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# Alternatives for the "Under 60" (MIPS) Crowd



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# Trademarks

- > IBM Trademarks/Registered Trademarks
 

S/390	Sysplex
VM/ESA	Multiprise
OS/390	CICS
IBM	VSE/ESA
- > IntelliWare Trademarks
 

Win/VSE	Web/VSE Host
Web/VSE Console	iFrame
- > Other Trademarks
 

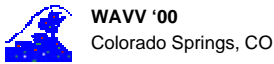
UNIX	FLEX-ES
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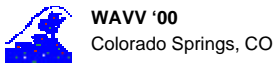
## Disclaimer

- I do not work for, or speak for, **IBM**
- The following is based on my understanding and conclusions from published IBM materials.
- **Everything** is subject to change!




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## Objective:

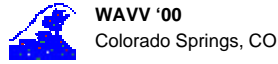
**Consider alternatives for VM/ESA and VSE/ESA users who are “in the middle”.**

- IBM offers good solutions for 60 MIPS or greater, but...
- What about users who need less??
- What are the choices and alternatives??



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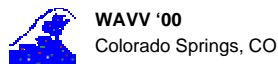
## Agenda

- \* Brief review of S/390 Servers
- \* Current S/390 families and their status
  - \* Traditional Mainframes (9672)
  - \* P/390 family
  - \* Hybrids (Multiprise 3000)
  - \* Software Emulation
- \* Considerations and thoughts on when to use what....




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## "Traditional Mainframe"


- What we grew up with
  - S/360 – S/370, 4381, 308x, 3090, 9x21, 2003, 9672
- Primarily hardware/microcode oriented
- Long development times
  - Available products were frequently a little behind the technology curve.
  - Enhancements came in big steps (S/370, XA, ESA, ESA-390)



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 **9672**


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## Today's Traditional:

- For the LARGE S/390 systems
  - Based on G6 processor of approximately 170 MIPS each
    - Up to 12 Processors in a Complex
    - (>1600 MIPS)
  - Up to 32 GB of storage
    - up to 15 LPARs
  - Crypto, Compression, spare CPUs, dynamic upgrades, etc.....
- 64 Bit (zSeries) server just around the corner





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 **P/390 Family**

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- Descendents of PC/370 adapter and 7490
- Based on standard PC/RS6000 hosts
- Bit-Slice hardware processor implementation with significant microcode
- I/O subsystem provided by host system and software (device managers: OS/2 – AIX)
- Introduced economical ESL licensing


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## P/390: Generation 1


- PC Server 500/520, Microchannel host
  - Pentium 90, RAID & SCSI, LAN Adapters
- P/390 Adapter: 3.5 – 4 MIPS
  - 32MB or 128MB S/390 memory (only)
  - Extensive use of Software Device Managers and device emulation
- Complete VSE system for under \$50K
- Got the ball rolling


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## P/390: Generation 1.5

- PC Server 330 (PCI bus) host
- PCI version of 4 MIPS P/390 adapter
- Enhancements to Device Managers





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## P/390 Generation 2


- PC Server 330-PB0
  - New RAID, support, more memory
- New P/390 'E' adapter:
  - About 7 MIPS
  - 256MB S/390 memory
- 'Extends' ESL license
- Additional Software/Device Manager changes
  - Can use PC memory for Expanded Storage
  - Use TCP/IP and TN3270 for display support


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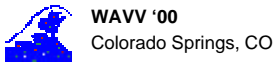

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## P/390 Generation 2.5

- AKA: S/390 Integrated Server / 3006
- Same P/390 E adapter
- Host system designed and built for and by S/390 (Poughkeepsie)
- Full S/390 support structure
- Improved I/O
  - SSA -RAID disks
  - Better S/390 channels
- More expensive




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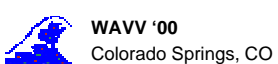

## Other P/390 based Systems

- Various OEM packages
  - Specific hardware and software package
  - Support by the OEM, not IBM
  - Including 'Laptop' implementation
- CDS-2000
  - Used P/390 E adapter in custom host
  - Multi-Tiered system intended to accelerate I/O
    - Fiber connections
    - Dedicated I/O processor




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## P/390 Considerations

- Inexpensive and flexible
- Supports architecture through OS/390 2.10 level\*
  - Can run LINUX/390
  - Does not have 64Bit / Freeway support
- Very limited expansion capabilities
- No known IBM development activities
- Single image (no LPAR)
- Limited I/O (channels/devices and speed)




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## Hybrid Systems

- Combines hardware execution element with extensive software/host support and I/O emulation.
- Current example is Multiprise 3000 (7060)
- We can expect further development in this line



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## Multiprise 3000 (1)

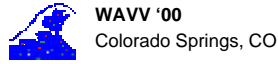
- ※ A family of S/390 Mid-Range Servers
  - ※ Three models: H30, H50, H70 (approx 60, 120, 210 MIPS)
  - ※ 1GB (H30), 2GB (H50), or 4GB (H70) memory
  - ※ Same 'frame' as S/390 Integrated Server, but many differences
- ※ New Software License: **G**rowth **O**pportunity **L**icense **C**harge
  - ※ MLC; not Group based, specific per model

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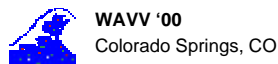
## Multiprise 3000 (2)

- Combines P/390, 9672, and Multiprise technologies
  - Uses G5 processor in 1+1 and 2+1 configurations
  - Uses Multiprise Internal disk (but with SSA & RAID-5)
  - Uses I.S. SSA RAID & Emulated I/O abilities
  - Expansion units available, for up to 792GB disk and 56 channels
  - Channels are 'full' S/390 channels (ESCON & Parallel), not emulated
  - LAN & WAN connections from I.S. (no OSA)




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## Multiprise 3000 Considerations

- Early problems, smoothed out now
- No OSA; restricts LAN connectivity
  - Channel connected units recommended
- High entry point (60 MIPS) (but)
- GOLC and incentives make 7060 attractive for many customers needing 30 MIPS or more
- Full architectural support for "beyond 2.10"
- Very good I/O and general performance
  - (other than Emulated I/O)




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## Software Emulation Systems


- Emulation of S/390 instructions / functions via software
- Emulation programs 'decode' S/390 machine instructions and 'execute' that function
- Varying levels of sophistication and performance
- Currently two known/primary players:
  - *FLEX-ES* (Fundamental Software)
  - Hercules (Open source / freeware)

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## Hercules S/390 Emulator

- Hercules is 'Open'; it is jointly developed and maintained by a group of people (similar to Linux). Available at no charge.
- Runs on Linux (Intel) base
- Currently testing ESA level functionality
- Limited I/O device support
- Performance not it's strong point:
  - Using a DUAL Pentium 1GHz system, S/390 performance is stated to be similar to early P/390 systems (4 MIPS)

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## FSI's *FLEX-ES*

- Available commercially since early 90s
- Very sophisticated emulation technology
- FSI licenses the right to replicate S/390 functions from IBM ( \$\$ )
- Many FLEX-ES based systems in production use today
- Provides ESA-390 functionality today.
  - LINUX/390 support "any day now"
  - Continuing Development / Enhancements

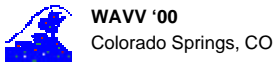

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## How *FLEX-ES* Works


```
graph TD; A[Line of S/390 machine instructions] --> B[FLEX-ES translator]; B --> C[Translated line of pseudo-Code]; C --> D[FLEX-ES Executor]; D --> E[Equivalent Pentium Instructions executed]; B --> F[Cache of translated lines of pseudo-Code Held for re-use]; F --> B; B --> G[Translator plus Executor produces same result as S/390 hardware]; D --> G;
```

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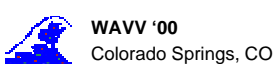

## Three types of *FLEX-ES* Systems

- 'Generic' *FLEX-ES* based systems sold by distributors
  - Using various brand PC hosts and components
- **IntelliWare *iFrame***
  - Branded line of systems using IBM Netfinity Servers and components
- NUMA-Q
  - IBM's "technology demonstration" of running *FLEX-ES* on the NUMA-Q server




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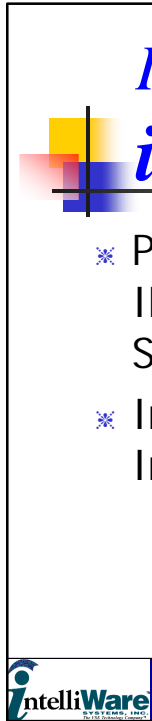
## 'Generic' *FLEX-ES* Systems

- Sold through several FSI 'distributors'
- Generally use whatever hardware is available
  - DELL and COMPAQ Servers
- Assembled and configured by distributor and/or FSI
- No "Brand recognition"

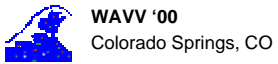


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**iFrame Server..**

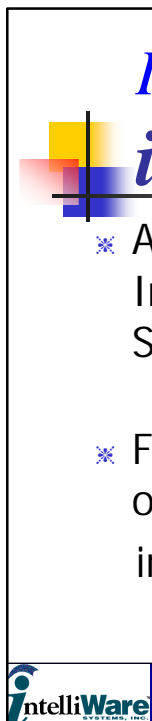


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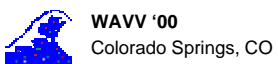
- ※ Pre-tested, standard configurations using IBM NetFinity servers and parts with S/390 components.
- ※ Integration and support you expect from IntelliWare and IBM
  - ※ Full "turn-Key" packaged solutions, including on-site set-up and services

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**iFrame Server.. (1)**




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- ※ A line of S/390 servers created by IntelliWare for the small and mid-range S/390 users
  - ※ Utilizes *FLEX-ES* technology
- ※ Five models provide 8 to 40+ MIPS and over 200 GB of internal disk (RAID 5)




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## **iFrame Server.. (2)**

- ✧ Some significant features/capabilities:
  - ✧ Up to 4GB S/390 memory
  - ✧ *i8* model can use ESL licensed software
  - ✧ Multiple High performance S/390 parallel channels
  - ✧ Supports Shared DASD, even over a LAN environment
  - ✧ Multiple Image capabilities (similar to LPAR)



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## **iFrame Server.. (3)**

- ✧ A complete integrated package:
  - ✧ Turnkey solutions... ready to run
  - ✧ Standardized components: IBM Netfinity, S/390 Software, and SCO UNIX. And *FLEX-ES*
  - ✧ Most important, IntelliWare support and services
- ✧ At affordable prices



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# What is IBM doing ?

**If you think that this is an 'off in left field' solution, look at what IBM is doing with *FLEX-ES* on a NUMA-Q (formerly SEQUENT) server.**

**Also see: "Numa-Q; the Coolest Platform You've Never Heard of"**


**Sunday 4:15 PM**


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# NUMA-Q Overview (1)

- **High**-end Intel based Servers
  - 550 or 700 MHz Pentiums
- Parallel processors in units of 4
  - Known as 'QUADS'





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## NUMA-Q Overview (2)


- NUMA= Non-Uniform Memory Access (All processors in all Quads can share all memory in system)
- Very powerful and extensible
  - Up to 64 processors
  - Very high bandwidth connections between Quads
  - Up to 64GB memory
  - Extensive disk capacity via Fiber Channel

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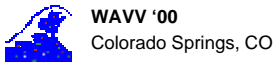

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## NUMA-Q and FLEX-ES

- Can use 1 to 'n' processors for running *FLEX-ES* based S/390 workload (max of 8 processors per 'image')
- Can mix S/390 and other workloads (UNIX and NT) across QUADS (NT can't share quad)
- Highly redundant components (cooling, power, I/O components) appropriate for large/critical S/390 systems


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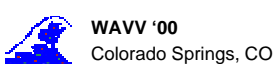

## Why I'm Excited about NUMA-Q

- IBM's use of *FLEX-ES* with the NUMA-Q 'validates' the technology.
- IBM's participation in the technology makes it 'safer' for the other *FLEX-ES* users
  - Possible changes to Software Licensing/charges
  - No 'name-calling' by IBM
  - Additional support and funding for FSI
- And, not competitive with the *iFrame*!




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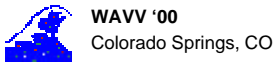
## Positioning: *iFrame* & NUMA-Q

- Two Different markets:
- NUMA-Q:
  - High-end, multi processor, Multi-Quad
  - Multi-Function (not just S/390)
  - Models? Configurations? Options?
- *iFrame*
  - Low-Mid range (8 – 40 MIPS)
  - Single Purpose: S/390 function only
  - Standard models with flexible options



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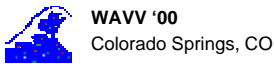
## Where From Here?

- Software emulation becomes more main-line
  - Especially *FLEX-ES*
- IBM will probably adopt/endorse the concept
  - NUMA-Q based products/offerings
  - Possible (!) changes in software licensing
- Performance goes up with Pentium performance
  - Consider 1.5 – 2 GHz 64 bit Itanium processors



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## One Thing for Sure.....

- **It's going to be interesting !**

***intelliWare* intends to participate  
and take a leadership role in  
this technology.**



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