



# MetaFrame Hardware Sizing Analysis



## Revision History

Revision	Change Description	Updated By	Date
1	Initial document	Doug Dobson	2/9/2001
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# 1 Overview

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One of the most common questions from MetaFrame administrators is the question of what type of server would provide the best price/performance benefit? The following discussion is intended as a generalized discussion based on field experience with both MetaFrame and large enterprise applications, such as Microsoft SQL Server. Each environment must be analyzed for unique requirements, which may dictate the architecture and hardware implementation.



## 2 Field Experience Results

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Empirical evidence and field experience has indicated to CCS that in most cases, multiple two-processor servers provide greater benefit than four and eight processor servers. The reasons for this can be summarized as follows:

- **Greater flexibility with 2-Processor Implementations**—When upgrading applications on the servers or administering the servers, it is possible to remove a small percentage of overall system capacity without impacting overall system performance and functionality. Monolithic systems, such as two 8-way boxes, do not provide the same advantage.
- **Greater Redundancy with 2-Processor Implementations** – When problems are encountered on a server, a smaller percentage of users are impacted. Problems are isolated to physically distinct servers.
- **Improved Per-Processor Performance**– Not all applications scale effectively on a multi-processor NT/Windows 2000 system. A database server application such as MS SQL Server has been written to take advantage of the advanced architecture offered by a multi-processor system, and in most cases will scale effectively. However, most user applications are not written in this fashion and will not be able to function as efficiently as SQL and other tuned applications. In simple terms, this may mean that the 5<sup>th</sup> processor on a system is effectively only utilizing 70% of its overall capacity, and the 6<sup>th</sup> processor can deliver only 60%. Actual performance will depend upon what counters (Threads, % CPU Utilization, etc.) are being reviewed to determine utilization levels. Perceived performance on MetaFrame servers is directly related to the performance of the applications running in MetaFrame sessions. Because these applications are generally optimized to perform well on desktop systems, they rarely scale well on multi-processor systems.
- **Limited Registry Size Impacts 8-Processor Systems** – NT Systems have a hard registry limit of 153.6 MB. Windows 2000 has hard limits somewhat greater than 296 MB. These limits are a function of the maximum paged pool size, with the registry size limit (RSL) calculated as 80% of this value. If each user has large registry entries, i.e. 1 MB or more, this could mean a limit of 153 users to a system, assuming no other factors or programs are utilizing the registry.
- **Ability to Segment High Load Processes with 2-Processor Implementations** – Two-processor systems distribute processing to physically separate systems. If a power user engages in activity that drives CPU, Memory, and/or I/O utilization up, the impact will be isolated to that single system. However, in an 8-processor system, this same user may monopolize the system and impact all users currently operating on the system. If peak loads are expected from a community of power users, it may be justified to analyze four-processor systems, but limiting their user load to the same level as other 2-processor systems. Unfortunately, this decreases the price/performance ratio.
- **Floor space limitations** – In the past, 8-processor systems have always been a better choice when data center space has been an issue. The design allowed a dense rack-mount of servers that packed more processors per square foot than other options. However, Compaq and other manufacturers have addressed this issue through the creation of their 1U rack mount server systems. These systems allow administrators to pack up to 42 servers (84 processors) per vertical rack, providing a level of parity with the 8-processor solution
- **Administration Comparisons** – A valid argument used in comparisons of large multi-processor systems vs. 2-processor systems revolves around the additional costs associated with administering more servers. However, experience has shown that by building redundancy through additional servers, the overall administrative impact can be (1) removing and replacing the offending server, and (2) assigning hardware issues to OEM support personnel. As for server rebuilds, unattended installation routines can automate the process and allow a single administrator to remotely manage a large group of servers. Utilizing Citrix Installation Management Services (IMS), Administrators can then publish applications to new servers from a single console. Proper architecture, planning, and procedures are key to the success of these implementations – which is true of all data center implementations.



- **Increased price/performance ratios with 2-Processor Implementations** – A recent analysis of system costs compared 2-processor systems with 8-processor systems. This simple comparison was done on June 30, 2000 and all prices reflect pricing on the Compaq site at that time. Assume 20 users per-processor in both systems, giving the 8-processor system linear scaling capacity:
- **2-Processor Configuration**
    - ✓ 1 2-Way Compaq ML530 (866 Pentium Xeon) 7U
    - ✓ Raid Controller
    - ✓ 2 Gb of Ram (@\$10K)
    - ✓ 2 9 Gb 10K RPM drives
    - ✓ Backup Power Supply
    - ✓ Extra NIC
    - ✓ **Total Cost:** @\$21,000
    - ✓ **Total Cost for four:** @\$84,000
  - **8-Processor Configuration**
    - ✓ 1 8-Way Compaq DL8500 (866 Pentium Xeon) (Standard box alone -- \$46,000) 14U
    - ✓ Processor Kit (8 Processors) -- \$24,500
    - ✓ Memory (8 Gb) -- \$44,300
    - ✓ 4 9 Gb 10K RPM Drives
    - ✓ 2 Raid Controllers
    - ✓ **Total Cost:** @\$118,000
  - **Analysis:** IF linear scaling can be assumed, as well as identical loads between the two configurations, then the 8-Way machine will end up costing \$34,000 MORE than a comparable 2-way configuration. For that same capital investment, an administrator could actually purchase an additional, redundant machine and reduce the load on all 2-way servers and give even better performance numbers. In addition, this configuration would be better positioned to handle PEAK utilization loads without impacting all users. A final advantage to consider is that with 4 2-Way boxes, you will have 4 separate swap-files and system drives. In other words, you will be reducing the workload 4 times on the I/O subsystem vs. the 8-way machine. This is VERY important because often I/O bottlenecks prove to be the major performance limitation vs. Processor or memory.