



FUSION 1200
ISVアプリケーションと共有メモリベンチマーク
スケーラブルシステムズ株式会社



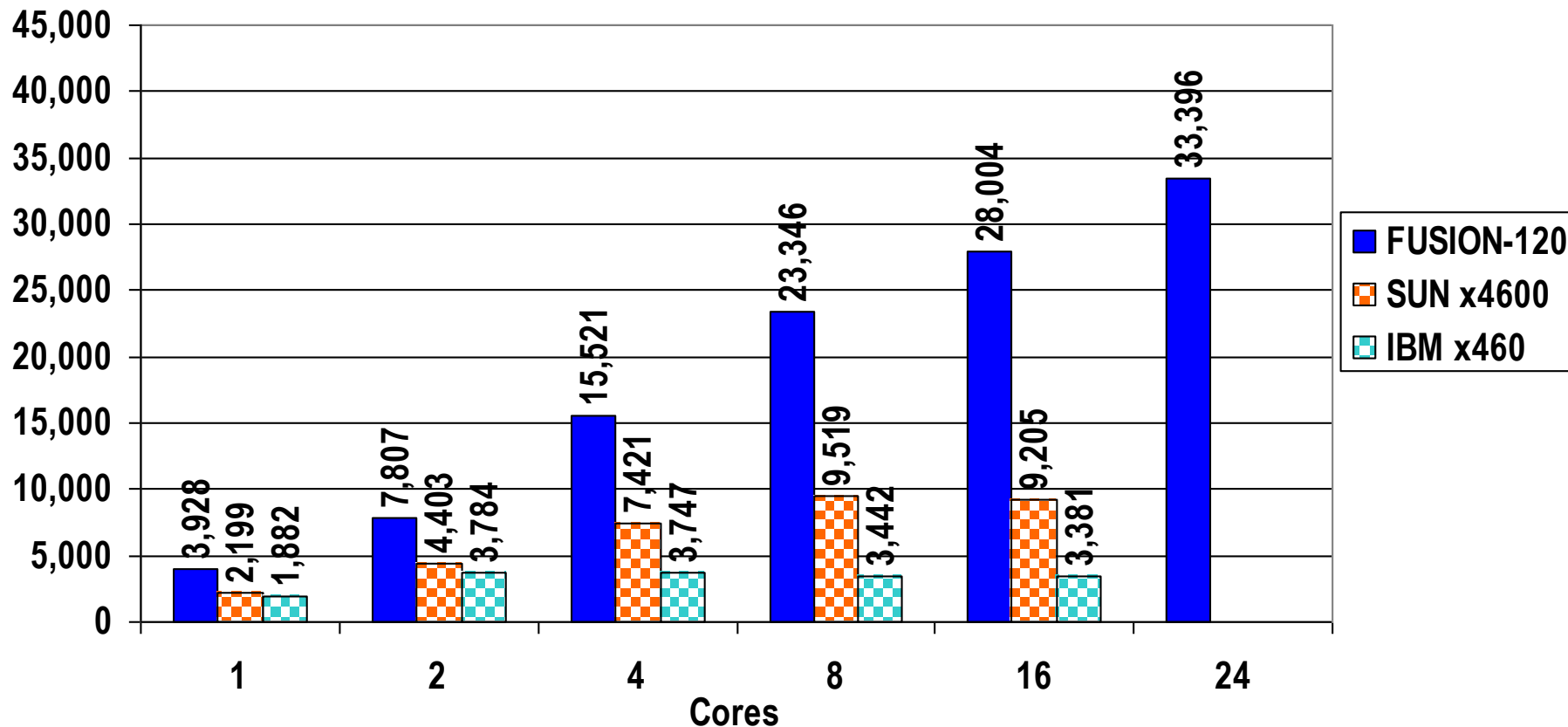
共有メモリベンチマーク

- 共有メモリ(SMP)ベンチマーク
 - FUSION 1200では、共有メモリ上での並列処理も可能
 - OpenMPなどの共有メモリAPIやIntel Math Kernel Libraryなどを利用した簡便な並列処理も可能
- 標準ベンチマーク
 - Streamベンチマーク(Cバージョン、OpenMP)
 - Himenoベンチマーク(Fortran、OpenMP)
 - Linpackベンチマーク(Intel® Optimized SMP LINPACK Benchmark package)
- コンパイラ及びライブラリ利用による並列処理



STREAM (OMPバージョン)

Bandwidth (MB/sec.) - Higher is better



HW Characteristics:

FUSION-1200 (vSMPowered™):

IBM x460:

SUN x4600:

12 x Intel XEON 5160 DC (Woodcrest), 3GHz, 4MB L2; 36/48GB (vSMP Foundation 1.6)

8 x Intel XEON 7040 DC (Paxville), 3GHz, 2x2MB L2; 16GB

8 x AMD Opteron 885 DC, 2.6GHz, 2x1MB L2; 32GB

(Source: ScaleMP)

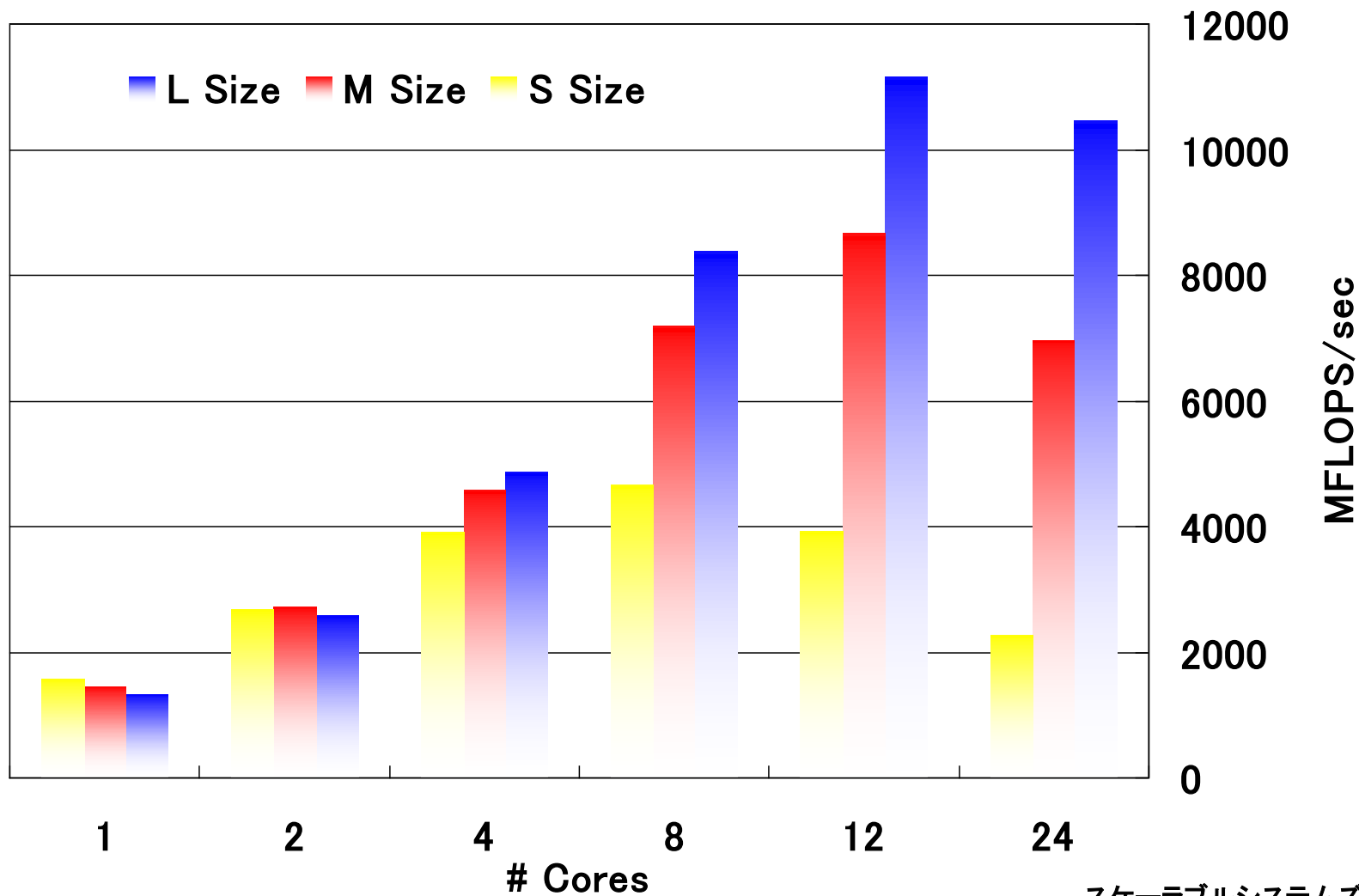
(Source: ScaleMP)

(Source: ScaleMP)



Himenoベンチマーク (Fortran、OpenMP)

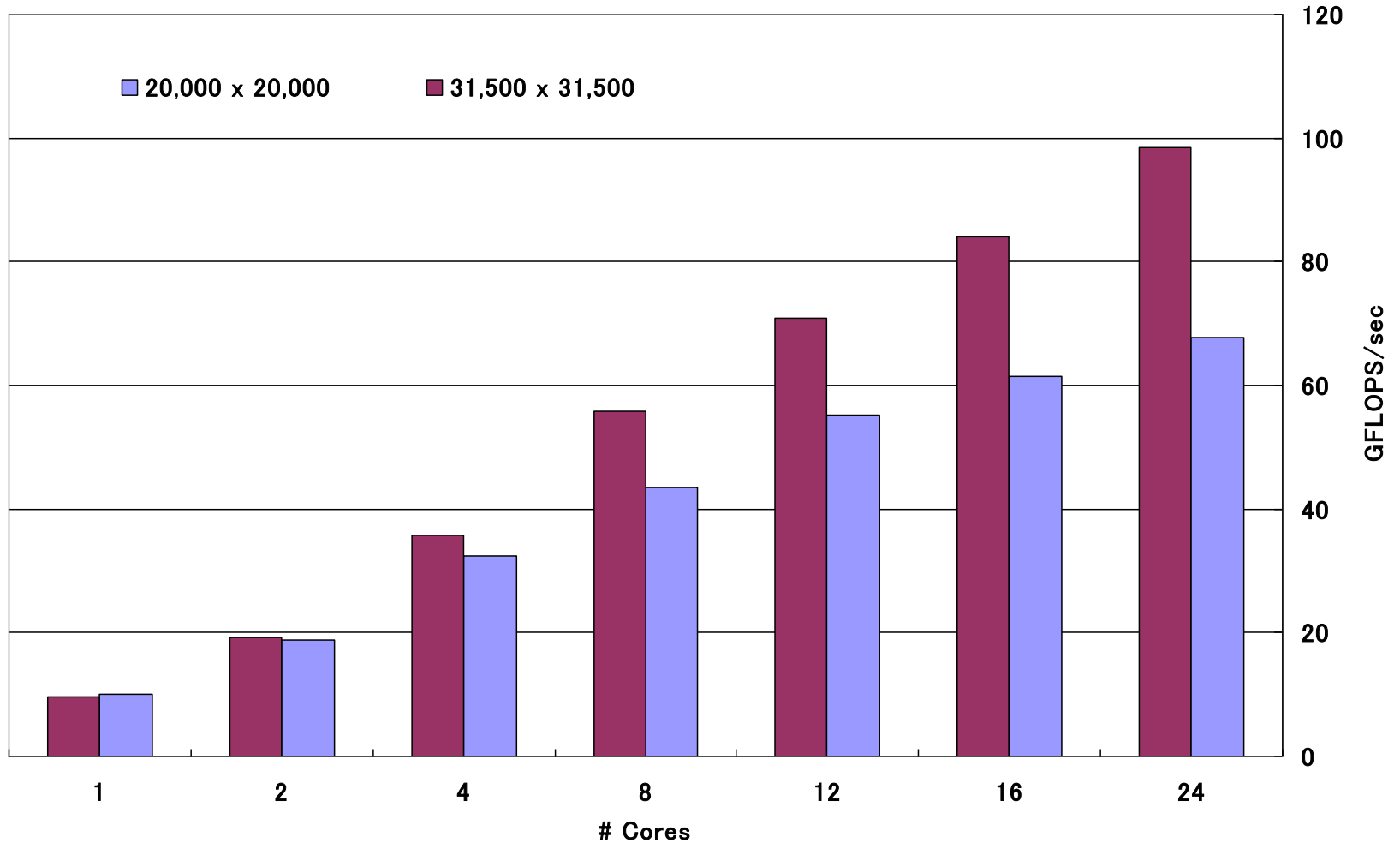
Himeno Benchmark





Linpackベンチマーク

Intel Optimized (SMP) LINPACK Benchmark





FUSION 1200の特徴

- ISVアプリケーション
 - 大規模なメモリを必要とするABQSUやANSYSのようなアプリケーションでの静解析でに高い性能
 - 衝突や流体解析で利用されるアプリケーションは、領域分割とMPIによる並列処理を行っているが、このような領域分散のアプリケーションでは、従来のクラスタ以上の性能を発揮する
- 共有メモリ(SMP)ベンチマーク
 - コンパイラとライブラリによるマルチスレッド並列処理でのスケーラブルな性能



FUSION 1200のサポート

- FUSION 1200でのアプリケーションサポート
 - ISVアプリケーションについては、100%の互換性を保証
 - 個々のアプリケーションに関して、スケーラビリティなどの問題がある場合、その対応が可能(アプリケーションエンジニアによるシステムの最適設定など)
 - インテルのコンパイラとライブラリ開発グループとの連携



FUSION 1200 – 性能データ



Speed | Performance | Passion for Innovation | www.vxtech.com



RISC FREE PERFORMANCE

Prepare to be amazed by the new FUSION® 1200 SMP server and its groundbreaking performance. Leave costly, proprietary RISC-based solutions behind and enjoy ease of operation and superior performance based on dual-core Intel® Xeon® processors.

Fulfill your High Performance Technical Computing needs with the FUSION® 1200 stellar performance. Leapfrog your competition by gaining faster insight from your application in Computational Structure Mechanics, Computational Fluid Dynamics, Bio-Informatics, Computational Chemistry, Reservoir Simulation, Seismic Processing and Interpretation fields.

FUSION® 1200 is a scalable 12-processor SMP system for the High Performance Technical Computing (HPTC) market. Available in both deskside and 19-inch rack-mount design, the FUSION® 1200 is a scalable alternative to traditional RISC based servers. FUSION® 1200 Series is an enterprise-class system for an IT department looking to leverage the benefits of Intel® standards in a data center. With the flexibility to grow from 12 to 48 Intel® Xeon® processors (single or dual core), the FUSION® 1200 Series scales beyond conventional Intel® based platforms while delivering superior price-performance compared to traditional high-end servers. The SMP operational model of the FUSION® 1200 provides reduced management costs compared to clusters. This Intel® Xeon® processor based server, supporting Intel® Extended Memory 64 Technology and the ScaleMP® vSMP architecture, is the ideal platform for clients with applications that require high processor count and large shared memory.

APPLICATIONS:

Computational Structural Mechanics

- ANSYS Mechanical
- ABAQUS/Explicit
- ABAQUS/Standard
- LSTC LS-DYNA

Computational Fluid Dynamics

- Fluent
- ANSYS CFX
- CD-Adapco STAR-CD
- AVL FIRE

Bio-Informatics

- HMMER

Computational Chemistry

- Schrödinger Jaguar
- Schrödinger Glide
- NAMD
- DOCK
- GAMESS
- GOLD

Reservoir Simulation

- Schlumberger ECLIPSE

Seismic Processing and Interpretation

- Paradigm GeoDepth
- 3D GEO 3DPSDM

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FUSION 1200

- 各社が公開している一般ベンチマークで他社システムとの性能を比較



アプリケーションベンチマーク

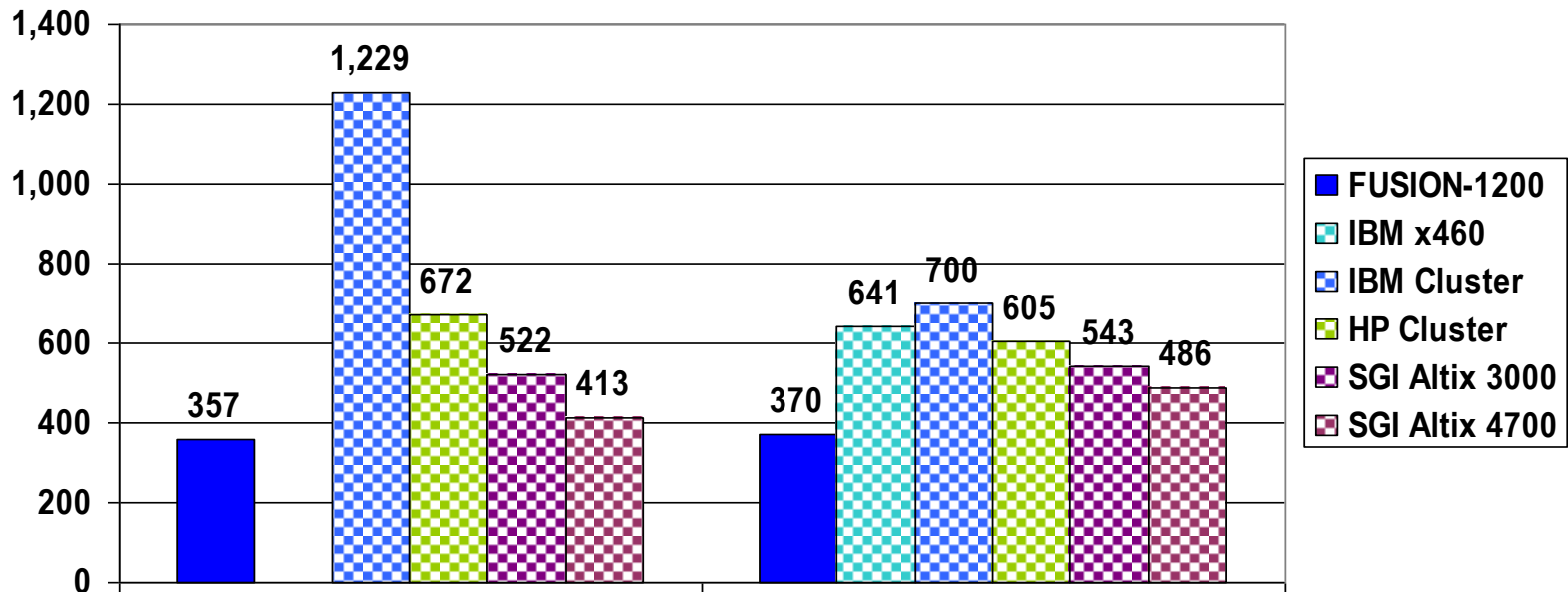
- Computational Chemistry
 - Schrödinger Jaguar
 - Schrödinger Glide
 - NAMD
 - DOCK
 - GAMESS
 - GOLD
 - mpiBLAST
 - GROMACS
 - MOLPRO
- Bio-Informatics
 - HMMER
- Oil & Gas
 - Schlumberger ECLIPSE
 - Paradigm Geophysical GeoDepth
 - 3DGEO 3DPSDM
- Computational Structural Mechanics
 - ANSYS Mechanical
 - ABAQUS/Explicit
 - ABAQUS/Standard
 - LSTC LS-DYNA
 - Open-RT
- Computational Fluid Dynamics
 - Fluent
 - ANSYS CFX
 - CD-adapco STAR-CD
 - AVL FIRE

- この資料で紹介しているアプリケーションリスト
- このリストに無いアプリケーションについても、お尋ねください。



ABAQUS Standard (6.6)

Runtime (Sec.) - Lower is better



HW Characteristics:

FUSION-1200 (vSMPowered™):
 IBM x460:
 IBM Cluster (x336):
 HP Cluster (xC4000):
 SGI Altix 3000:
 SGI Altix 4700:

S2b

12 x Intel XEON 5160 DC (Woodcrest), 3GHz, 4MB L2; 36/72GB (vSMP Foundation 1.6)
 8 x Intel XEON 7040 DC (Paxville), 3GHz, 2x2MB L2; 16GB
 8 node cluster: 8 x 2 x Intel XEON DP, 2.8GHz, 1MB L3; 8GB/node; InfiniBand
 16 node cluster: 16 x 2 x AMD Opteron 275 DC, 2.2GHz, 2x1MB L2; 8GB/node; InfiniBand
 16 x Intel Itanium2, 1.6 GHz; 128GB
 8 x Intel Itanium2 DC, 1.6 GHz; 256GB

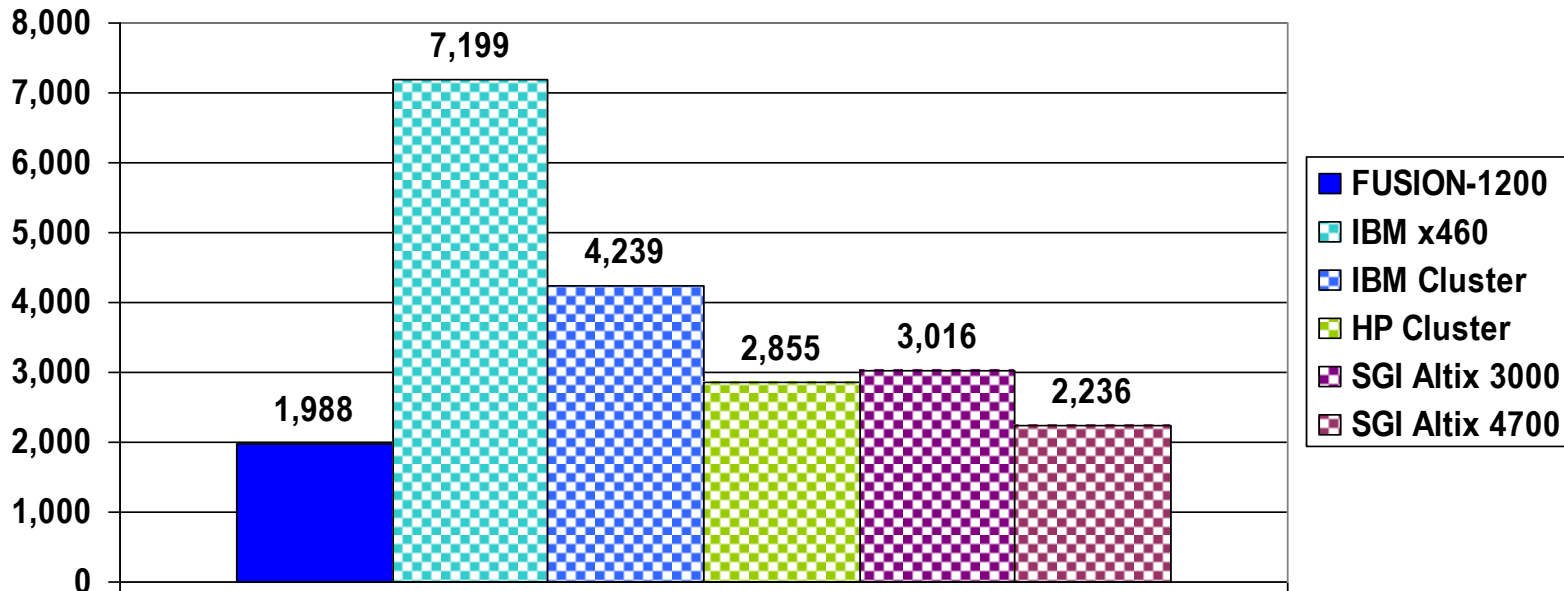
S4a

(Source: ScaleMP)
 (Source: ScaleMP)
 (Source: Public)
 (Source: Public)
 (Source: Public)
 (Source: Public)



ABAQUS Explicit (6.6)

Runtime (Sec.) - Lower is better



HW Characteristics:

FUSION-1200 (vSMPowered™):

IBM x460:

IBM Cluster (x336):

HP Cluster (XC4000):

SGI Altix 3000:

SGI Altix 4700:

12 x Intel XEON 5160 DC (Woodcrest), 3GHz, 4MB L2; 36/72GB (vSMP Foundation 1.6)

8 x Intel XEON 7040 DC (Paxville), 3GHz, 2x2MB L2; 16GB

8 node cluster: 8 x 2 x Intel XEON DP, 2.8GHz, 1MB L3; 8GB/node; InfiniBand

16 node cluster: 16 x 2 x AMD Opteron 275 DC, 2.2GHz, 2x1MB L2; 8GB/node; InfiniBand

16 x Intel Itanium2, 1.6 GHz; 128GB

8 x Intel Itanium2 DC, 1.6 GHz; 256GB

E6

(Source: ScaleMP)

(Source: ScaleMP)

(Source: Public)

(Source: Public)

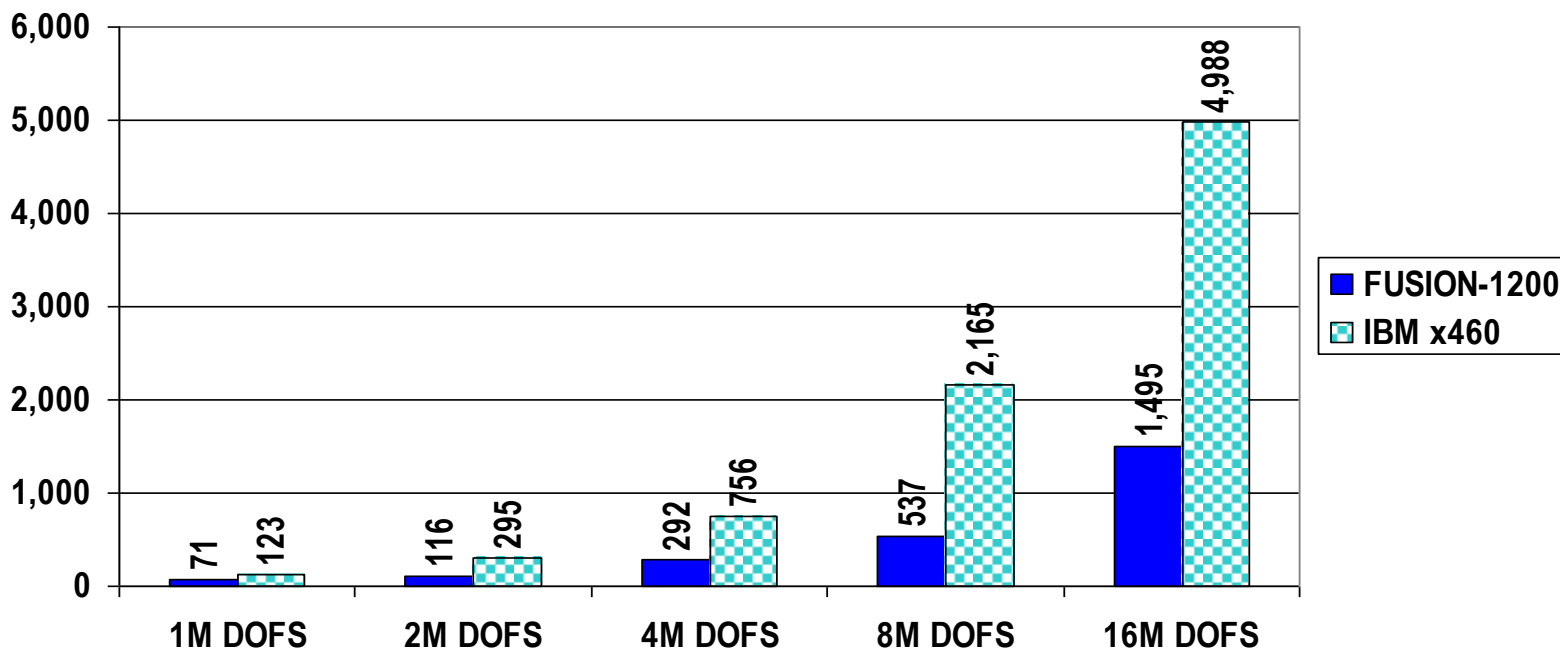
(Source: Public)

(Source: Public)



ANSYS 10SP1, WingSolid95, PCG solver

Runtime (Sec.) - Lower is better



HW Characteristics:

FUSION-1200 (vSMPowered™):

12 x Intel XEON 5160 DC (Woodcrest), 3GHz, 4MB L2; 36/48GB (vSMP Foundation 1.6)

(Source: ScaleMP)

IBM x460:

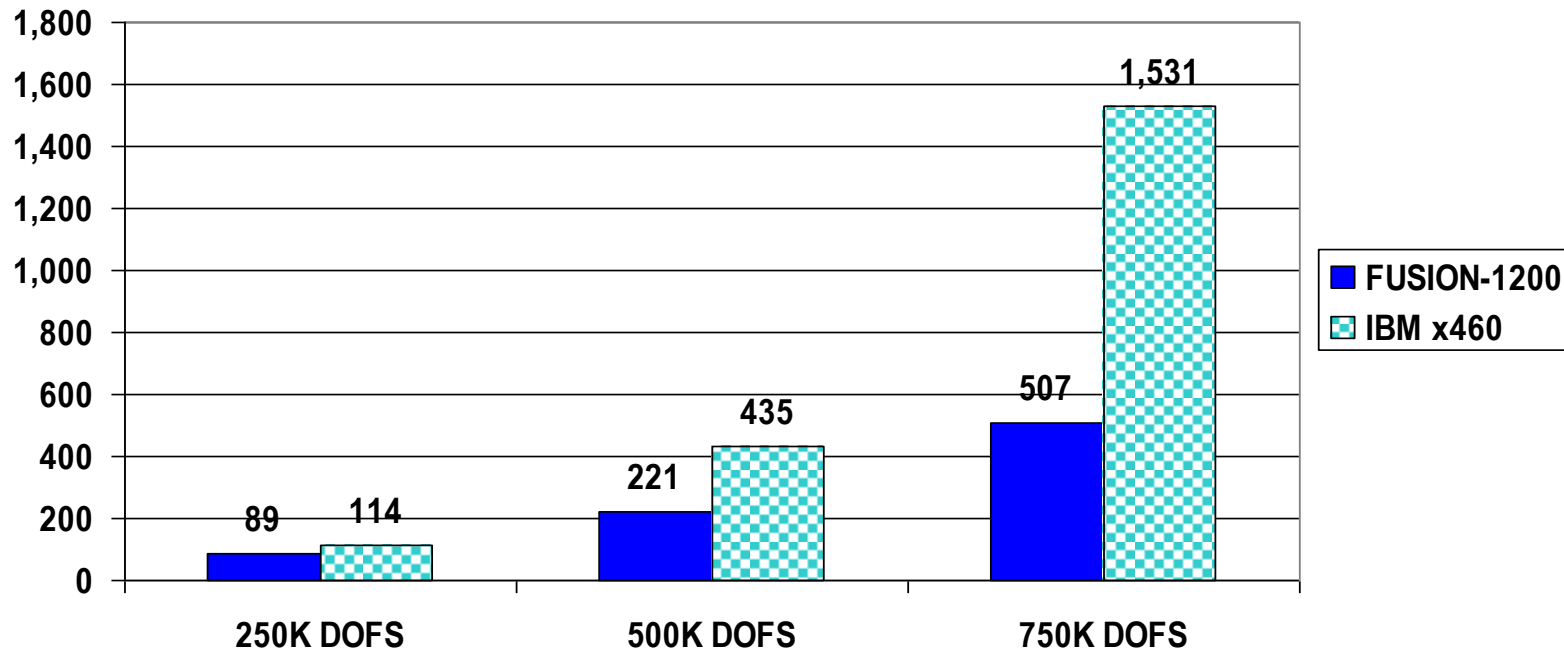
8 x Intel XEON 7040 DC (Paxville), 3GHz, 2x2MB L2; 16GB

(Source: ScaleMP)



ANSYS 10SP1, WingSolid95, DSP solver

Runtime (Sec.) - Lower is better



HW Characteristics:

FUSION-1200 (vSMPowered™):

12 x Intel XEON 5160 DC (Woodcrest), 3GHz, 4MB L2; 36/48GB (vSMP Foundation 1.6)

(Source: ScaleMP)

IBM x460:

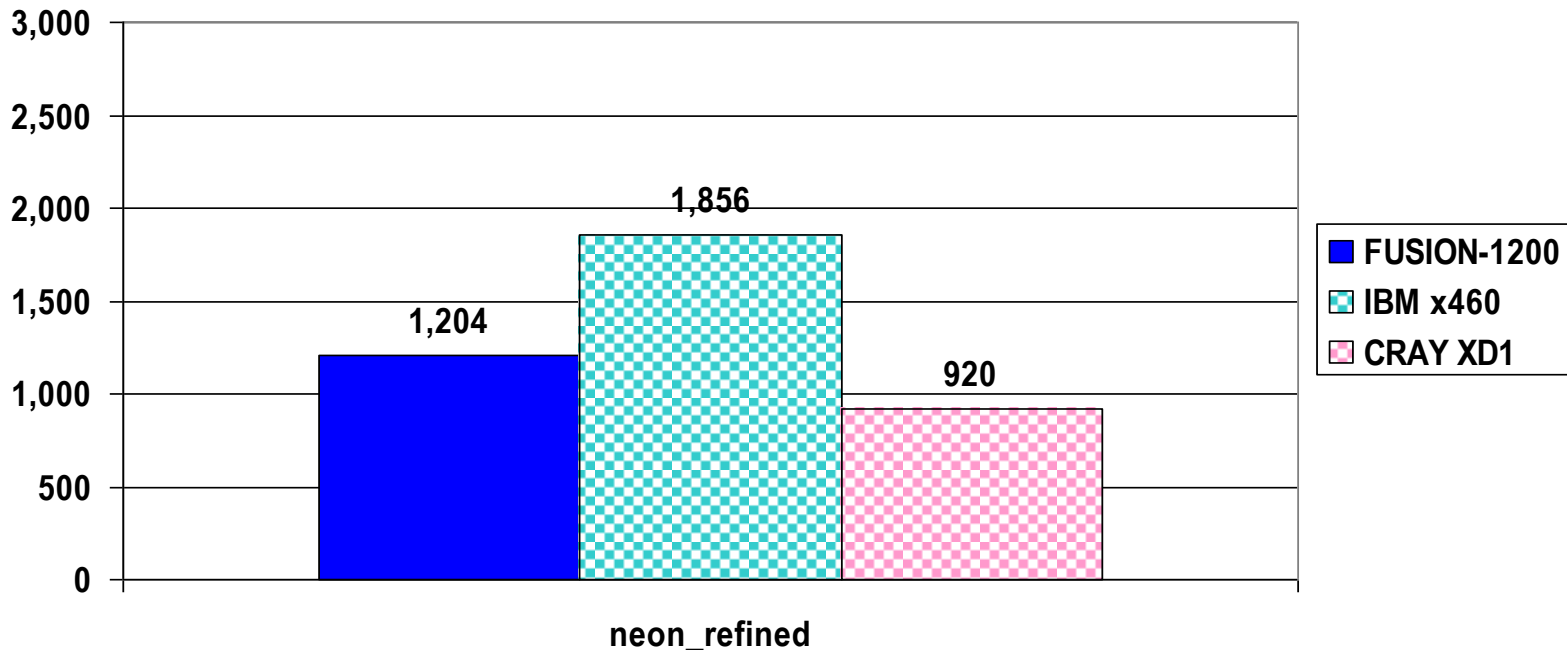
8 x Intel XEON 7040 DC (Paxville), 3GHz, 2x2MB L2; 16GB

(Source: ScaleMP)



LSTC, LS-DYNA

Runtime (Sec.) - Lower is better



HW Characteristics:

FUSION-1200 (vSMPowered™):

12 x Intel XEON 5160 DC (Woodcrest), 3GHz, 4MB L2; 36/48GB (vSMP Foundation 1.6)

(Source: ScaleMP)

IBM x460:

8 x Intel XEON 7040 DC (Paxville), 3GHz, 2x2MB L2; 16GB

(Source: ScaleMP)

CRAY XD1:

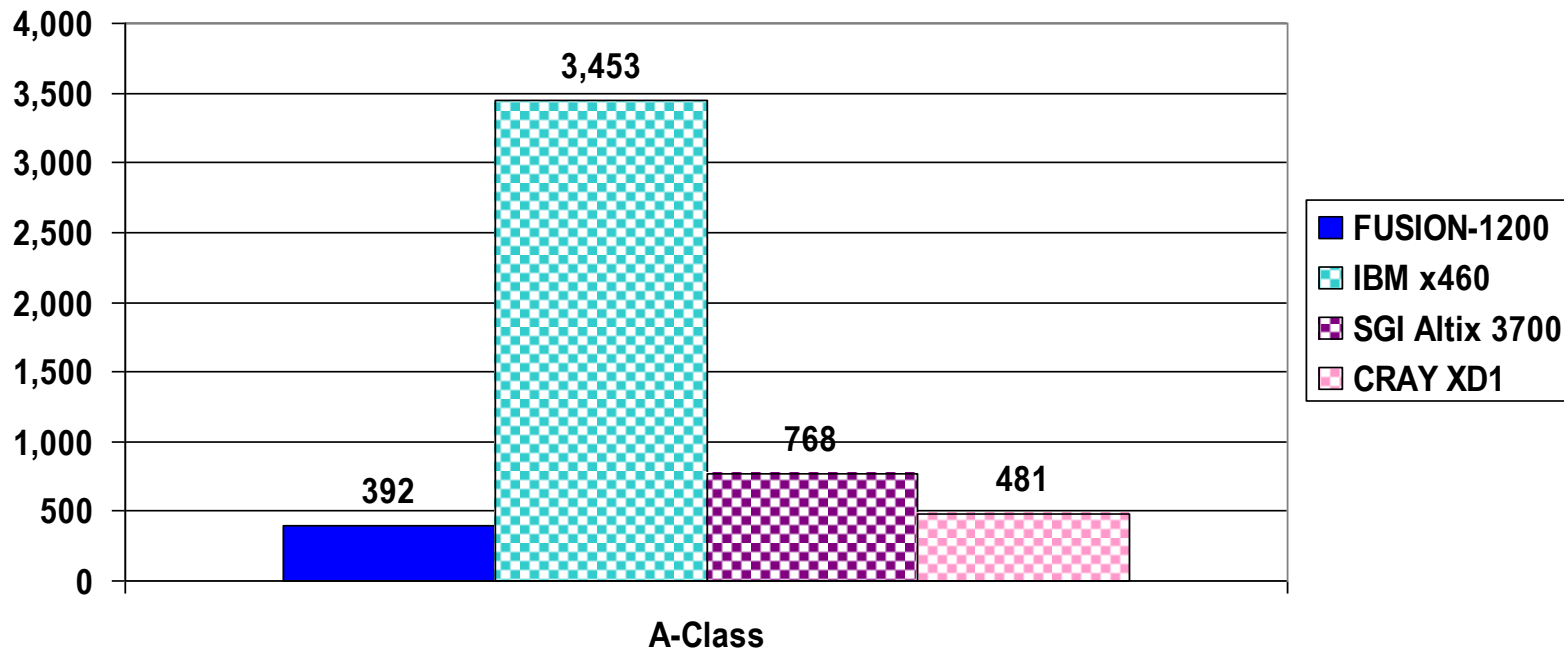
16 x AMD Opteron SC 250 2.2 GHz

(Source: Public)



CD-adapco, STAR-CD

Runtime (Sec.) - Lower is better



HW Characteristics:

FUSION-1200 (vSMPowered™):

12 x Intel XEON 5160 DC (Woodcrest), 3GHz, 4MB L2; 36/48GB (vSMP Foundation 1.6)

(Source: ScaleMP)

IBM x460:

8 x Intel XEON 7040 DC (Paxville), 3GHz, 2x2MB L2; 16GB

(Source: ScaleMP)

SGI Altix 3700 Bx2:

8 x Intel Itanium2, 1.6GHz, 9M L3; ??GB RAM

(Source: Public)

CRAY XD1:

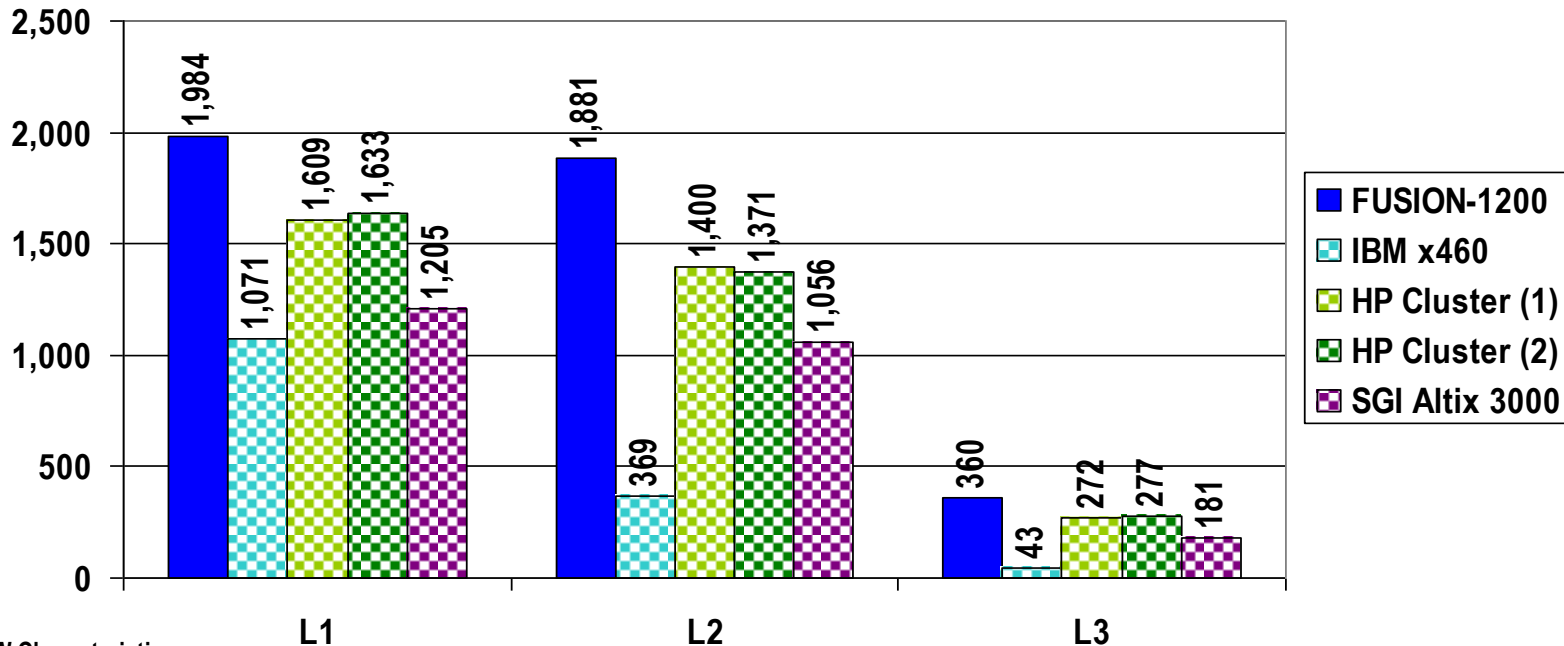
16 x AMD Opteron SC 250 2.2 GHz

(Source: Public)



FLUENT, FL5 (Large Class)

Rate - Higher is better



HW Characteristics:

FUSION-1200 (vSMPowered™):

IBM x460:

HP Cluster (1) (XC4000):

HP Cluster (2) (DL585):

SGI Altix 3000:

12 x Intel XEON 5160 DC (Woodcrest), 3GHz, 4MB L2; 36/48GB (vSMP Foundation 1.6)

8 x Intel XEON 7040 DC (Paxville), 3GHz, 2x2MB L2; 16GB

8 node cluster: 8 x 2 x AMD Opteron 260 SC, 2.4GHz, 1MB L2; 8GB/node; Infiniband

4 node cluster: 4 x 4 x AMD Opteron 260 SC, 2.4GHz, 1MB L2; 8GB/node; Infiniband

16 x Intel Itanium2, 1.6 GHz

(Source: ScaleMP)

(Source: ScaleMP)

(Source: Public)

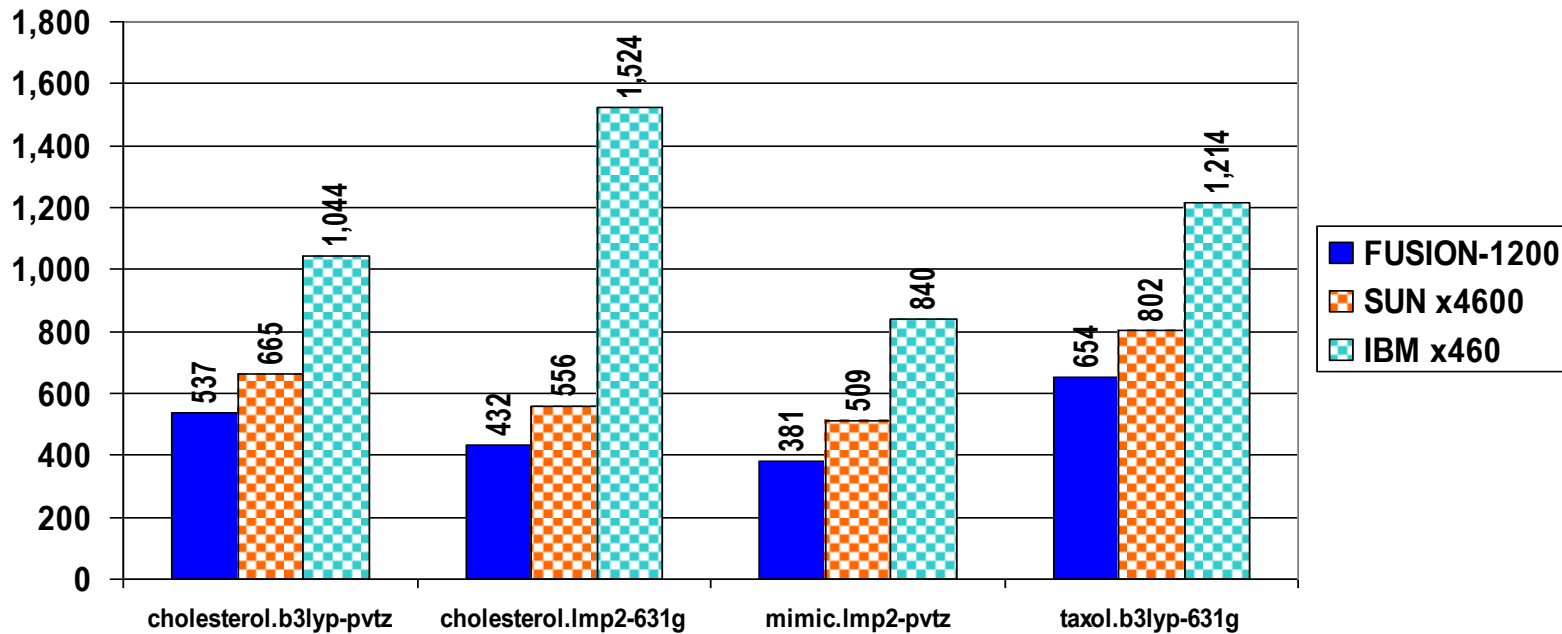
(Source: Public)

(Source: Public)



Jaguar

Runtime (Sec.) - Lower is better



HW Characteristics:

FUSION-1200 (vSMPowered™):

12 x Intel XEON 5160 DC (Woodcrest), 3GHz, 4MB L2; 36/48GB (vSMP Foundation 1.6)

(Source: ScaleMP)

IBM x460:

8 x Intel XEON 7040 DC (Paxville), 3GHz, 2x2MB L2; 16GB

(Source: ScaleMP)

SUN x4600:

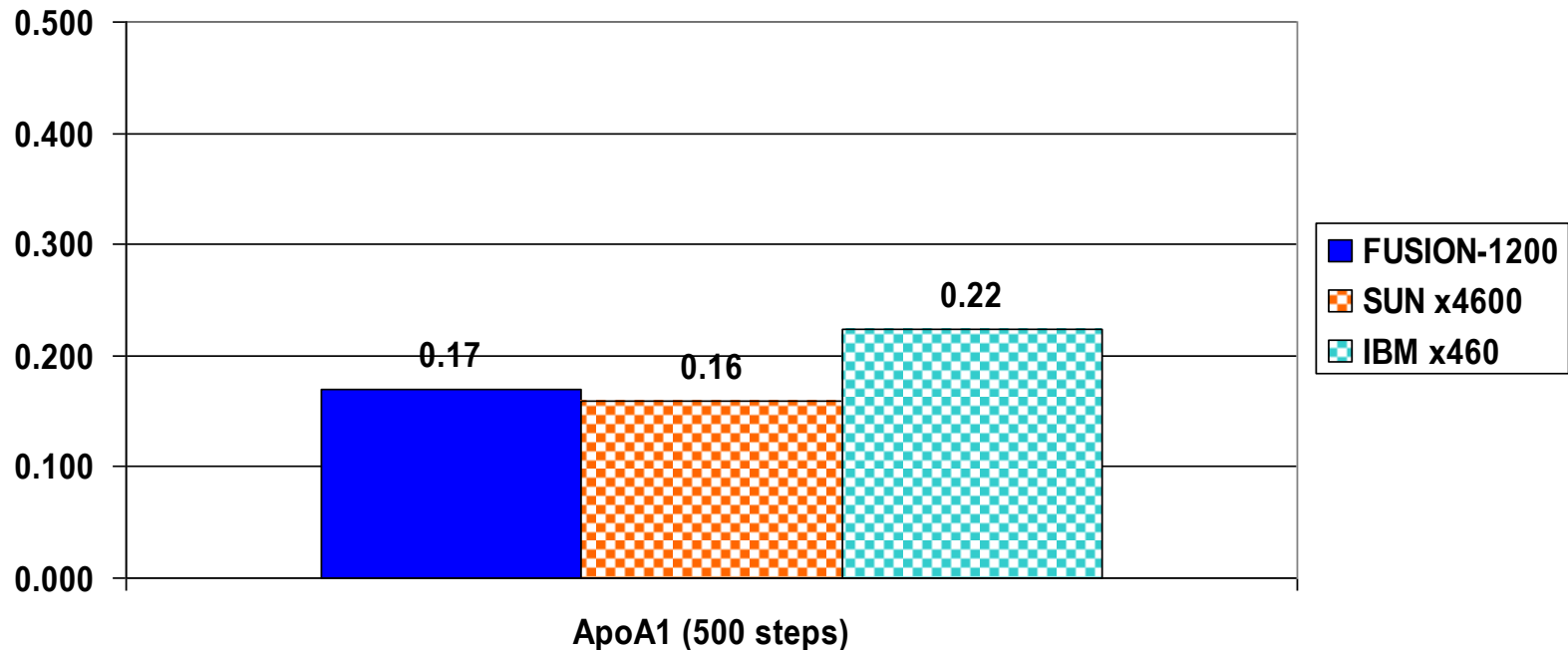
8 x AMD Opteron 885 DC, 2.6GHz, 2x1MB L2; 32GB

(Source: ScaleMP)



NAMD

Runtime (Time (Sec.)/Step) - Lower is better



HW Characteristics:

FUSION-1200 (vSMPowered™):

12 x Intel XEON 5160 DC (Woodcrest), 3GHz, 4MB L2; 36/48GB (vSMP Foundation 1.6)

(Source: ScaleMP)

IBM x460:

8 x Intel XEON 7040 DC (Paxville), 3GHz, 2x2MB L2; 16GB

(Source: ScaleMP)

SUN x4600:

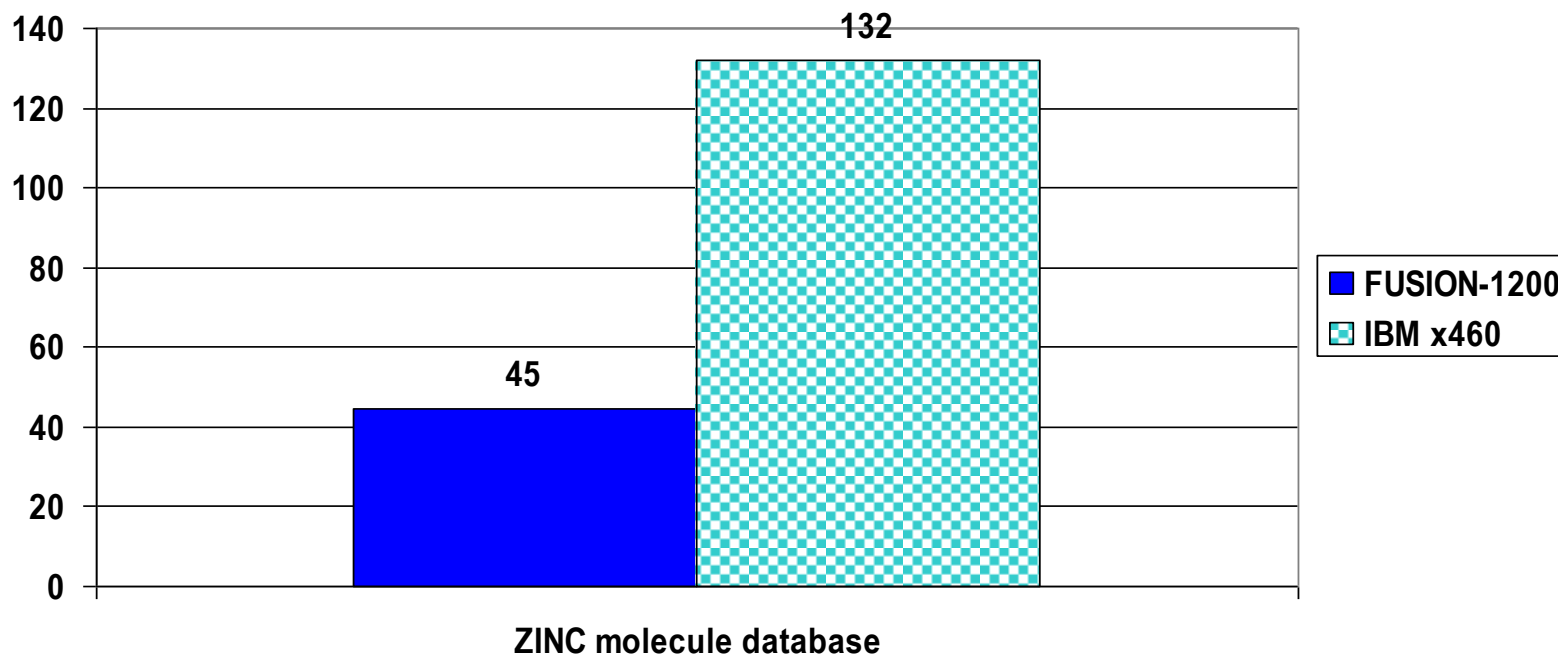
8 x AMD Opteron 885 DC, 2.6GHz, 2x1MB L2; 32GB

(Source: ScaleMP)



DOCK 5.3

Runtime (Sec.) - Lower is better



HW Characteristics:

FUSION-1200 (vSMPowered™):

12 x Intel XEON 5160 DC (Woodcrest), 3GHz, 4MB L2; 36/48GB (vSMP Foundation 1.6)

(Source: ScaleMP)

IBM x460:

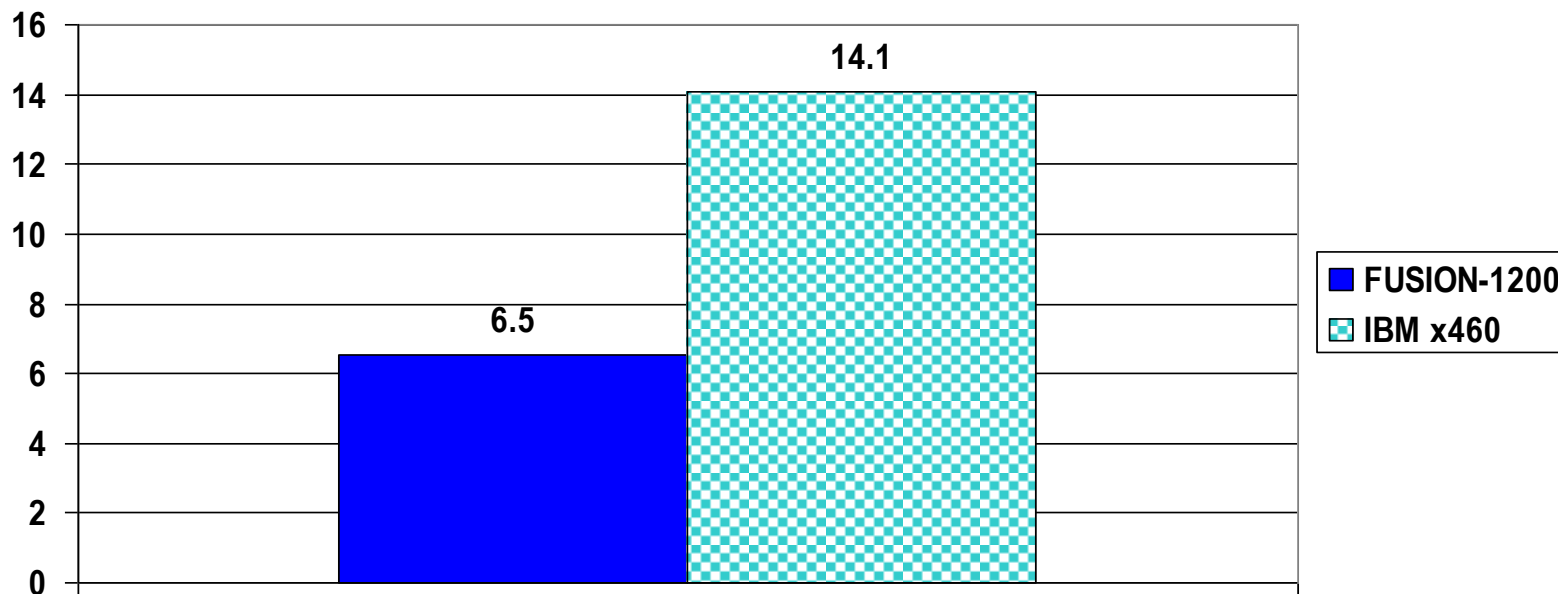
8 x Intel XEON 7040 DC (Paxville), 3GHz, 2x2MB L2; 16GB

(Source: ScaleMP)



GOLD 3.0

Runtime (Min.) - Lower is better



Max. Ops: 250,000; Islands: 3; Migrate Frequency: 10

HW Characteristics:

FUSION-1200 (vSMPowered™):

12 x Intel XEON 5160 DC (Woodcrest), 3GHz, 4MB L2; 36/48GB (vSMP Foundation 1.6)

(Source: ScaleMP)

IBM x460:

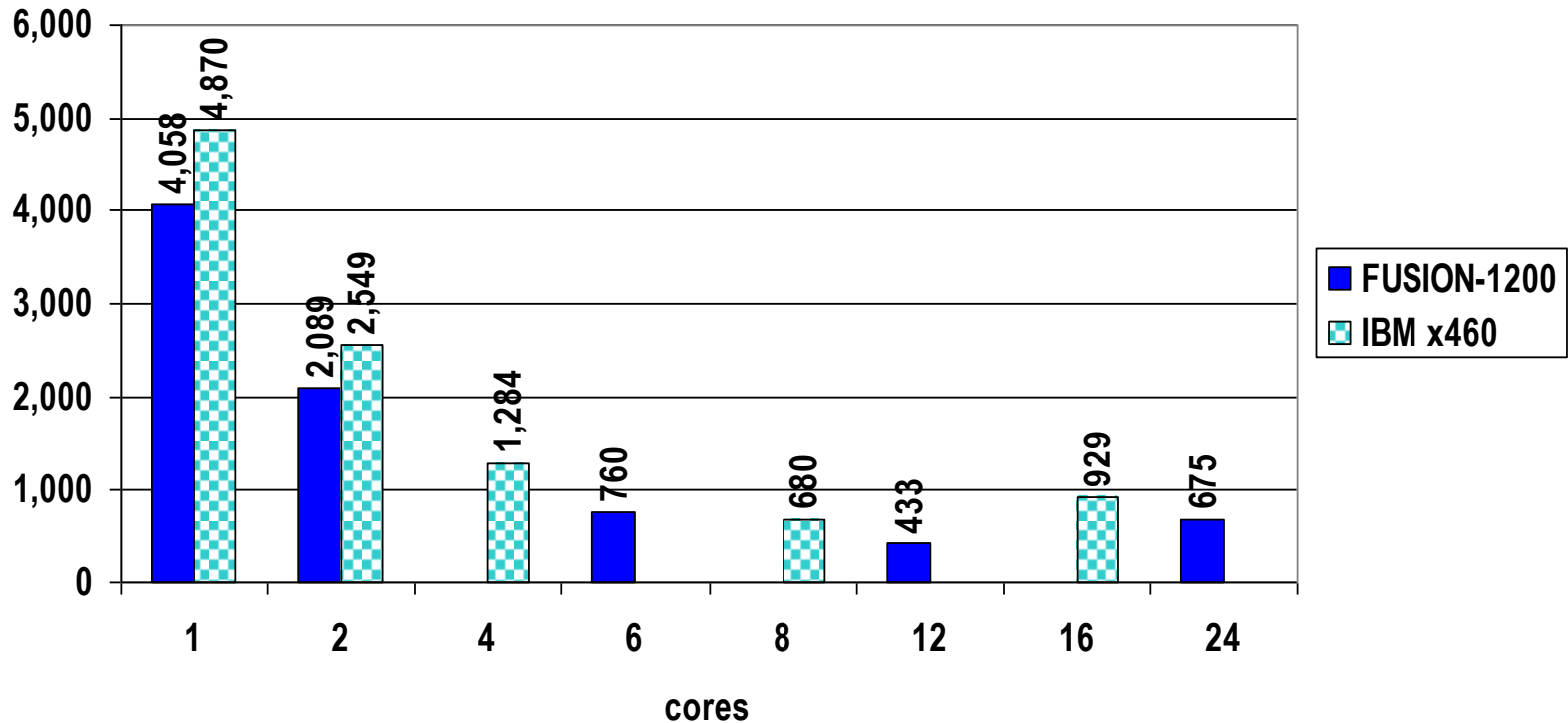
8 x Intel XEON 7040 DC (Paxville), 3GHz, 2x2MB L2; 16GB

(Source: ScaleMP)



mpiBLAST (tomato_15min.est model)

Runtime (Sec.) - Lower is better



HW Characteristics:

FUSION-1200 (vSMPowered™):

12 x Intel XEON 5160 DC (Woodcrest), 3GHz, 4MB L2; 36/48GB (vSMP Foundation 1.6)

(Source: ScaleMP)

IBM x460:

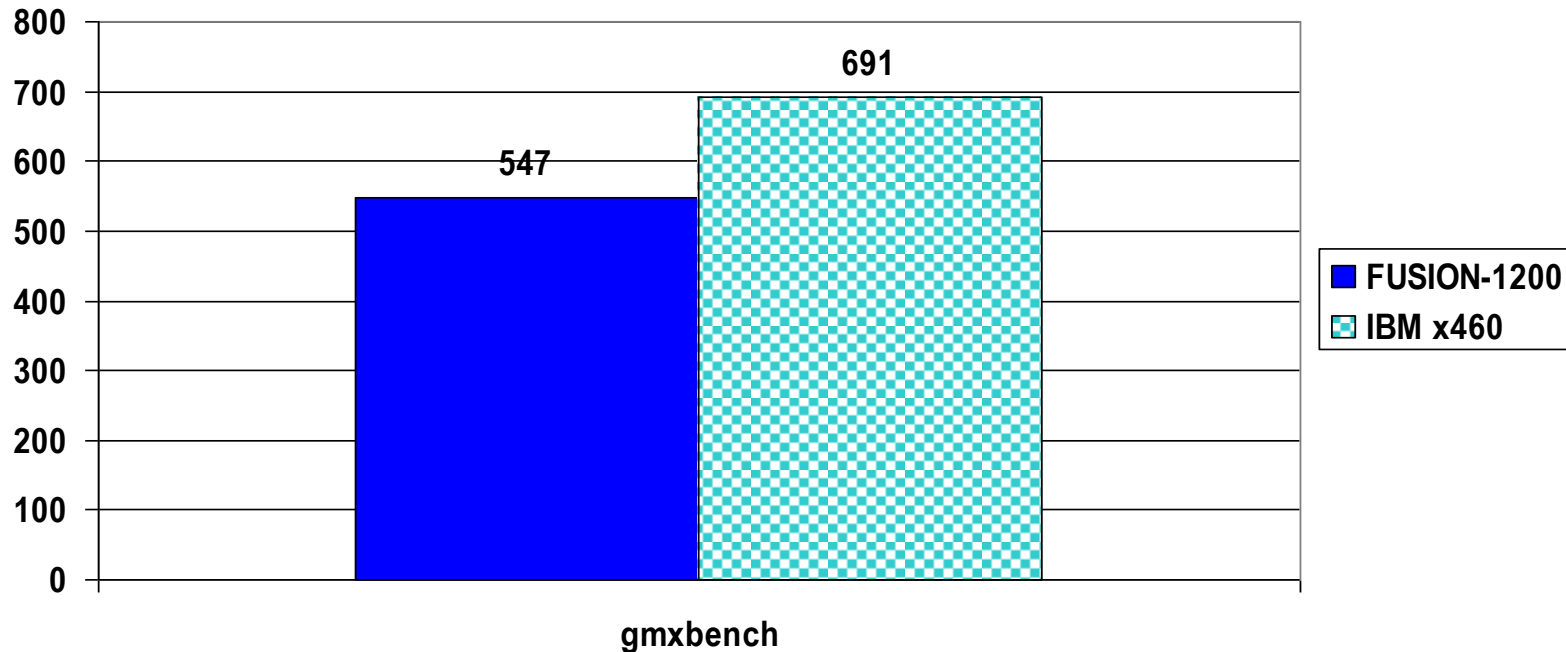
8 x Intel XEON 7040 DC (Paxville), 3GHz, 2x2MB L2; 16GB

(Source: ScaleMP)



GROMACS

Runtime (Sec.) - Lower is better



HW Characteristics:

FUSION-1200 (vSMPowered™):

12 x Intel XEON 5160 DC (Woodcrest), 3GHz, 4MB L2; 36/48GB (vSMP Foundation 1.6)

(Source: ScaleMP)

IBM x460:

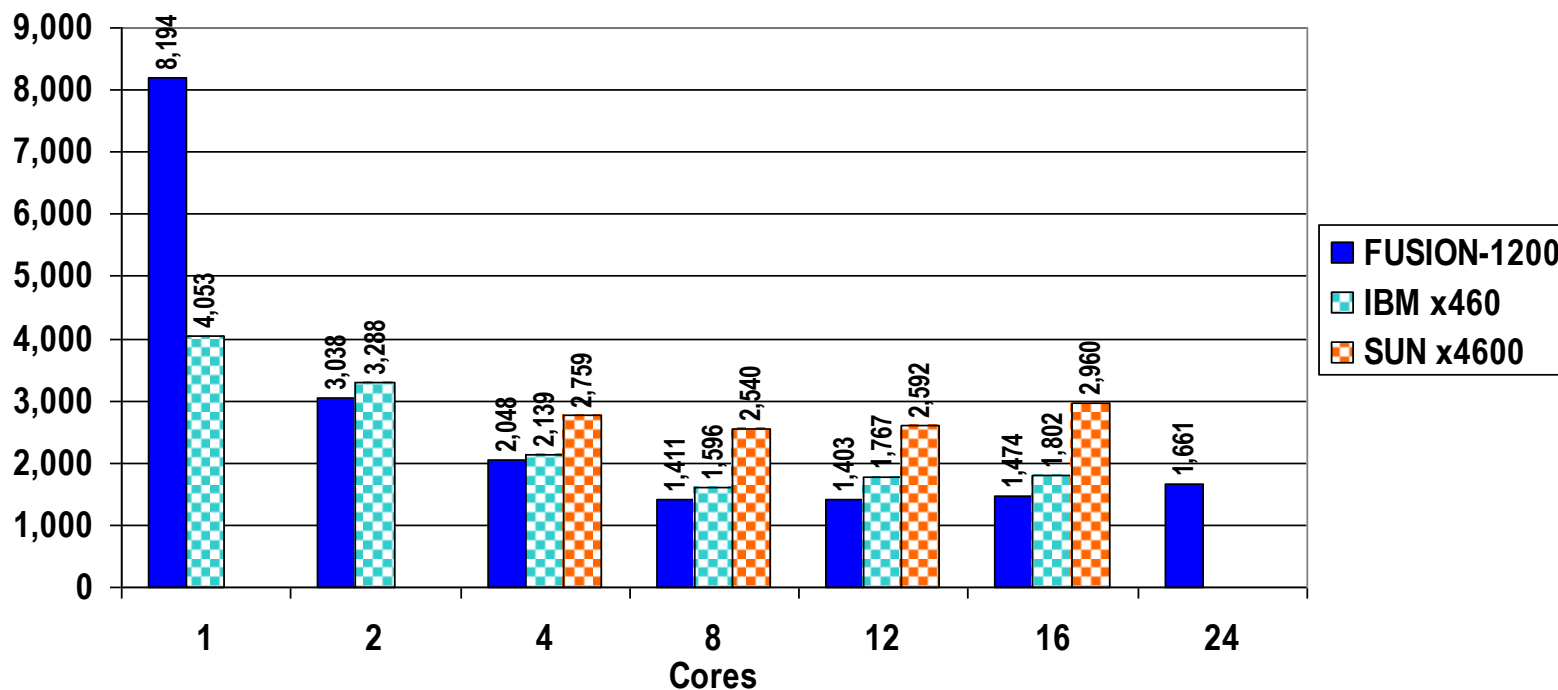
8 x Intel XEON 7040 DC (Paxville), 3GHz, 2x2MB L2; 16GB

(Source: ScaleMP)



MOLPRO (Small model - Intel Compiler)

Runtime (sec.) - Lower is better



HW Characteristics:

FUSION-1200 (vSMPowered™):

12 x Intel XEON 5160 DC (Woodcrest), 3GHz, 4MB L2; 34/72GB (vSMP Foundation 1.6)

(Source: ScaleMP)

IBM x460:

8 x Intel XEON 7040 DC (Paxville), 3GHz, 2x2MB L2; 16GB

(Source: ScaleMP)

SUN x4600:

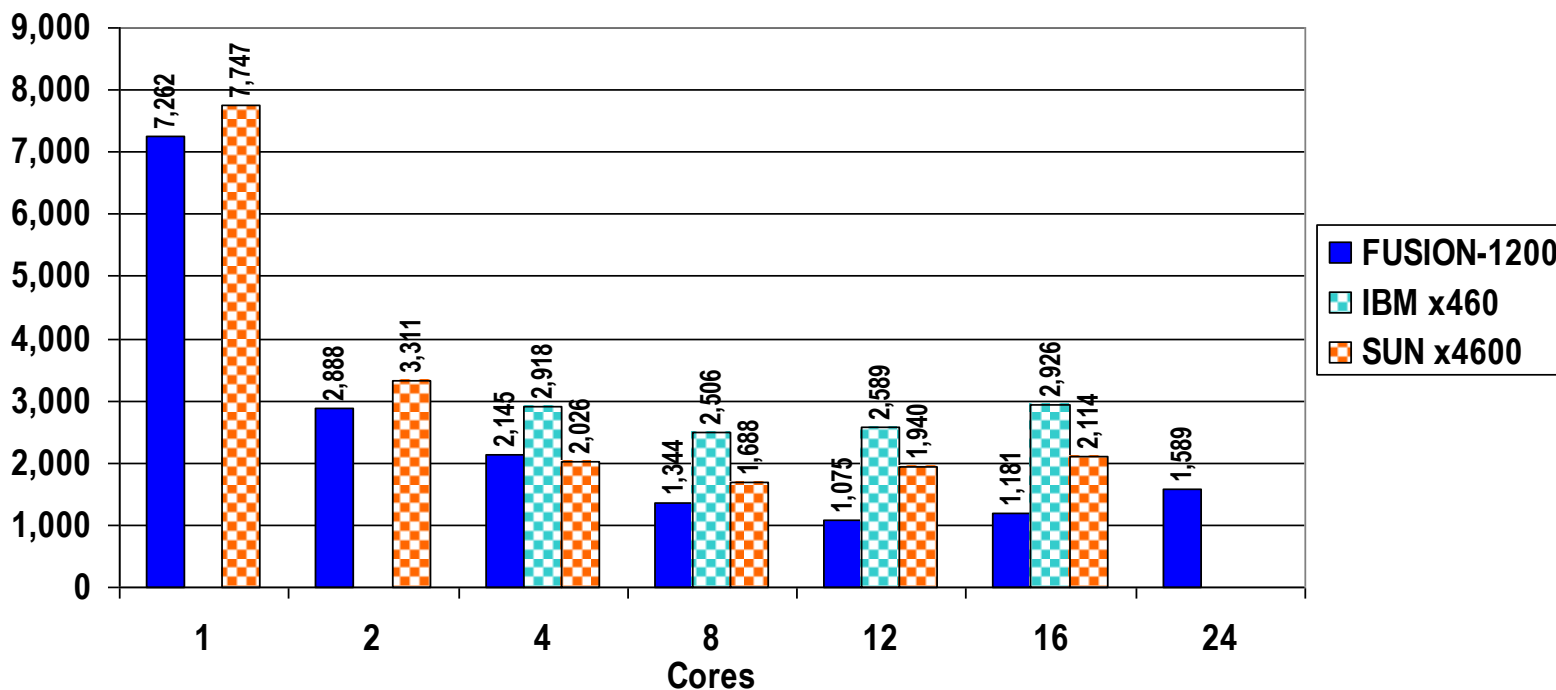
8 x AMD Opteron 885 DC, 2.6GHz, 2x1MB L2; 32GB

(Source: ScaleMP)



MOLPRO (Small model - PGI Compiler)

Runtime (sec.) - Lower is better



HW Characteristics:

FUSION-1200 (vSMPowered™):

12 x Intel XEON 5160 DC (Woodcrest), 3GHz, 4MB L2; 34/72GB (vSMP Foundation 1.6)

(Source: ScaleMP)

IBM x460:

8 x Intel XEON 7040 DC (Paxville), 3GHz, 2x2MB L2; 16GB

(Source: ScaleMP)

SUN x4600:

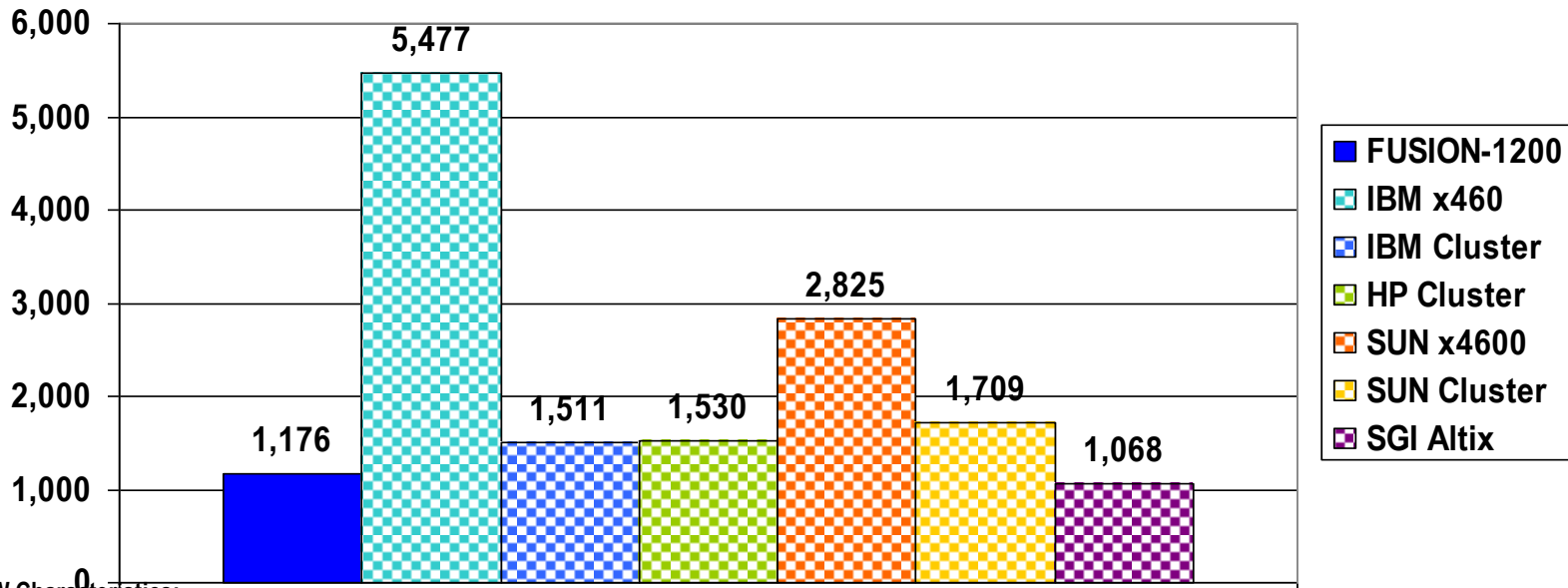
8 x AMD Opteron 885 DC, 2.6GHz, 2x1MB L2; 32GB

(Source: ScaleMP)



Schlumberger Eclipse

Runtime (Sec.) - Lower is better



HW Characteristics:

FUSION-1200 (vSMPowered™):

IBM x460:

IBM Cluster:

HP Cluster:

SUN x4600:

SUN Cluster:

SGI Altix:

12 x Intel XEON 5160 DC (Woodcrest), 3GHz, 4MB L2; 36/48GB (vSMP Foundation 1.6)

8 x Intel XEON 7040 DC (Paxville), 3GHz, 2x2MB L2; 16GB

4 node cluster: 4 x 2 x AMD Opteron 275 DC, 2.2GHz, 2x1MP L2; 8GB/node; InfiniBand

8 node cluster: 8 x 2 x Intel XEON DP, 3.6GHz, 1MB L3; 8GB/node; Myrinet

8 x AMD Opteron 885 DC, 2.6GHz, 2x1MB L2; 32GB

4 node cluster: 4 x 2 x AMD Opteron 280 DC, 2.4GHz, 2x1MB L2; 4GB/node; Infiniband

8 x Intel Itanium2 DC (Montecito), 1.6GHz; 432 GB RAM; Propack 4 SP3, SLES 9

(Source: ScaleMP)

(Source: ScaleMP)

(Source: Public)

(Source: Public)

(Source: ScaleMP)

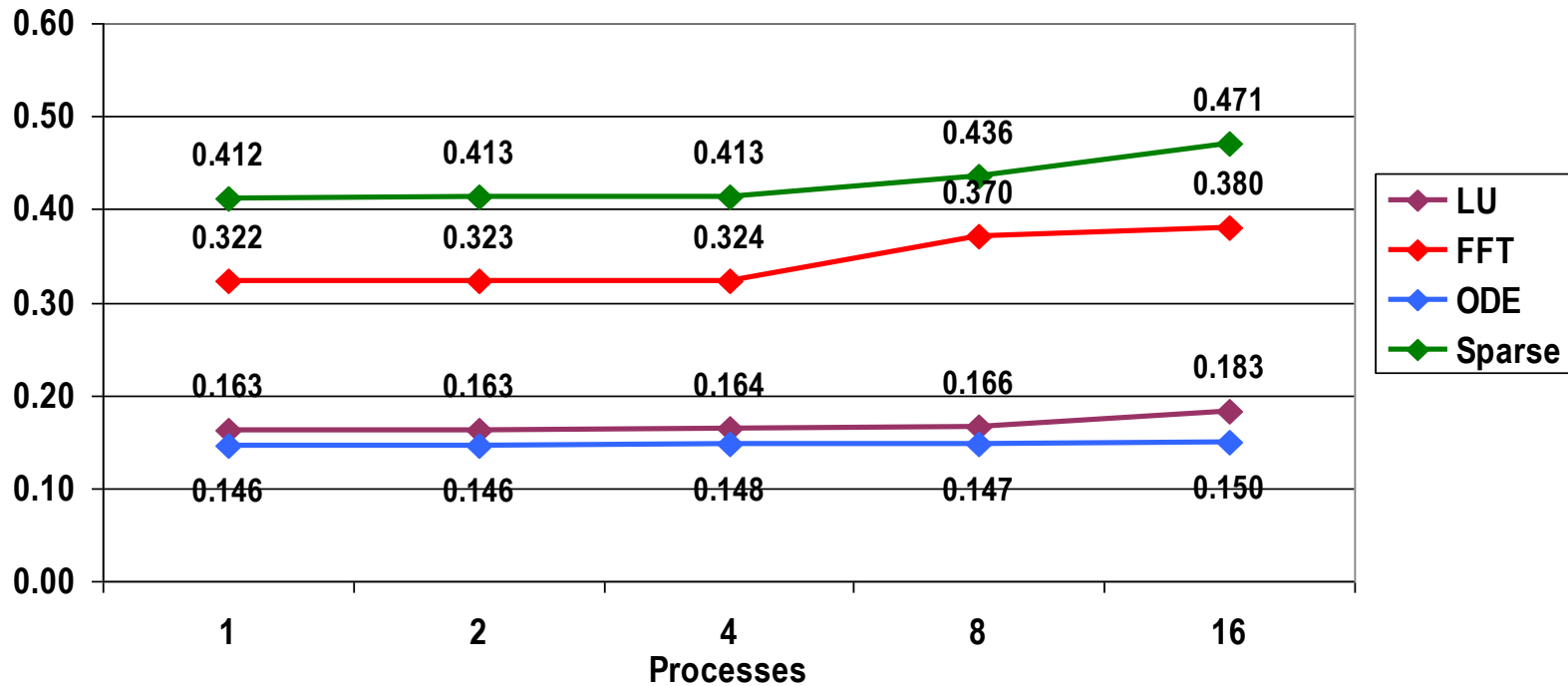
(Source: Public)

(Source: Public)



MATLAB

Runtime (sec.) should not increase with # of processes



HW Characteristics:

FUSION-1200 (vSMPowered™):

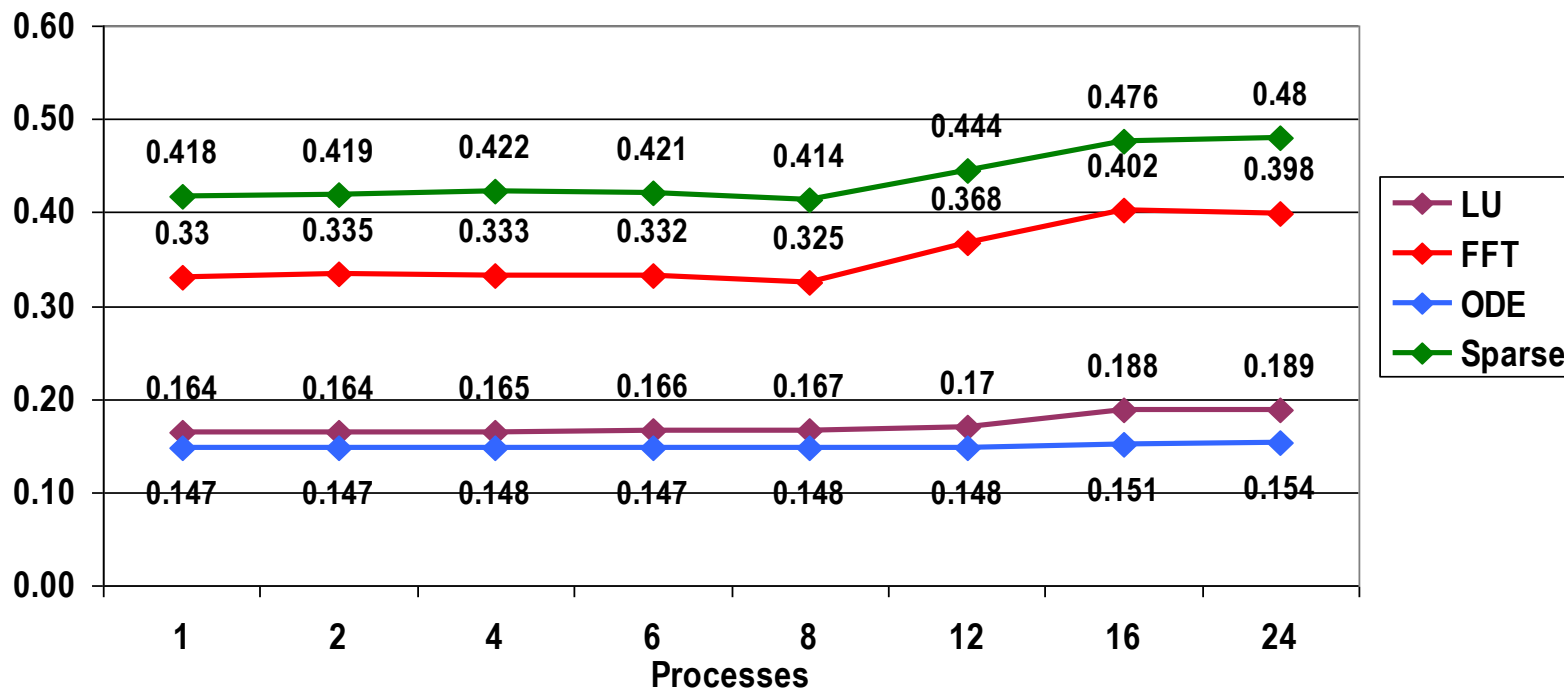
8 x Intel XEON 5160 DC (Woodcrest), 3GHz, 4MB L2; 24/32GB (vSMP Foundation 1.6)

(Source: ScaleMP)



MATLAB

Runtime (sec.) should not increase with # of processes



HW Characteristics:

FUSION-1200 (vSMPowered™):

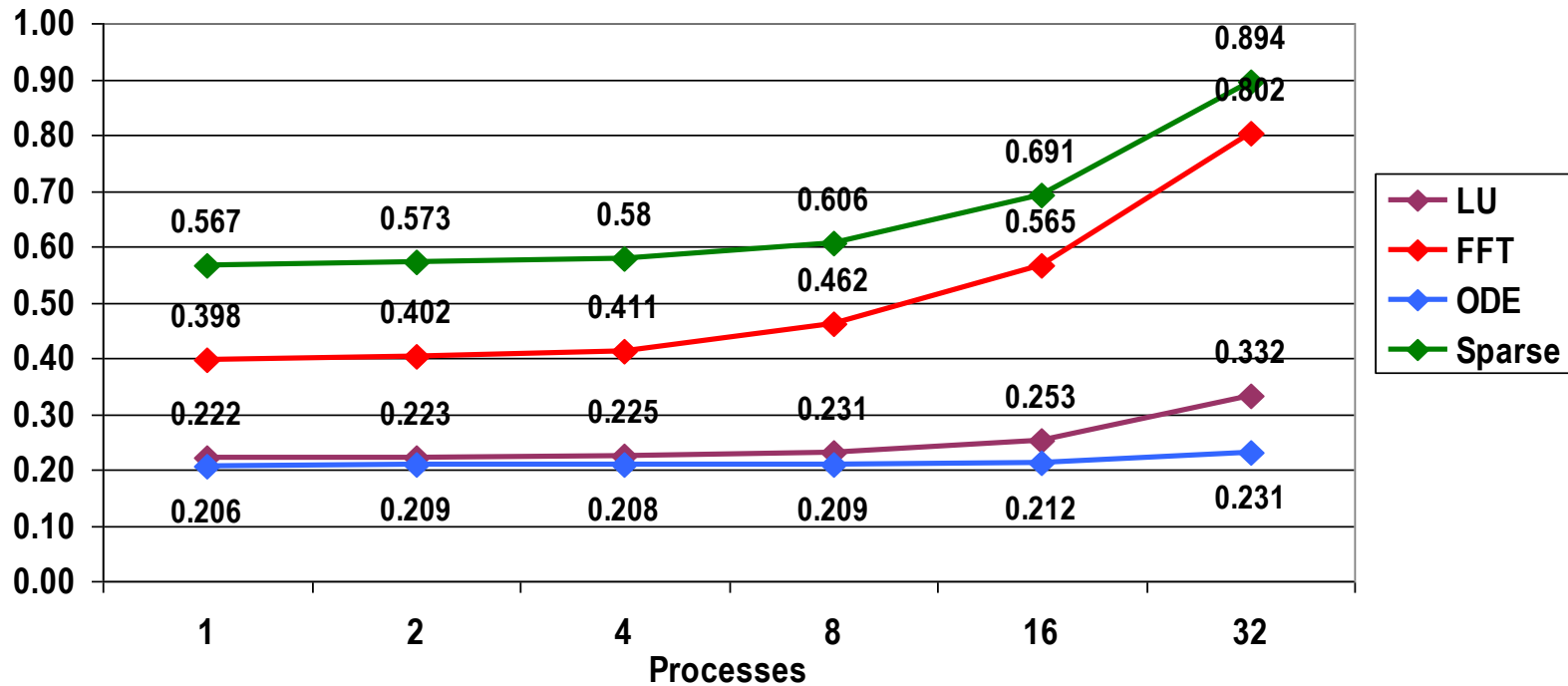
12 x Intel XEON 5160 DC (Woodcrest), 3GHz, 4MB L2; 36/48GB (vSMP Foundation 1.6)

(Source: ScaleMP)



MATLAB

Runtime (sec.) should not increase with # of processes



HW Characteristics:

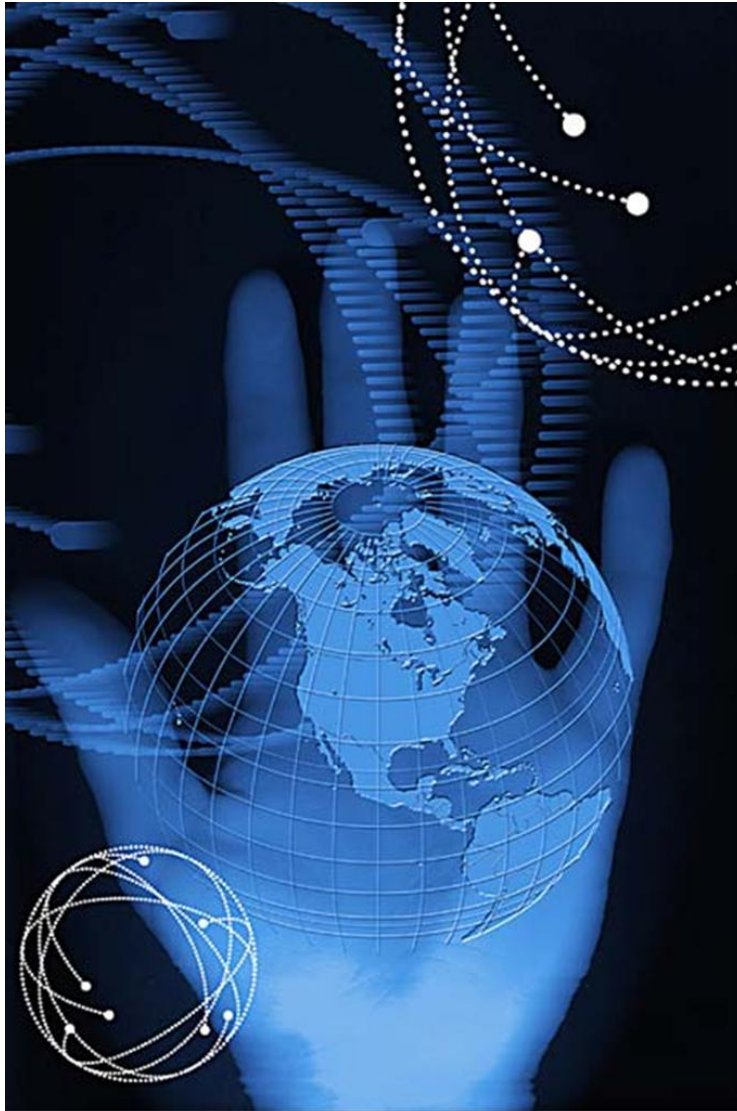
FUSION-1200 (vSMPowered™):

8 x Intel XEON 53xx QC (Clovertown), 2.13GHz, 2x4MB L2; 24/32GB (vSMP Foundation 1.6)

(Source: ScaleMP)



この資料について



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2007年1月



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コンサルテーション

<http://www.sstc.co.jp>

製品技術

<http://www.hp2c.biz>

2007年1月

