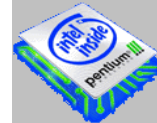


# S/390 on Intel?

*Session G13: Thursday 4:30PM,  
Saturday 10:50AM*



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Performance measurements cited in this presentation are based on results achieved using the TPC-H, results are current as of June 1, 2000.

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## Objectives and Approach

### OBJECTIVES

- Acknowledge the mix of IBM and OEM servers you use
- Show how NUMA-Q, FLEX-ES by Fundamental Software Inc. (FSI), and S/390 could manage those to your advantage

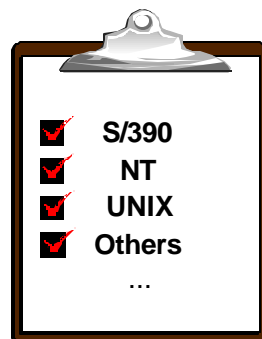
### METHODS

- Show how IBM's NUMA-Q servers deliver unparalleled
  - server consolidation environment
  - application delivery engines
  - infrastructure for managing chaos and complexity with flexibility and control



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## What's it Like Out There?



*How many servers do YOU run?*



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# 1999 Survey Results



## What other Platforms are Currently Installed (not counting VM)?

- 100% Windows NT
- 100% AIX/Linux/Other UNIX
- further back in the pack
  - 60% Novell
  - 25% AS/400
  - 70% all other

There are an average of 3.5 *types* of platform per customer. One might even say there are no "VSE customers", only "customers with VSE"



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# Key Conclusions



## It's a 'Mixed-Platform' World

- 3.5 *types* on average (the best server for the application)
- IBM product diversity is a potential strength

## Core Applications

- mostly alive, doing well, and growing

## Platform of choice for **Replacement** Apps is unpredictable

- often there's **both** core growth *and* replacement

## Platform of choice for **New** Applications is unpredictable

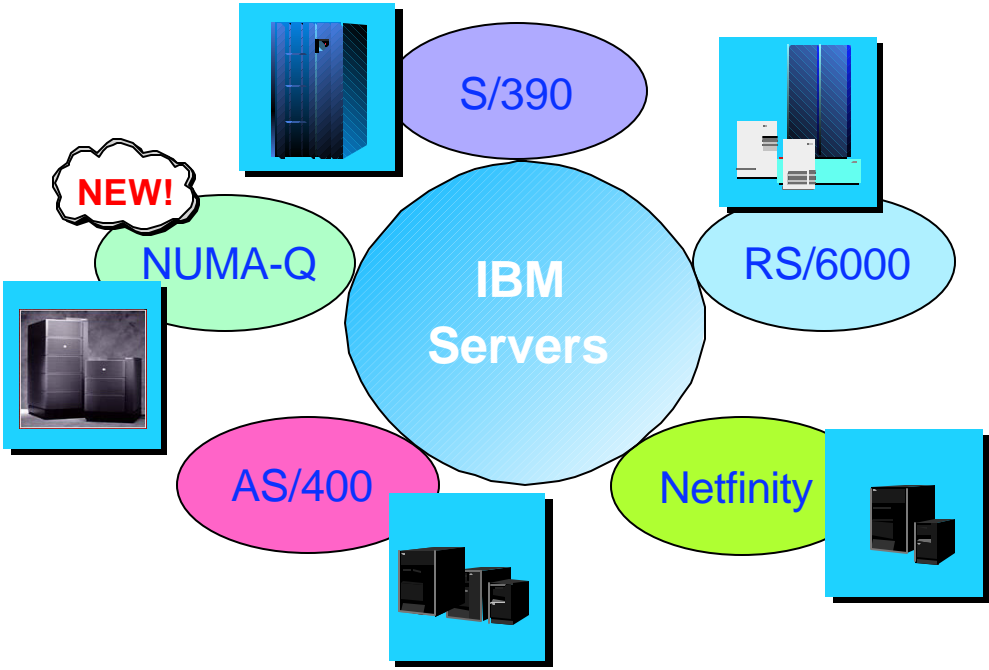


Users need a model that's flexible and extendable, while protecting existing investments

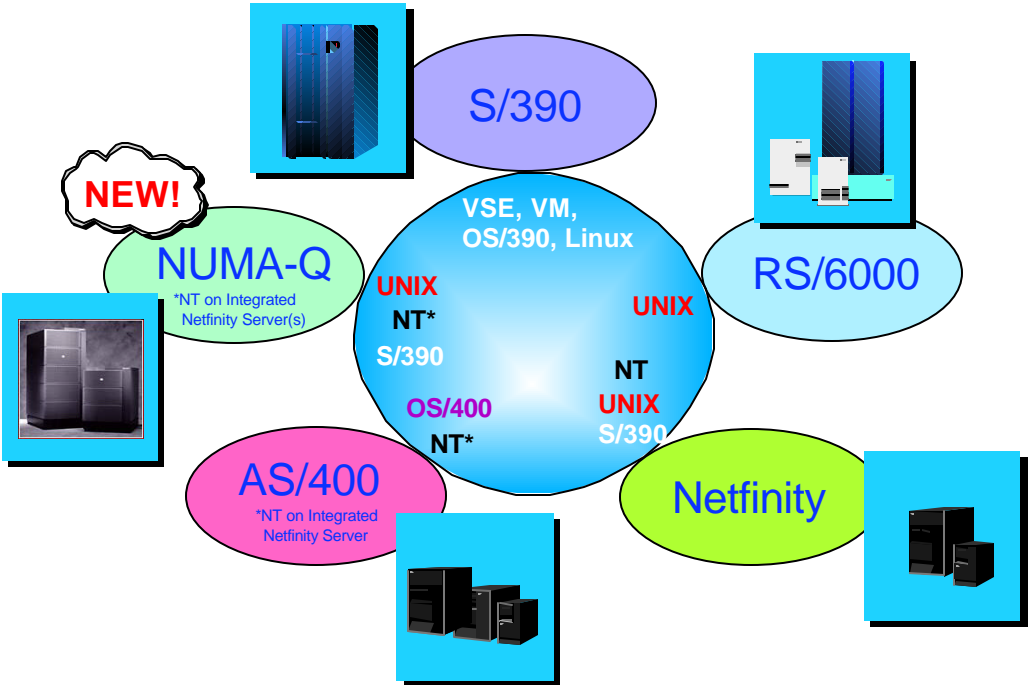


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# IBM Server Family

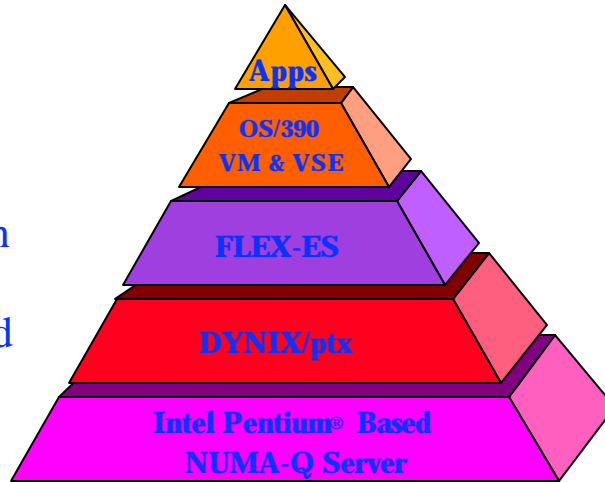


# IBM Server Operating Systems



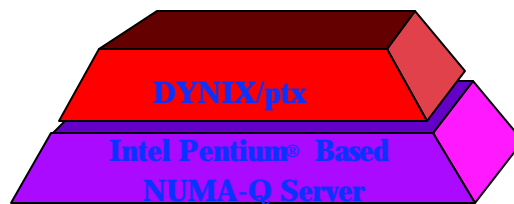
## What are the Pieces?

A software-based computing platform which enables the *unmodified* execution of IBM S/390 Server operating systems and applications on an Intel-based server



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## NUMA-Q Overview



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# NUMA-Q 2000 System Specifications



## Current Configurations

- Processors Up to 64
- Memory Up to 64GB
- I/O Capacity Over 200 TB of disk
- I/O Bandwidth Up to 110 MB/s per host adapter
- Architecture CC-NUMA SMP
- Clusters Up to 4 nodes

4 CPU's per quad; 1 - 16 quads per system in an Enterprise height cabinet(s)

## RAS

- Redundant & Hot Swap Power and Cooling
- Hot Swap DASD
- Fault Tolerant I/O
- 4 Node Clusters
- Aggressive SLAs

## NUMA-Q Architecture Capabilities in the Future

- Processors Up to 256
- Memory Up to 256 GB



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# NUMA-Q Enterprise Server Product

## NUMA-Q model 2000

- Run S/390 and other workload (UNIX & NT) in same frame

## Flexible configurations

- S/390 on two quads
- S/390 on one quad, NT (NumaCenter) on another quad
- S/390 and UNIX apps on two quads
- S/390 and UNIX on two quads, NT on a third

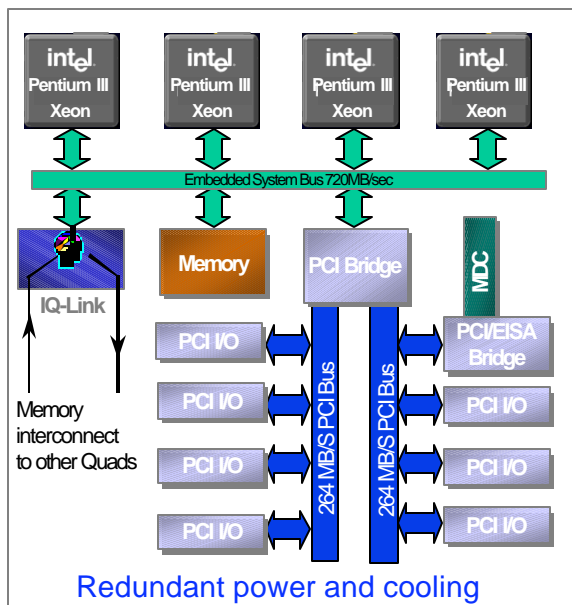
## Other configurations available

- UNIX & UNIX-NT Integration



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## The NUMA-Q Quad



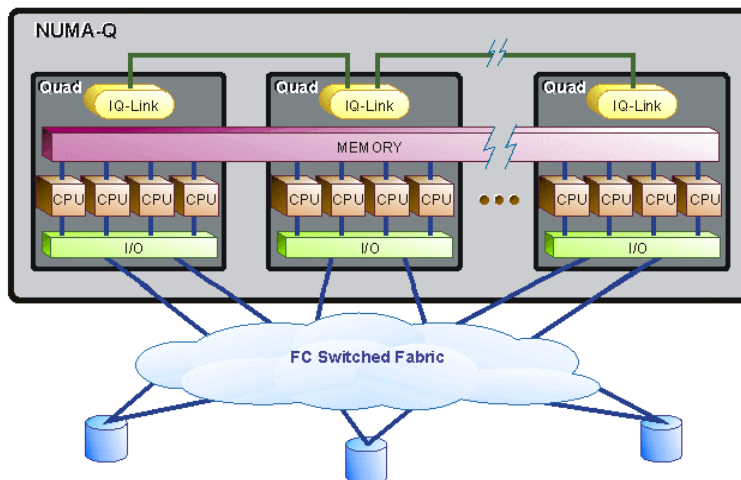
**Building block:** The quad, which can be a standalone node or can be grouped logically or physically into a larger single system

- ✓ 4 Intel CPUs
  - 550Mhz Xeon
  - 700Mhz ann. May 2000
- ✓ 1 to 8 GB Memory
- ✓ 7 PCI slots per quad available
- ✓ 720MB/sec bus per quad
- ✓ Runs primarily DYNIX/ptx (UNIX) or NT on a Quad boundary
- ✓ High-speed interlink port (IQ-Link)
  - 1GB/sec memory link between quads
- ✓ Internal Fibre connected DASD and/or fibre connection to SAN (e.g. SHARK)



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## NUMA-Q: From Quad to System

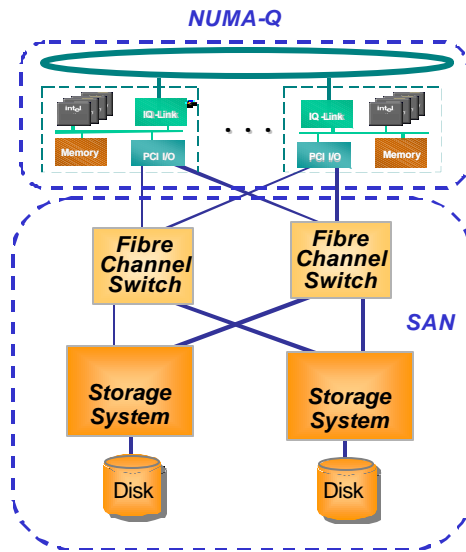


- Scales massively and retains SMP programming model
  - Processors, Memory and I/O
  - IQ-LINK enables shared memory between quads
- System provides one physical address space and one I/O address space



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## Multi Path I/O System Supports Storage Area Network



- Disks are accessible through redundant routes
- Automatic Load Balancing and recovery
- Processor to Memory interconnect not used for I/O traffic
- Fully multi-pathed multi-ported Fibre channel
- No single point of failure

All NUMA-Q systems are fibre channel based and feature the industry's only UNIX operating system supporting multi-pathed, multi-ported fibre channel.



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## NUMA-Q Technology Benefits

### Proven, 3rd Generation NUMA

- Simplified management of complex environments
  - UNIX and integrated UNIX-NT capable
  - single instance on OS for up to 16 quads
- Scalability for planned/unplanned workloads
  - Additional quads for capacity (no forklift required)
  - Memory size
  - Multi-terabyte I/O capacity
- High availability ... 99.95 + +
  - Proven mission critical operations
  - Multi-pathed SAN (Storage Area Network)
- IT Investment protection & technology coexistence
  - Multiple generations of quads can be mixed
  - Mixed workload in same frame



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## So Who's Using NUMA-Q Today?



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## NUMA-Q Value Today

### Primary Customers

- Major corporations in Telco, Financial, Retail & High-Tech Mfg.
- High-end UNIX, plus integrated UNIX - NT data center solutions
- Requiring large Oracle database
- Running integrated BI, CRM, ERP, and e-business solutions; SCON

### Benefits

- Proven enterprise-class computing on Intel technology
- Fast, low-risk implementation of complex projects with technology & expertise
- Mission critical, open systems applications for UNIX and UNIX - NT
- Guaranteed Availability & Performance (Oracle, CRM, Siebel)

### Value

- Superior ROI
- Proven, successful implementation of complex, open system projects
- Excellent references



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## Partial Listing of NUMA-Q BI Customers



## DB2 Sets BI Performance Record in 300GB TPC-H Benchmark

- "IBM SETS NEW STANDARD FOR BUSINESS INTELLIGENCE PERFORMANCE"
- Somers, N.Y., May 11, 2000 . . . IBM today announced that its NUMA-Q systems set new records for both performance and price/performance in the industry standard TPC-H\* benchmark. The system, running DB2 Universal Database Enterprise-Extended Edition (EEE), produced industry leading results at the 300GB scale factor, placing it at the top of the list for business intelligence solutions.
- "Compared to published TPC-H results, NUMA-Q has the best performance and price performance in the industry."
- <http://www-4.ibm.com/software/data/db2/benchmarks/050300.html>

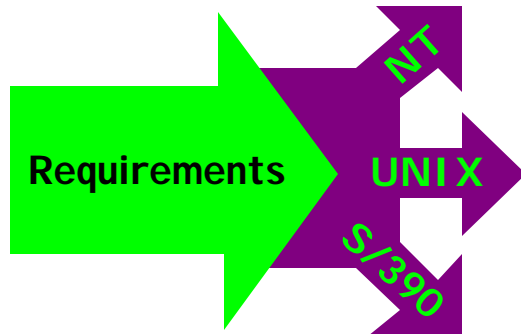
\* TPC - Transaction Processing Council



# NUMA-Q Assets: Flexibility

Other OS mixes are possible

A NUMACenter configuration allows you to run a centralized mixed UNIX and NT environment now.



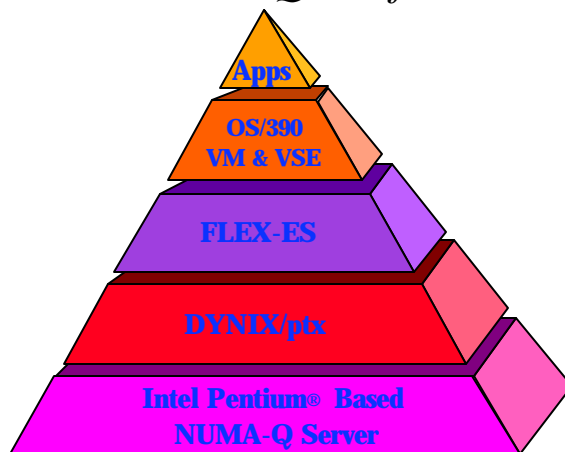
You can also run FLEX-ES to emulate S/390 hardware.



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# FLEX-ES

*S/390 Server Compatibility on a  
NUMA-Q Platform*



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# Who is Fundamental Software?

- Headquarters in Fremont, CA
- Additional offices in Arizona, Michigan, and New Jersey
- Incorporated in 1993
- FLEX-ES product
  - Initially FS/370 released in 1991



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## What is FLEX-ES?



### FLEX-ES is a Plug Compatible S/390 Server

- UNIX application emulating 'S/390 processor architecture'
  - implements S/370 & S/390 machine instructions in software
  - licensed to utilize one or more Intel processors
  - achieving ~9 MIPs per 500MHZ Xeon CPU

### FSI PCI-based Peripheral Interconnects

- Parallel channel Adapter (PCA)
  - 1 or 3 channel card
  - tape drives, printers, unit record
  - multiple cards allowed
- Integrated Communications Adapter (ICA)
  - supports SDLC and bisync communications



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## What is FLEX-ES? (cont...)



### FSI Emulated Devices

- IBM DASD
  - CKD (3390, 3380 and more) & FBA (3370, 3310, 9332, 9335, and more)...
- IBM Tape
  - 3490/80, 3420
  - FakeTape (disk files used as virtual tapes, data sharing w/UNIX & S/390)
  - IBM OMA/2 format CD (VM & VM service avail.)
  - AWSTAPE (from P/390)
- Emulated Printers
- 3270 and ASCII (TWX) terminal networks
- TCP/IP Network Controllers
  - 3172, K200
- Card Reader & Punch
- Channel to Channel Adapter



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## What Are The Limits?



- 8 Processors per Image (An 8 way MP can be built)
  - No hard limit on the number of images
- 18TB/image of disk storage may be configured
- No Parallel Sysplex
- ESCON is coming but is not here yet
- No DASD on PCA
- Limited Token Ring support
- No VM Dataspace support
- No Data Compression
- No IEEE floating point
- No halfword immediate instructions
  - required for LINUX for S/390



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## Easy to Install/Migrate



- Migration can occur in a matter of days
  - standard dump/restore utilities
- No modifications to any applications or program products
- Mainframe tools run exactly the same
  - performance measurement, etc.
- S/390 Operating System Release Support
  - all current releases of VSE/ESA, VM/ESA & OS/390
- Pricing
  - IBM software is licensed by the user from IBM
  - FLEX-ES software is licensed by the user from FSI



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## Typical Uses



- Older systems replacement
  - S/370, 43xx, 30xx, 9221, small 2003/9121, older P/390, etc.
- Offloading of selected projects/ applications
- Downsizing, rightsizing, mergers, acquisitions
  - just load images of current environment and run
- Interim re-hosting platform
- Multiple use disaster recovery platform



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## Benefits



### Scalable performance

- Up to eight processors

### Low total cost of ownership

- Reduced cost of maintenance and environmental

### Leverage existing staff experience

- S/390, UNIX, and NT

### 100% software solution

- more easily upgraded

No conversion of existing S/390 OS, program products or apps



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## Is FLEX-ES Ready for Prime Time?



### FLEX-ES has been used in mission critical installations since 1994

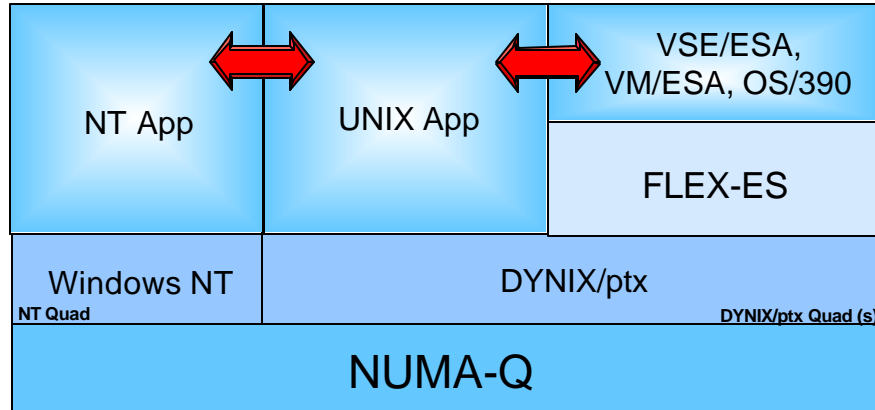
- Federal Aviation Administration (VM/ESA V2.2 & Sequent)
  - Notice to Airman System (NOTAMS)
  - Mission critical application for both military and civilian flights
- More than 50 mission critical systems installed today
- Visit the FSI web site ([www.funsoft.com](http://www.funsoft.com)) for success stories.



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# NUMA-Q & FLEX-ES: A Flexible Server



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