



E41

# VSE – Looking Back Over the Last 40 Years

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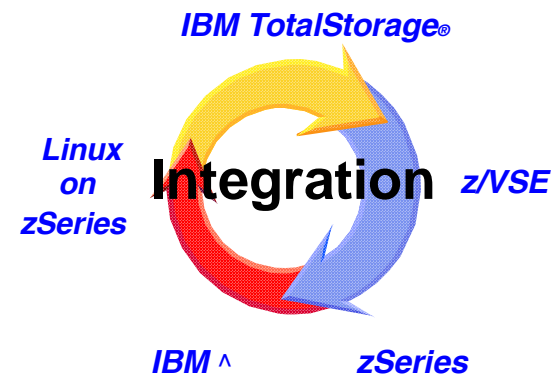
zSeries Expo

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Miami, FL



**Abstract:** Next year (2005) will mark the 40<sup>th</sup> anniversary of **IBM System/360 Disk Operating System (DOS/360)** – the forerunner of today’s VSE/ESA and of tomorrow’s z/VSE. This session will chronical the origins and some key milestones that led to today’s proven product. If you are a relative VSE novice, learn more about the heritage of this popular operating system. If you are a seasoned VSE veteran, take a trip down memory lane – and possibly correct or expand upon what is included in this retrospective.



# 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](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/>



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| CICS*                  | IBM*               | S/390*                    |
| DB2*                   | IBM logo*          | S/390 Parallel Enterprise |
| DB2 Connect            | IBM eServer        | Server                    |
| DB2 Universal Database | IBM e(logo)server* | TotalStorage*             |
| Domino                 | iSeries            | VM/ESA*                   |
| DRDA*                  | Lotus*             | VSE/ESA                   |
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| Server*                | MQSeries*          | WebSphere*                |
| ES/9000*               |                    | xSeries*                  |
|                        |                    | z/VM*                     |
|                        |                    | zSeries*                  |

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# Familiar Events in History

- Helen of Troy leaves her husband
- Citizens of Pompeii watch volcano with casual interest
- Montezuma invites Cortez to palace for dinner
- Ann Boleyn marries King Henry VIII
- President Lincoln attends theater
- Elite travelers book maiden voyage of *Titanic*
- Thousands take out loans to buy stocks in 9/1929
- Ford introduces the Edsel
- Thousands worldwide depend on VSE for their IT needs

# What Doesn't Belong and Why?

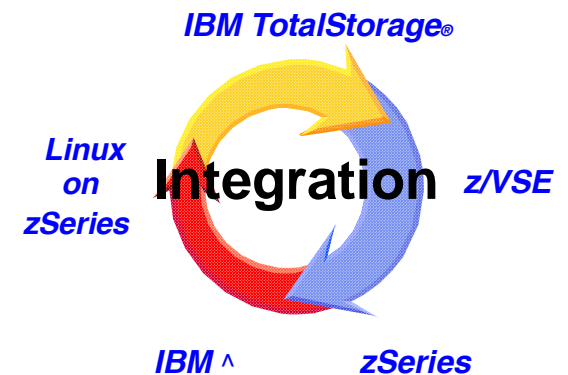
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Wait. We'll get the answer later.....

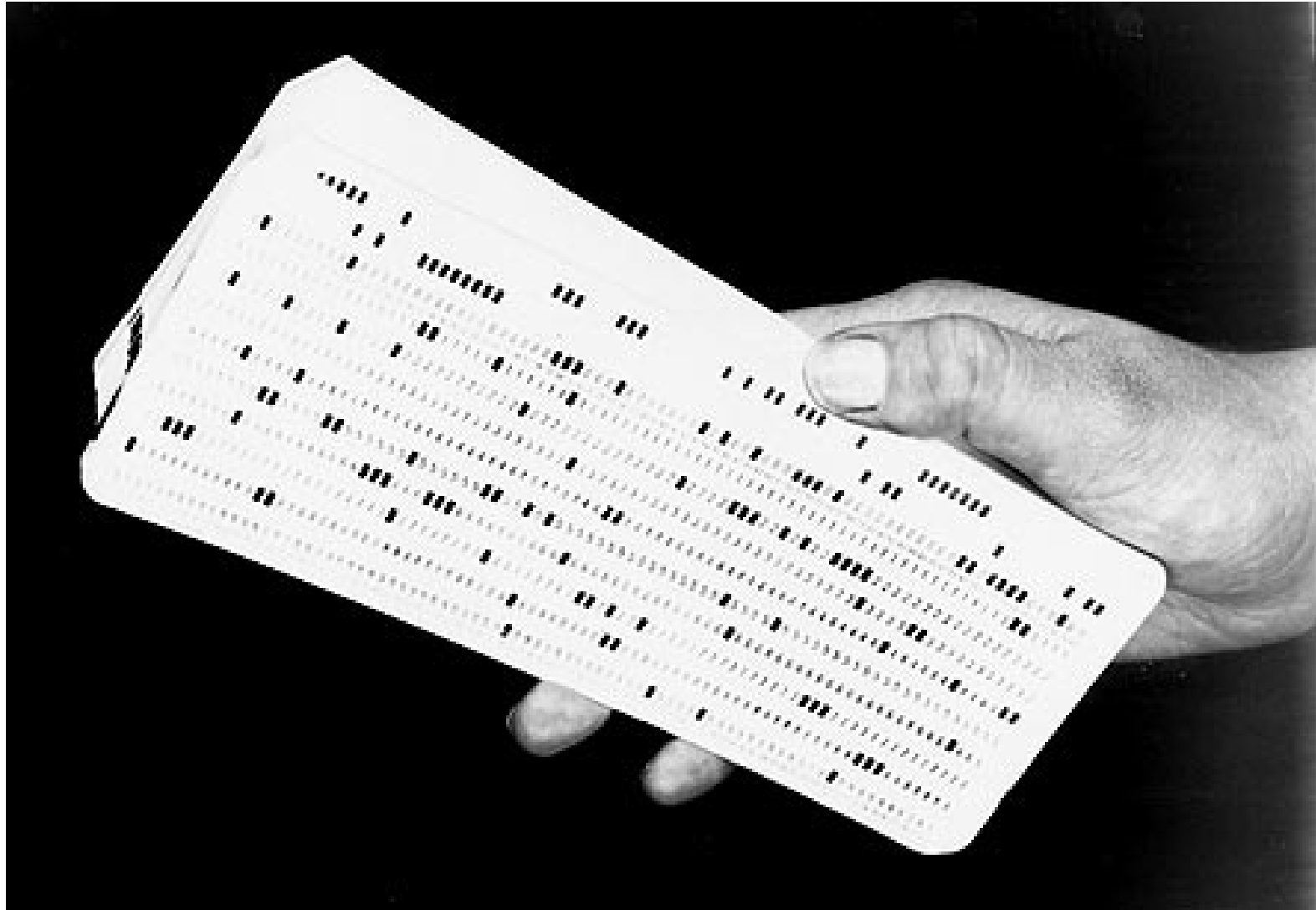


“The further backward you look, the further forward you can see.....”

.....*Sir Winston Churchill*



In the beginning was the card.....





the key punch ....



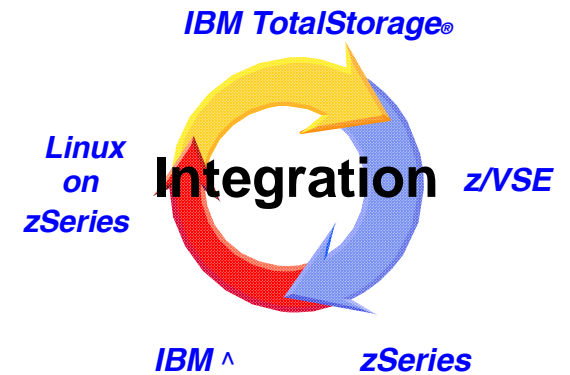
# And the Hollerith Tabulator ....





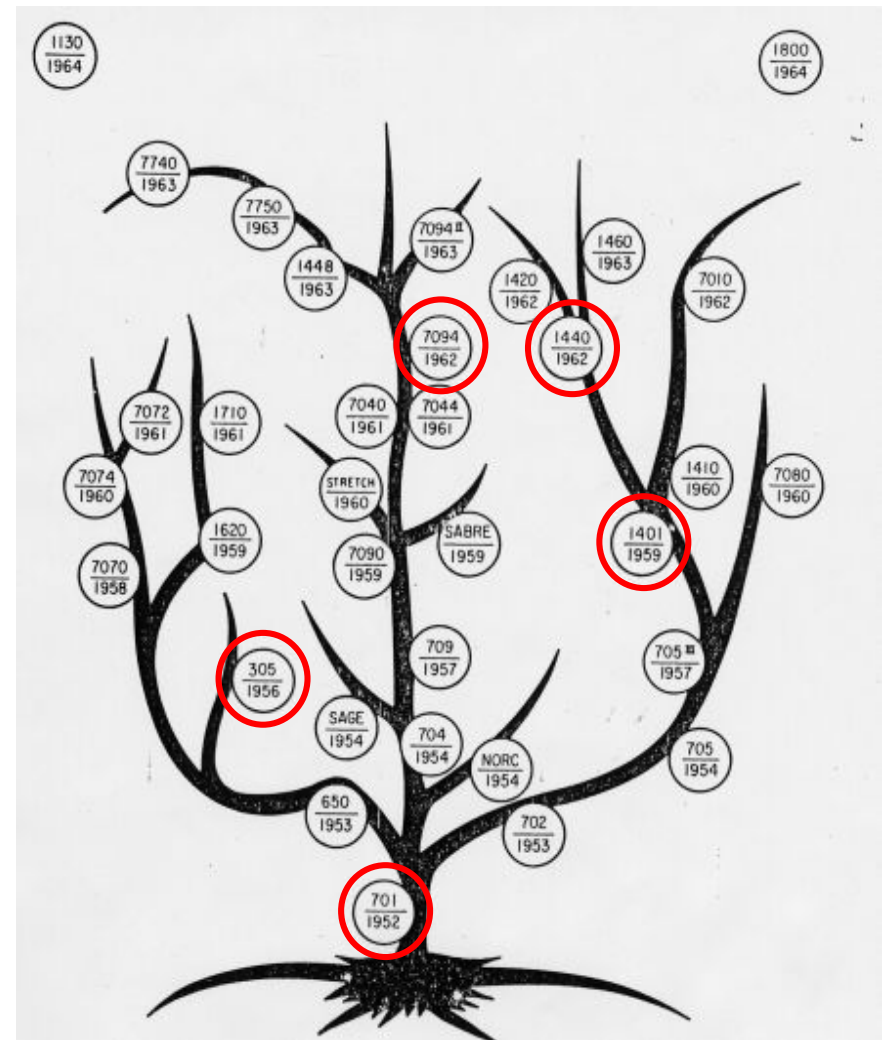
# The 1950's

..... 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

## *1<sup>st</sup> 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

## *2<sup>nd</sup> 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)





# S/360 Family

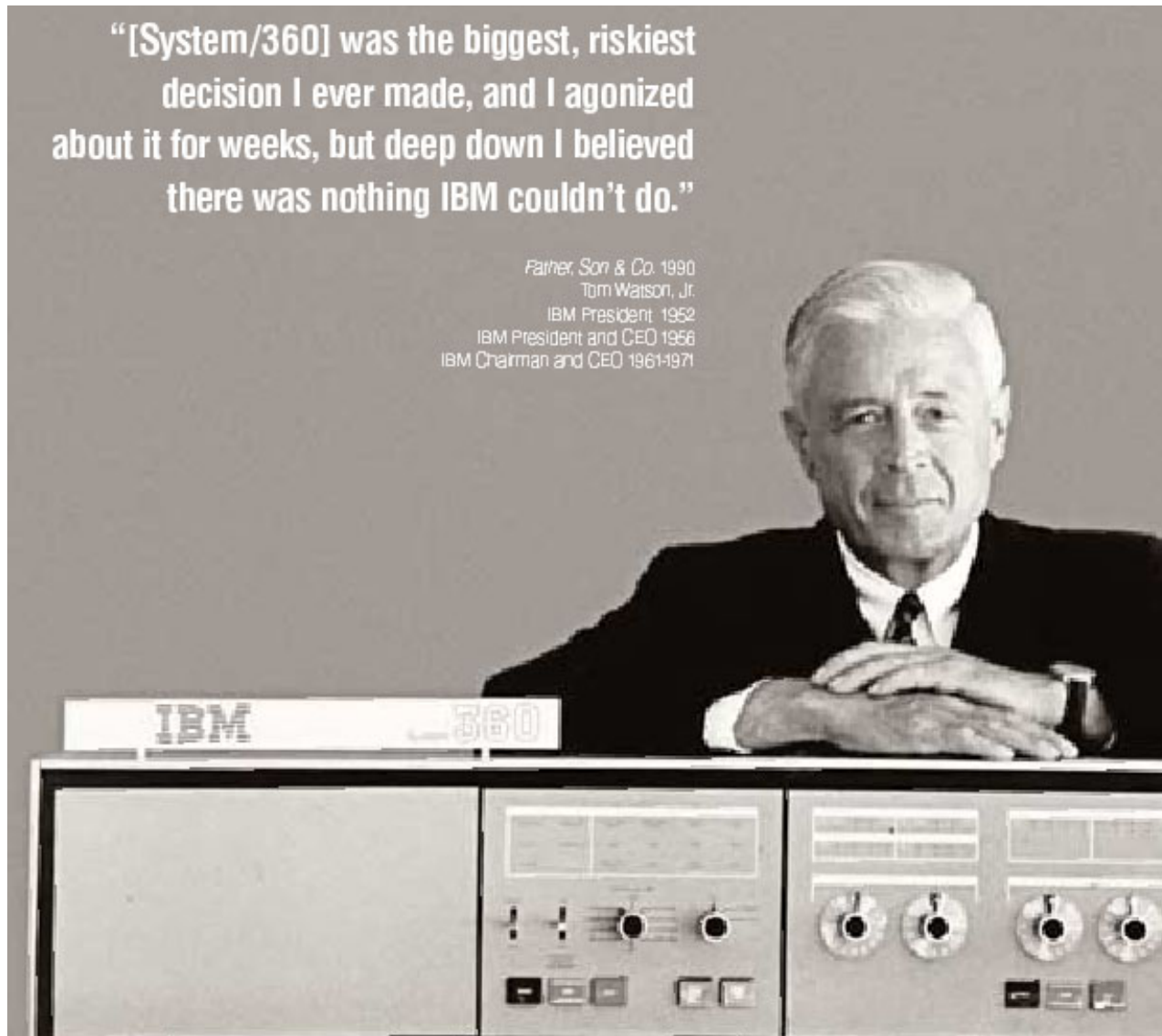


| Model      | Announced                | First Shipped         |                       |
|------------|--------------------------|-----------------------|-----------------------|
| <b>30</b>  | <b>April 7, 1964</b>     | <b>June, 1965</b>     |                       |
| <b>40</b>  | <b>April 7, 1964</b>     | <b>April, 1965</b>    |                       |
| <b>50</b>  | <b>April 7, 1964</b>     | <b>August, 1965</b>   |                       |
| <b>20*</b> | <b>November 18, 1964</b> | <b>April, 1966</b>    | not a 'true' S/360    |
| <b>65</b>  | <b>April 22, 1965</b>    | <b>November, 1965</b> |                       |
| <b>75</b>  | <b>April 22, 1965</b>    | <b>January, 1966</b>  |                       |
| <b>44</b>  | <b>August 16, 1965</b>   | <b>June, 1966</b>     | focused on scientific |
| <b>67</b>  | <b>August 16, 1965</b>   | <b>May, 1966</b>      | early Virtual Storage |
| <b>91</b>  | <b>January 18, 1966</b>  | <b>October, 1967</b>  |                       |
| <b>25</b>  | <b>January 3, 1968</b>   | <b>October, 1968</b>  |                       |
| <b>85</b>  | <b>January 30, 1968</b>  | <b>December, 1969</b> |                       |
| <b>195</b> | <b>August 20, 1969</b>   | <b>March, 1971</b>    |                       |

# 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



# 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?

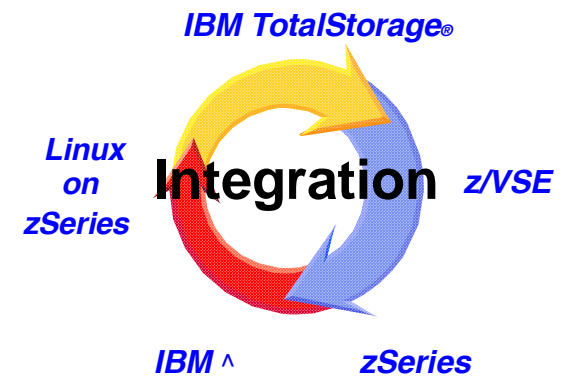
- US President: Lyndon Johnson
- Value (in 2004\$) of \$1 = \$6.01
- Average income = \$7,704
- Average price of a car = \$2,350
- Average price of a house = \$21,500
- Dow Jones Industrial Average = 969
- Some Top Songs
  - Beatles ‘Help’
  - Sonny & Cher ‘I Got You Babe’
  - Rolling Stones ‘Satisfaction’
- 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



# S/370 family

| Model | Announced          | First Shipped  |  |
|-------|--------------------|----------------|--|
| 155   | June 30, 1970      | January, 1971  |  |
| 165   | June 30, 1970      | April, 1971    |  |
| 195   | June 30, 1970      | August, 1973   |  |
| 145   | September 23, 1970 | June, 1971     |  |
| 135   | March 8, 1971      | April, 1972    |  |
| 158   | August 2, 1972     | April, 1973    |  |
| 168   | August 2, 1972     | May, 1973      |  |
| 125   | October 4, 1972    | April, 1973    |  |
| 115   | March 13, 1973     | March, 1974    |  |
| 138   | June 30, 1976      | November, 1976 |  |
| 148   | June 30, 1976      | January, 1977  |  |

Virtual storage capable models

# VSE Moved from Endicott to Boeblingen





# 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?

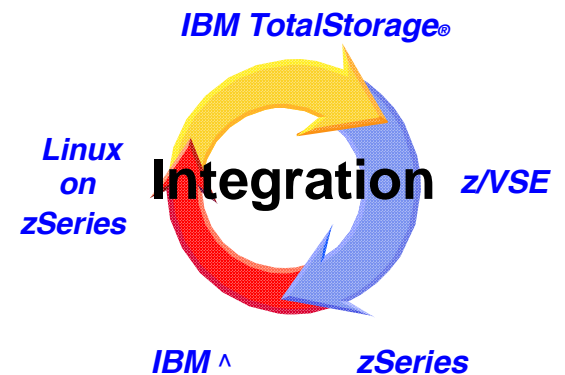
- US President: Richard Nixon
- Value (in 2004\$) of \$1 = \$4.53
- Average income = \$12,625
- Average price of a car = \$3,879
- Average price of a house = \$30,500
- Dow Jones Industrial Average = 1020
- Some Top Songs
  - Don McLean ‘American Pie’
  - Sammy Davis, Jr. ‘The Candy Man’
  - Rolling Stones ‘Satisfaction’
- 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 2004\$) 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 were a single integrated system
  - Capacity-based Pricing



# What were things like in 1987?

- US President: Ronald Reagan
- Value (in 2004\$) 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

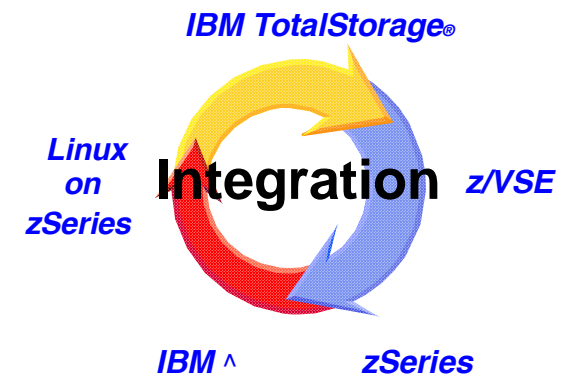




# The 1990's – revitalization of VSE!

.....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.

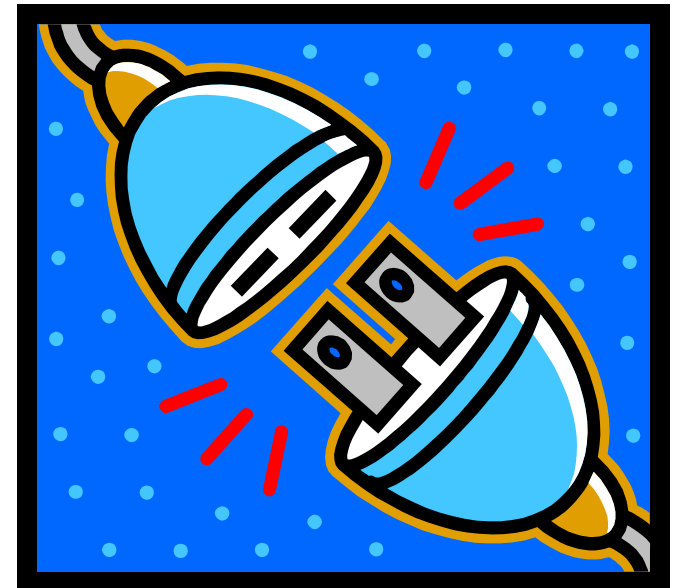




# One well known example....

- “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
    - 200MB 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 2004\$) 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 2004\$) 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

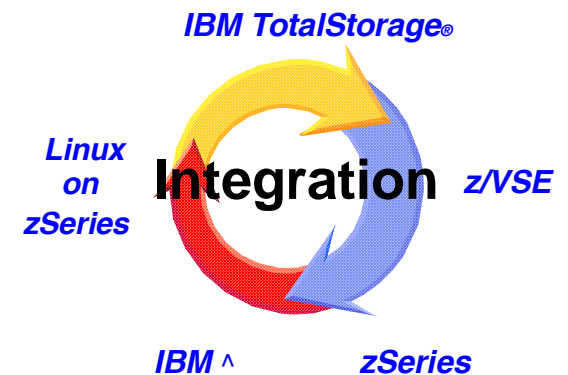




## The 2000's

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

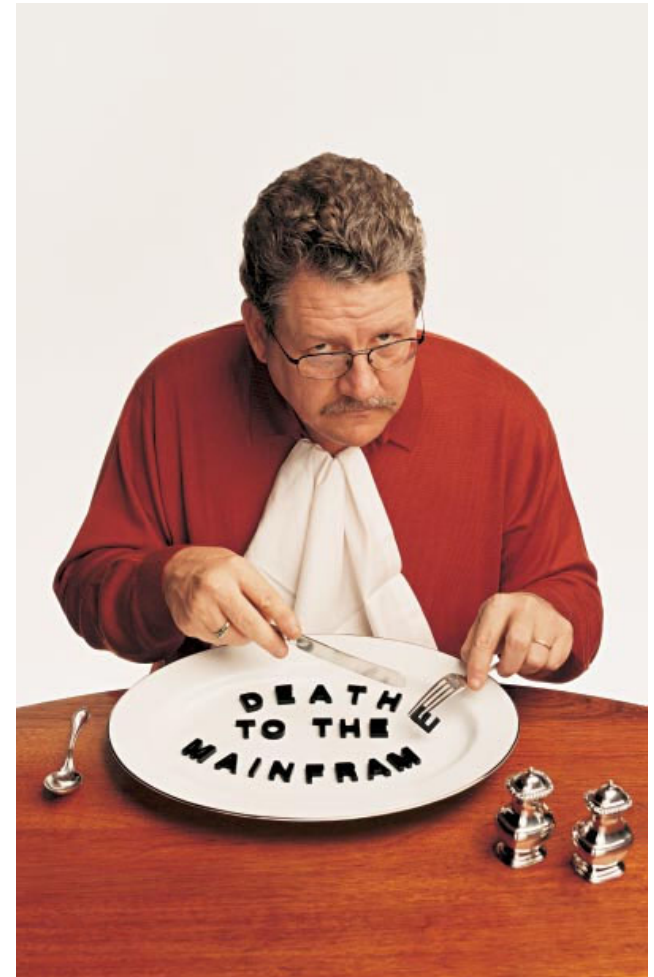
...looking to the future with IBM ^ zSeries and z/VSE V3



# Reports of the death of the mainframe ....were premature

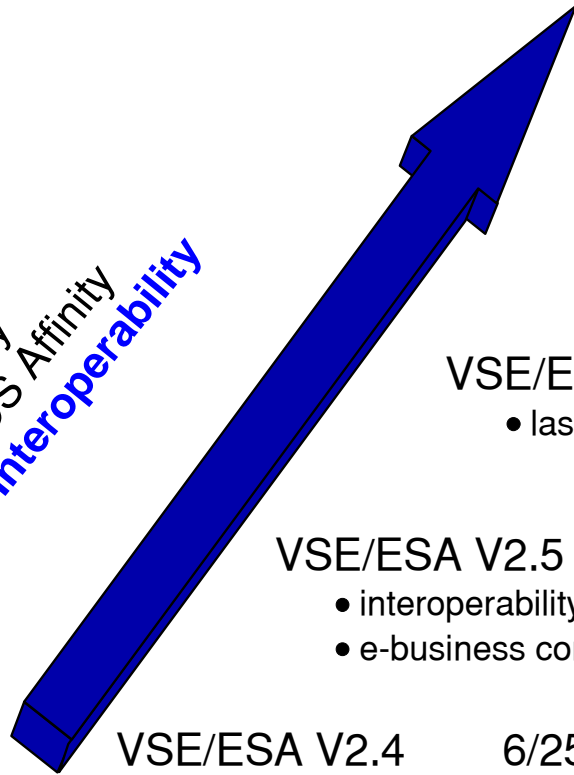
- “I predict that the last mainframe will be unplugged on March 15, 1996.”
  - Stewart Alsop, March 1991
- “It’s clear that corporate customers still like to have centrally controlled, very predictable, reliable computing systems— exactly the kind of systems that IBM specializes in.”
  - Stewart Alsop, February 2002

Source: IBM Annual Report 2001



# Recent VSE Innovation

Capacity  
Quality  
z/OS Affinity  
**Interoperability**



## **z/VSE V3.1**      **2005**

- zSeries features, FCP-SCSI
- 31-bit mode only

## VSE/ESA V2.7      3/14/2003

- enhanced interoperability
- ALS2 servers only

## VSE/ESA V2.6      12/14/2001

- last release to support pre-G5 servers

## VSE/ESA V2.5      9/29/2000

- interoperability
- e-business connectors

## VSE/ESA V2.4      6/25/1999

- CICS Transaction Server for VSE/ESA
- e-business

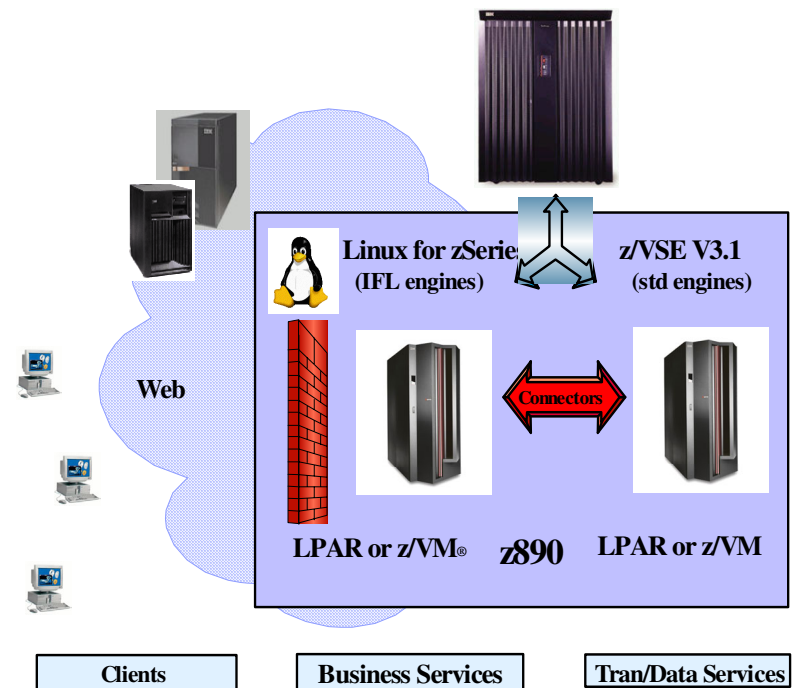




# VSE Strategy

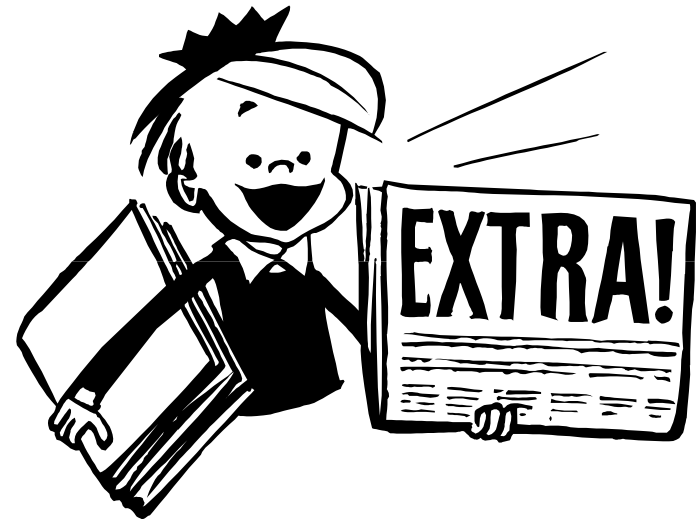
- Helps **Protect** your existing investments in core VSE programs, data, equipment, IT skills, *plus* business processes, end user training, etc.
  - modernize, i.e. extend VSE resources to Web
  - exploit IBM servers, storage, and software
- **Integrate** VSE with the rest of your IT based on open and industry standards
  - IBM middleware
  - VSE connectors and web services
- **Extend** with Linux on zSeries
  - infrastructure consolidation/simplification
  - add new infrastructure and/or line-of-business applications

Why Not Think Inside the Box?



# z/VSE (1) V3.1 Preview

- Helps **Protect** investments in your core VSE assets
  - **Fibre Channel Protocol (FCP) Channel attached SCSI disk**
  - HiperSockets, incl spanned HiperSockets
  - PCICA hardware encryption assist
  - Adapter interrupts for OSA-Express
  - OSA-Express, incl Ethernet and Token Ring
  - OSA-Integrated Console Controller
  - Up to 30 LPARs
  - Up to 2 LCSSs on z890 - 4 on z990
  - FICON-Express
- **Integrate** VSE with the rest of your IT
  - VSE Connectors and web services
  - IBM middleware
- **Extend** with Linux on zSeries



Note 1: z/VSE 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 zSeries hardware

# VSE Server Support

| IBM zSeries Servers                             | z/VSE<br>V3.1 | VSE/ESA<br>V2.7 | VSE/ESA<br>V2.6 | Hdwr<br>EoS |
|---|---------------|-----------------|-----------------|-------------|
| <b>zSeries 800, 890, 900, 990 (31-bit only)</b> | <b>Yes</b>    | <b>Yes</b>      | <b>Yes</b>      | <b>tbd</b>  |
| <b>S/390 Parallel Enterprise Server™ G5/G6</b>  | <b>Yes</b>    | <b>Yes</b>      | <b>Yes</b>      | <b>tbd</b>  |
| <b>S/390® Multiprise® 3000</b>                  | <b>Yes</b>    | <b>Yes</b>      | <b>Yes</b>      | <b>tbd</b>  |
| S/390 Parallel Enterprise Server™ G3/G4         | No            | No              | Yes             | tbd         |
| S/390® Multiprise® 2000                         | No            | No              | Yes             | tbd         |
| S/390 Integrated Server                         | No            | No              | Yes             | tbd         |
| S/390 Parallel Enterprise Server™ G2            | No            | No              | Yes             | 12/2004     |
| P/390 and R/390                                 | No            | No              | Yes             | 12/2004     |
| S/390 Parallel Enterprise Server™ G1            | No            | No              | Yes             | 12/2003     |
| ES/9000® – 9221                                 | No            | No              | Yes             | 12/2003     |
| ES/9000® – 9121, 9021                           | No            | No              | Yes             | 06/2003     |

# VSE Interoperability

| <b>zSeries Functions</b>                      | <b>z/VSE<br/>V3.1</b> | <b>VSE/ESA<br/>V2.7</b> | <b>VSE/ESA<br/>V2.6</b> |
|---|-----------------------|-------------------------|-------------------------|
| <b>VSE Connectors (no additional charge)</b>  |                       |                         |                         |
| Web Services i.e. SOAP and XML                | <b>Yes</b>            | <b>Yes</b>              | Yes*                    |
| VSEScript and DL/1                            | <b>Yes</b>            | <b>Yes</b>              | Yes*                    |
| VSAM Redirector                               | <b>Yes</b>            | <b>Yes</b>              | Yes                     |
| VSAM, POWER, Librarian, ICCF Lib, console     | <b>Yes</b>            | <b>Yes</b>              | Yes                     |
| DB2 Stored Procedures for VSAM and DL/1       | <b>Yes</b>            | <b>Yes</b>              | Yes                     |
| <b>IBM Middleware (priced)</b>                |                       |                         |                         |
| CICS Transaction Gateway                      | <b>Yes</b>            | <b>Yes</b>              | Yes                     |
| DB2 Connect/DB2 UDB link to stored procedures | <b>Yes</b>            | <b>Yes</b>              | Yes                     |
| MQSeries                                      | <b>Yes</b>            | <b>Yes</b>              | Yes                     |

Note 1: z/VSE 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 zSeries hardware

# circa 2005

- IBM <sup>^</sup> zSeries 890
  - based on innovative z990 technology
  - 1 model, 28 capacity settings
    - 1 to 4 Processing Units (PUs)
  - 8 to 32 GB Processor Storage
  - up to 30 LPARs, up to 2 LCSSs
  - 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 V3.1
  - Turbo dispatcher
    - support for n-way processors
  - CICS TS for VSE/ESA
    - availability and z/OS affinity
  - TCP/IP for VSE/ESA
    - offered under agreement with CSI
  - VSE e-business connectors
  - Web services
  - Hipersockets
  - PCICA encryption assist
  - Shark Flashcopy and PPRC
  - FCP-attached SCSI disks



After almost 40 years  
providing robust,  
cost-effective solutions,  
VSE doesn't get older –  
**it gets better.....**

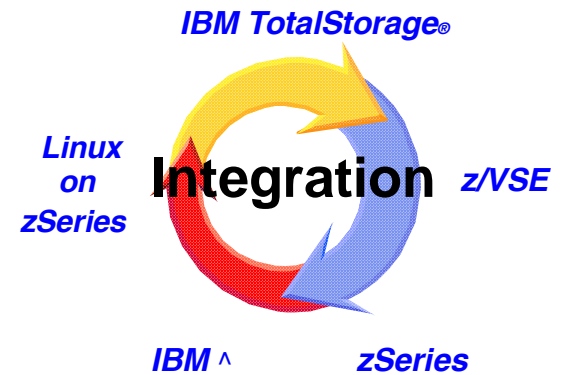
**P** rotect  
**I** ntegrate  
**E** xtend



*Simple as P i e !*



# Miscellaneous retrospectives...



# Do You Recall?

- Wing Tip shoes and ‘Onward, Ever Onward’
- ‘Think’ signs and ‘Think’ writing pads
- ‘Blue’ Letters? ... how about ‘Ivory’ Letters
- BOS, TOS
- Future System (FS)
- April 11, 1980 at 8:00 GMT
  - don’t forget September 17, 2042
- VM/BSEPP



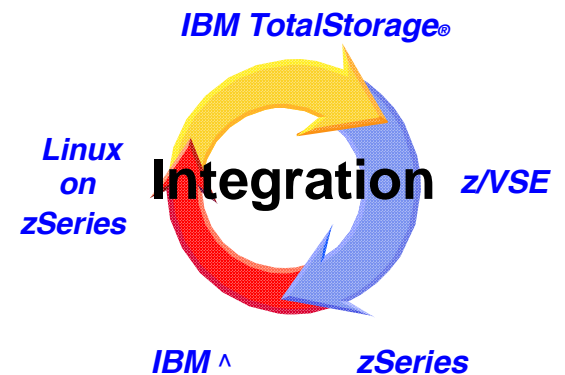
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- VM/BSEPP
- IBM 1130, System 7, 8100 and DPPX, and Series 1
- Operations Research, Video Text, CASE
- Buildings heated by the heat of their mainframes
- Systems Application Architecture (SAA)
- Dr. Ed Altman and GUIDE
- Client/Server
- Year 2000

future?

“Never prophesy, especially about the future...”

.....*Sam Goldwyn*



# These Classics Began Around 1965

.... all are still going strong

- **VSE** - *in one form or another*
  - DOS/360, DOS/VS, DOS/VSE, (SSX), VSE/SP, VSE/ESA, z/VSE
- **Ford Mustang** – have you seen the 2005 models?
- **Boeing B-52 Stratofortress** – the grandsons of the original pilots will be flying the darned things for years to come.
- **The Rolling Stones** - *OK, some classics eventually do get older*

# What Doesn't Belong and Why?

- Helen of Troy leaves her husband
- Citizens of Pompeii watch volcano with casual interest
- Montezuma invites Cortez to palace for dinner
- Ann Boleyn marries King Henry VIII
- President Lincoln attends theater
- Elite travelers book maiden voyage of *Titanic*
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*...Because all the others lived to regret their actions*

# Two lessons can be drawn from history...

- 1. The revolution that begun 40 years ago never ended*
- 2. Legacy systems are systems that work!*



Thanks for listening, and thanks for your business



→ The History of IBM



*Your friends, the VSE team*

