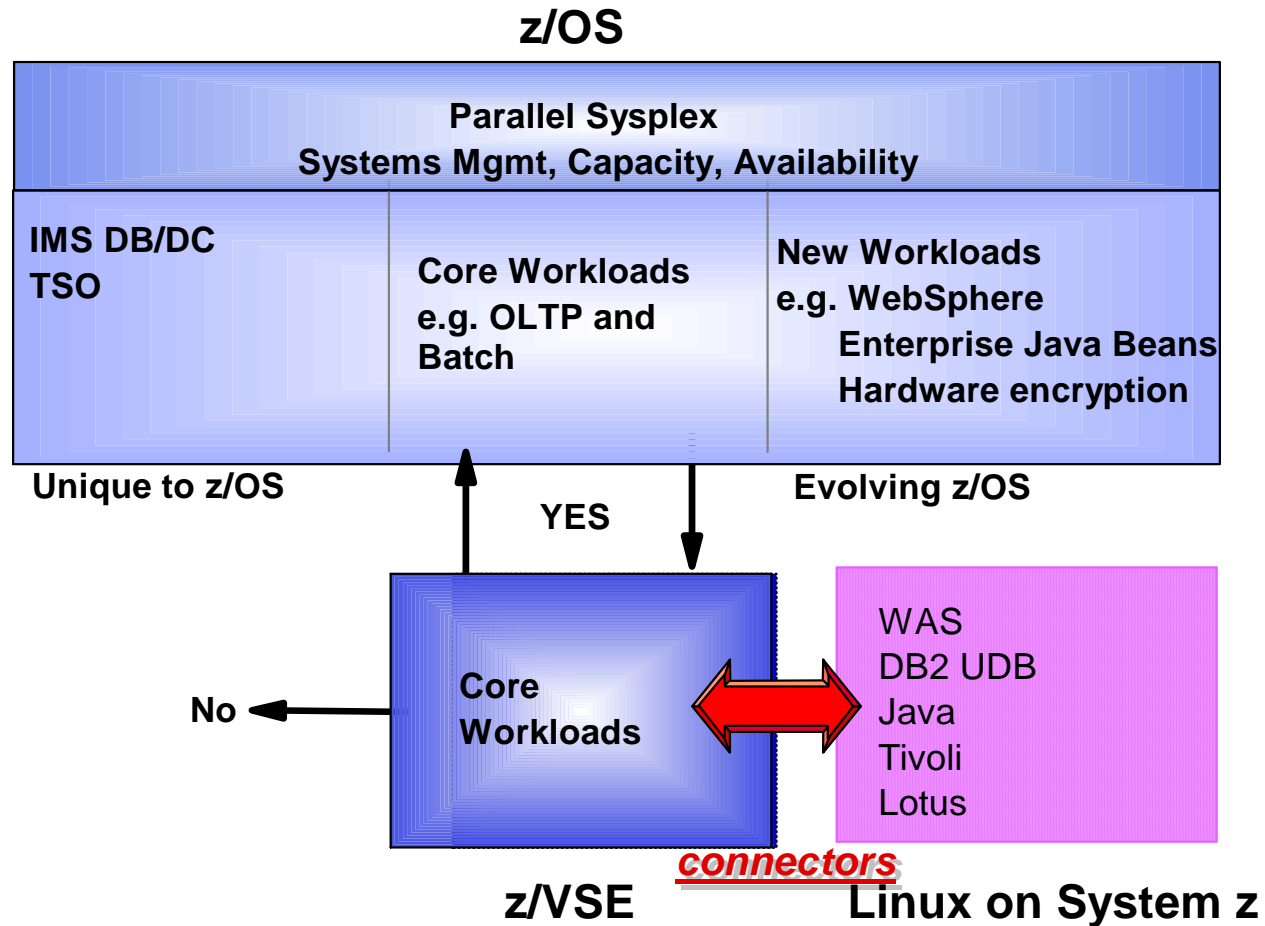
VSAM

SEQ.
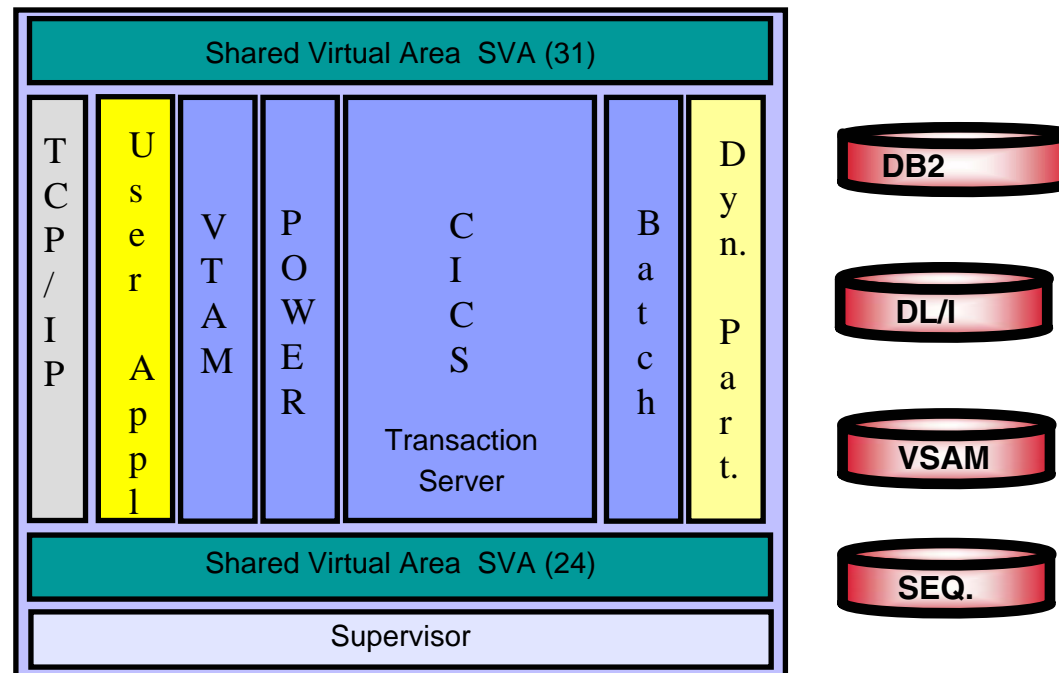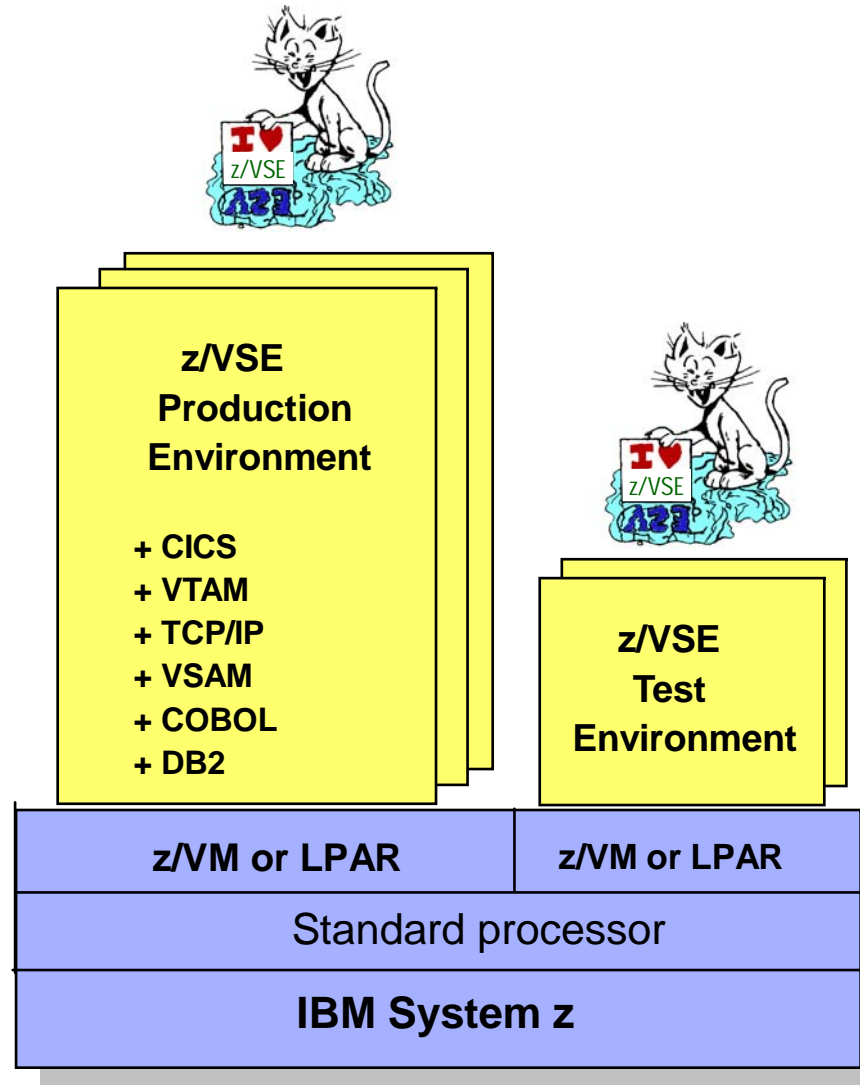
► VSE programs (jobs) execute in address spaces (partitions)
  ► under control of CICS
  ► in batch
  ► in dynamically built partitions

► SVA contains code that is called from various programs running in different address spaces
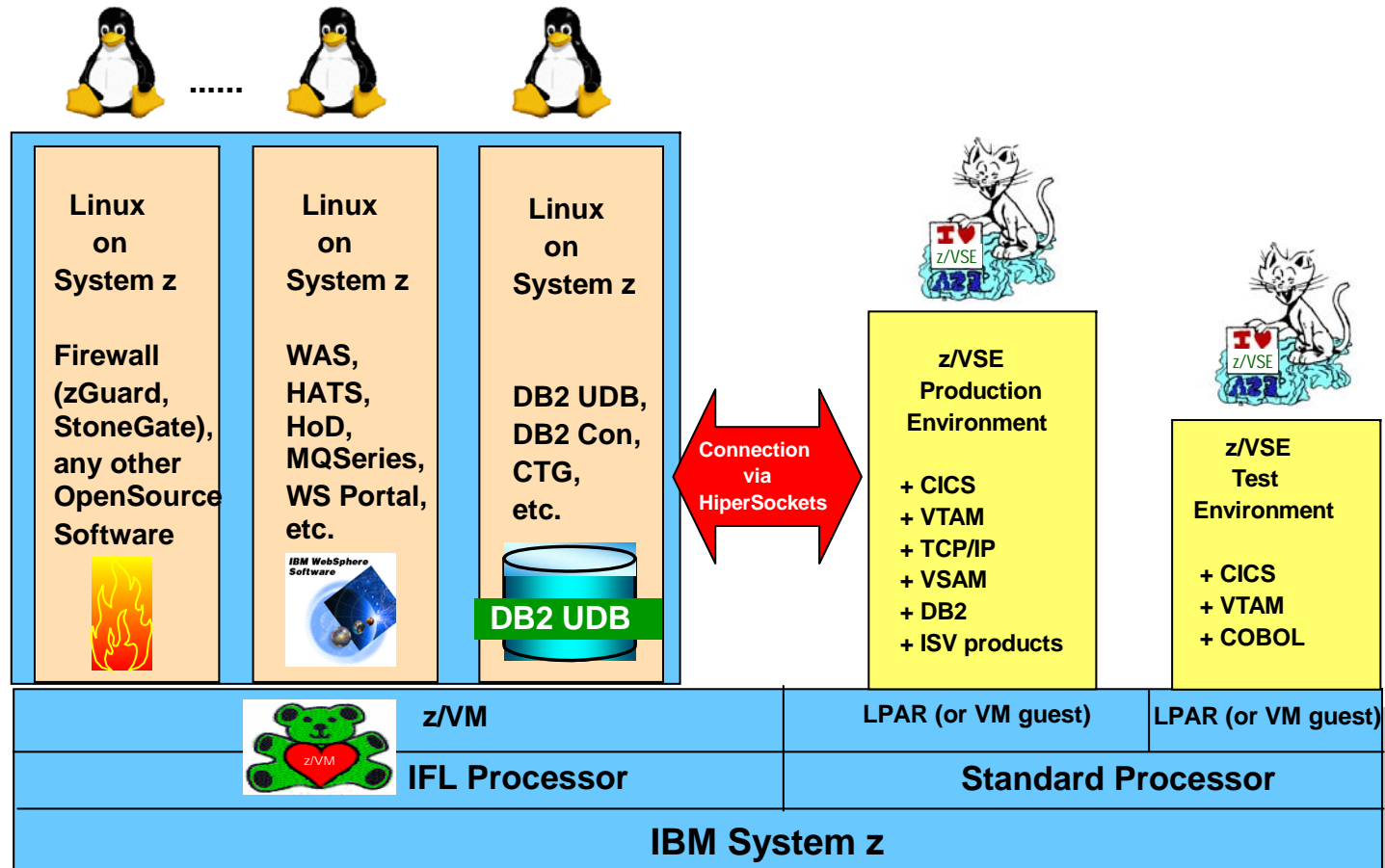► Supervisor (kernel) controls I/O
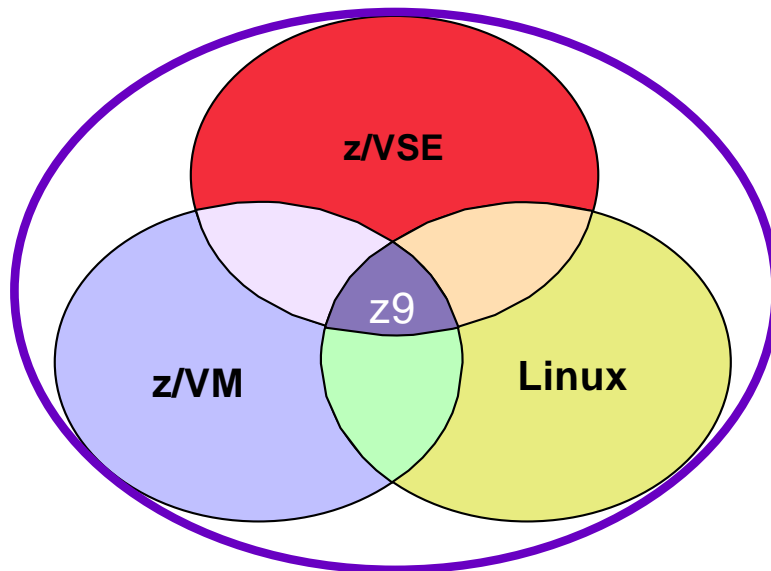
z/VSE and z/OS Affinity

z/OS

Parallel Sysplex Systems Mgmt, Capacity, Availability		

IMS DB/DC
TSO
	Core Workloads
	e.g. OLTP and
	Batch
		New Workloads
		e.g. WebSphere
		      Enterprise Java Beans
		      Hardware encryption

Unique to z/OS   **Evolving z/OS**

YES

No ←

Core
Workloads

WAS
DB2 UDB
Java
Tivoli
Lotus

connectors

z/VSE   **Linux on System z**

Typical z/VSE Environment

z/VSE Modernization w/ Linux on System z

Exploiting the best of all Worlds on System z

- **z/VSE**
    - Protect core IT investments
    - Robust, secure enterprise server
    - Cost-effective solutions
    - Interoperability with network/servers
    - z/OS affinity
- **Linux on System z**
    - Large portfolio of new applications
    - Platform for IBM middleware
    - Infrastructure Simplification
    - Massive scalability
- **z/VM**
    - Highly flexible, industrial strength
    - Multiple z/VSE and Linux images
    - Designed to exploit System z

Two lessons can be drawn from history...

1. The revolution that begun 43 years ago <u>never ended</u>
2. Legacy systems are systems that work!

For more information…..

Much of the product information in this presentation, plus much more, can be found on the IBM Archives web site. If you are interested, simply use this URL:

http://www-1.ibm.com/ibm/history/index.html

Also see 'The 360 Revolution', by Chuck Boyer. Available in .pdf format at:

ftp://ftp.software.ibm.com/eserver/zseries/misc/bookoffer/download/360revolution_040704.pdf

Other information can be found on the VSE web site:

http://www-1.ibm.com/servers/eserver/zseries/os/vse/