TAGITT-CATIA V4/ENOVIA DMU Evaluation

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Albert-Battaglin Consulting Group TAGITT-CATIA V4/ENOVIA DMU Evaluation

Table of Contents

Albert-Battaglin Consulting Group TAGITT-CATIA V4/ENOVIA DMU Evaluation

Table of Figures

Albert-Battaglin Consulting Group TAGITT-CATIA V4/ENOVIA DMU Evaluation

Table of Result Charts

Notices

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Executive Summary

The Albert-Battaglin Consulting Group evaluated nine engineering workstations from Hewlett-Packard, IBM and Sun using TAGITT (The Albert Group Interactive Throughput Test). TAGITT-CATIA V4/ENOVIA DMU measures workstation performance from a user perspective by simulating interactive work sessions using CATIA 4.2.4 refresh 02 and ENOVIA DMU R15 SP2 versions of this CAD/CAM application software package. Key results were as follows:

- IBM's IntelliStation® POWER™ 285 workstations remained the overall performance leaders for CATIA V4 and ENOVIA DMU tests.
- IBM's new IntelliStation POWER 185 workstations outperformed the IBM POWER 275 (1w) GXT6500P as well as the HP c8000 (2w) FireGL X3, Sun Blade 2500 (1w) XVR-1200 and Sun Blade 1500 (1w) XVR-1200 by considerable margins.
- The new IBM POWER 185 machines were an average of 11% slower than the fastest IBM POWER 285 machines in the TAGITT-CATIA V4 test.
- The new IBM POWER 185 (2w) GXT6500P was 17% slower than the IBM POWER 285 (2w) GXT6500P in overall ENOVIA DMU throughput.
- The HP c8000 (2w) FireGL X3 was the fastest V4 workstation for the graphics throughput measurement. For pure dynamic graphic manipulations, which are a subset of these graphics tests, the HP c8000 (2w) FireGL X3 was 42% faster than the IBM POWER 285 (1w/2w) GXT6500P.
- The IBM POWER 285 (2w) GXT6500P and IBM POWER 285 (1w) GXT6500P machines were the fastest for overall DMU graphic operations. These machines outperformed the second place IBM POWER 185 (1w/2w) GXT6500P machines by just under 30%. The HP c8000 (2w) FireGL X3 was 62% slower than the leaders in this test.
- Machine performance was not the same across all tested applications. Although the 1.9 GHz IBM POWER 285 machines were the fastest in nearly all tests, the HP c8000 (2w) FireGL X3 also won in a few individual tests (Overall Dynamic Graphics Performance, and Walk Through). In addition, the relative performance of the machines varied significantly on the different tests.
- IBM's dual-core configurations performed significantly better than the single-core configurations in several tests. Running V4, the dual-core configurations outperformed single-core configurations in the Studio and Image Viewer tests by about 60% and 95% respectively. Running DMU navigator clash computations, the dual-core configurations were 70% to 80% faster than their single-core cousins.
- No performance advantage was apparent with HP's dual-core configuration.

- The Sun Blade 2500 (1w) XVR-1200 and Sun Blade 1500 (1w) XVR-1200 performance was markedly worse than all other systems. In V4 overall throughput, the Sun Blade 2500 (1w) XVR-1200 was 128% slower than the IBM POWER 285 (1w) GXT6500P, IBM's fastest single-core configuration. In ENOVIA DMU overall throughput, the Sun Blade 2500 (1w) XVR-1200 was 237% slower than the IBM POWER 285 (2w) GXT6500P due to extremely bad performance in the interference computation test.

Summary of Top Three Winners in Each Test:

V4 Throughput Summary Results

Task/Test	First	Second	Third
Overall V4 Throughput	**IBM POWER 285 (2w) GXT6500P** **IBM POWER 285 (1w) GXT6500P**	**IBM POWER 185 (2w) GXT4500P** **IBM POWER 185 (1w) GXT4500P** **IBM POWER 185 (2w) GXT6500P** **IBM POWER 185 (1w) GXT6500P**	**IBM POWER 275 (1w) GXT6500P**
Application Throughput	**IBM POWER 285 (2w) GXT6500P** **IBM POWER 285 (1w) GXT6500P**	**IBM POWER 185 (1w) GXT4500P** **IBM POWER 185 (2w) GXT6500P** **IBM POWER 185 (2w) GXT4500P** **IBM POWER 185 (1w) GXT6500P**	**IBM POWER 275 (1w) GXT6500P**
Graphics Throughput	HP c8000 (2w) FireGL X3	**IBM POWER 285 (1w) GXT6500P** **IBM POWER 285 (2w) GXT6500P**	**IBM POWER 185 (2w) GXT4500P**
Responsiveness Throughput	**IBM POWER 285 (2w) GXT6500P** **IBM POWER 285 (1w) GXT6500P**	**IBM POWER 185 (1w) GXT4500P** **IBM POWER 185 (1w) GXT6500P** **IBM POWER 185 (2w) GXT4500P** **IBM POWER 185 (2w) GXT6500P**	**IBM POWER 275 (1w) GXT6500P**
Dynamic Graphics Throughput	HP c8000 (2w) FireGL X3	**IBM POWER 285 (2w) GXT6500P** **IBM POWER 285 (1w) GXT6500P**	**IBM POWER 185 (2w) GXT4500P**

DMU Navigator Summary Results

Task/Test	First	Second	Third
DMU Throughput	**IBM POWER 285 (2w) GXT6500P**	**IBM POWER 185 (2w) GXT6500P** **IBM POWER 285 (1w) GXT6500P**	**IBM POWER 185 (2w) GXT4500P**
Graphics Throughput	**IBM POWER 285 (2w) GXT6500P** **IBM POWER 285 (1w) GXT6500P**	**IBM POWER 185 (1w) GXT6500P** **IBM POWER 185 (2w) GXT6500P**	**IBM POWER 275 (1w) GXT6500P**
CGR Creation Throughput	**IBM POWER 285 (1w) GXT6500P** **IBM POWER 285 (2w) GXT6500P**	**IBM POWER 185 (1w) GXT4500P** **IBM POWER 185 (2w) GXT4500P** **IBM POWER 185 (2w) GXT6500P** **IBM POWER 185 (1w) GXT6500P**	**IBM POWER 275 (1w) GXT6500P**
DMU Load Throughput	**IBM POWER 185 (2w) GXT4500P** **IBM POWER 185 (2w) GXT6500P** **IBM POWER 185 (1w) GXT4500P** **IBM POWER 185 (1w) GXT6500P** **IBM POWER 285 (2w) GXT6500P** **IBM POWER 285 (1w) GXT6500P**	**IBM POWER 275 (1w) GXT6500P** HP c8000 (2w) FireGL X3	Sun Blade 2500 (1w) XVR-1200
DMU Clash Throughput	**IBM POWER 285 (2w) GXT6500P**	**IBM POWER 185 (2w) GXT6500P** **IBM POWER 185 (2w) GXT4500P**	**IBM POWER 185 (1w) GXT4500P** **IBM POWER 285 (1w) GXT6500P** **IBM POWER 185 (1w) GXT6500P**

Individual Application Test Throughput Results:

Primary Application Test Throughput Results

Task/Test	First	Second	Third
Modeling Solid Model Creation and Modification	**IBM POWER 285 (1w) GXT6500P** **IBM POWER 285 (2w) GXT6500P**	**IBM POWER 185 (1w) GXT4500P** **IBM POWER 185 (2w) GXT6500P** **IBM POWER 185 (1w) GXT6500P** **IBM POWER 185 (2w) GXT4500P**	**IBM POWER 275 (1w) GXT6500P**
Finite Element Analysis (ANSOLID)	**IBM POWER 285 (2w) GXT6500P** **IBM POWER 285 (1w) GXT6500P**	**IBM POWER 185 (2w) GXT4500P** **IBM POWER 185 (1w) GXT6500P** **IBM POWER 185 (1w) GXT4500P** **IBM POWER 185 (2w) GXT6500P**	**IBM POWER 275 (1w) GXT6500P**
NC Operations STL Generation	**IBM POWER 285 (2w) GXT6500P** **IBM POWER 285 (1w) GXT6500P**	**IBM POWER 185 (2w) GXT6500P** **IBM POWER 185 (1w) GXT6500P** **IBM POWER 185 (2w) GXT4500P** **IBM POWER 185 (1w) GXT4500P**	**IBM POWER 275 (1w) GXT6500P**
Detail Drawing Creation	**IBM POWER 285 (1w) GXT6500P** **IBM POWER 285 (2w) GXT6500P**	**IBM POWER 185 (1w) GXT6500P** **IBM POWER 185 (2w) GXT6500P** **IBM POWER 185 (1w) GXT4500P** **IBM POWER 185 (2w) GXT4500P**	**IBM POWER 275 (1w) GXT6500P**

Secondary Application Test Throughput Results

Task/Test	**First**	**Second**	**Third**
Solid and Surface Analysis Function	**IBM POWER 185 (2w) GXT6500P** **IBM POWER 185 (1w) GXT4500P** **IBM POWER 185 (1w) GXT6500P** **IBM POWER 185 (2w) GXT4500P**	**IBM POWER 285 (1w) GXT6500P** **IBM POWER 285 (2w) GXT6500P**	**IBM POWER 275 (1w) GXT6500P**
Model Save	**IBM POWER 285 (2w) GXT6500P**	Sun Blade 2500 (1w) XVR-1200 **IBM POWER 185 (2w) GXT6500P** **IBM POWER 185 (2w) GXT4500P** **IBM POWER 185 (1w) GXT4500P** **IBM POWER 185 (1w) GXT6500P**	**IBM POWER 285 (1w) GXT6500P**
Walk Through	HP c8000 (2w) FireGL X3	**IBM POWER 185 (1w) GXT4500P** **IBM POWER 185 (2w) GXT4500P**	**IBM POWER 285 (2w) GXT6500P** **IBM POWER 285 (1w) GXT6500P** Sun Blade 2500 (1w) XVR-1200
Bend (Sheet Metal Part Development and Modification)	**IBM POWER 285 (1w) GXT6500P** **IBM POWER 285 (2w) GXT6500P**	**IBM POWER 185 (1w) GXT4500P** **IBM POWER 185 (2w) GXT6500P** **IBM POWER 185 (1w) GXT6500P** **IBM POWER 185 (2w) GXT4500P**	**IBM POWER 275 (1w) GXT6500P**
Fitting Simulation	**IBM POWER 185 (2w) GXT4500P** **IBM POWER 185 (1w) GXT4500P**	**IBM POWER 285 (2w) GXT6500P**	**IBM POWER 285 (1w) GXT6500P**
Studio	**IBM POWER 185 (2w) GXT6500P**	**IBM POWER 185 (2w) GXT4500P** **IBM POWER 285 (2w) GXT6500P**	**IBM POWER 185 (1w) GXT4500P** **IBM POWER 185 (1w) GXT6500P**

Secondary Application Test Throughput Results			
Task/Test	**First**	**Second**	**Third**
Image Viewer	**IBM POWER 185 (2w) GXT6500P** **IBM POWER 185 (2w) GXT4500P**	**IBM POWER 285 (2w) GXT6500P**	**IBM POWER 185 (1w) GXT4500P** **IBM POWER 185 (1w) GXT6500P**

Why TAGITT?

The Need for Application-Level Testing

When mechanical engineers select and use workstations, performance considerations should be based on the ability of the machine to rapidly complete the users' design task. Users are concerned with throughput: how much faster (or better) could I design my next product if I upgraded to a faster graphics card or a faster CPU? In the workstation industry, MHz, MIPS, MFLOPS, SPECmarks, etc. have become the standards for performance comparison of CPUs. For graphics, 3D vector drawing speed and polygon drawing speed (polygons per second) are often used for comparison. In selecting a workstation for a mechanical design application, the user is faced with a choice between many competitive machines — some with higher MIPS ratings, others with higher vector and/or polygon rates. Without running an actual application benchmark, it is difficult to predict which of the two machines will provide the better performance level for its application.

MHz, MIPS, MFLOPS, vectors per second, GPC, XPC, OPC and polygons per second all allow users to compare machines, but those specs may be misleading as predictors of engineering task efficiency. Today's CAD/CAM applications are typically very large, complicated programs. The way in which these programs perform in the context of different hardware architectures and with different operating system services and graphic libraries is generally not predictable from the previously mentioned specifications. Although software vendors are striving to make their code highly "portable" so that it runs on a wide variety of machines, the fact is that all applications must be ported and tuned to obtain optimal performance. Each workstation vendor offers unique performance-enhancing capability. Without tuning, application software may or may not take full advantage of the target hardware/operating system platform. Since software developers cannot possibly take advantage of every function in every workstation and/or operating system, performance compromises occur. The user has no way of knowing to what extent his/her application software has been ported and tuned to match capabilities offered by any particular workstation vendor without application level testing.

Test Description

TAGITT, The Albert Group Interactive Throughput Test, was designed to directly measure performance in completing typical engineering design tasks, especially related to solid modeling. For users of solid modeling software, the results provide a comparison of workstations that is more relevant than the typical manufacturer’s published specifications of MHz, MIPS, MFLOPS, vectors per second and polygons per second.

TAGITT testing is typically accomplished by recording and playing back user interaction scenarios. Most CAD/CAM applications include functions to accomplish this task although some are undocumented. Record and playback mechanisms are the preferred method of testing for a number of reasons, including repeatability, accuracy, and user relevance. Although it is often easier to measure times for individual operations or functions, this can be a misleading measure of performance from a user perspective. Users constantly switch between functions and/or modules, which can result in significant performance variation as portions of the software are loaded, unloaded, and accessed from memory. The use of interaction scenarios provides a more realistic measurement of overall system performance. TAGITT tests use built-in timing and data capture mechanisms in order to obtain accurate measurements over a relatively large number of functional tests.

In addition to overall time measurements, TAGITT scenarios normally include interim times for specific functions or operations. These can provide specific performance data for individual functions such as adding a solid feature, shading a model or generating an NC tool path. These times are also used by Albert-Battaglin Consulting Group as a rough method for isolating performance that is compute intensive, graphic intensive or I/O intensive. While it is clear that the interplay between these system aspects is too complicated to be accurately measured at the application level, the measurements can sometimes point to areas for in-depth performance profiling using specialized tools.

TAGITT interaction scenarios consist of a variety of operations, with an emphasis on parametric/variational solid modeling and associated tasks such as part visualization, kinematic and “walk through” analysis, drawing view creation from 3D models, NC tool path generation, STL output, geometric/FE analysis and high quality image rendering and display. Regardless of the task, special emphasis is placed on tasks that are not by nature “interactive.” For example, the creation of a line segment in most systems takes place in well under a half second so that performance differences will most likely be unnoticed by users. These times are not considered in TAGITT results. In contrast, updating a solid model or regenerating a drawing layout following a dimensional change can take from many seconds to several minutes and therefore has an impact on a user’s productivity. TAGITT evaluations also measure ancillary tasks such as changing functions (through menu picks) or selecting geometry. The time taken for these operations generally ranged between 1 and 15 seconds. Albert-Battaglin Consulting Group feels that the overall responsiveness of the system is reflected in these interaction times. This “responsiveness” is the difference between systems that seem heavy and slow, compared to those that “feel” quick and light. The TAGITT measurements gather data from both of these interaction types and combine them together to create an overall throughput measurement.

Models used for TAGITT evaluations are taken from previously released customer data and no data is ever provided to workstation vendors or third parties by the Albert-Battaglin Consulting Group.

TAGITT-CATIA/ENOVIA DMU

The V4 portion of TAGITT-CATIA/ENOVIA DMU consists almost entirely of a series of CATIA "record files" which are capable of recording and playing back a series of user interactions. The record files capture a majority of user interactions including some simulations of dynamic graphic manipulations performed via the GRAPER utility function. Fifty record files are used in the 4.2.4 refresh 2 version of TAGITT/CATIA V4. The record files were either created by ABCG, adapted from standard CATIA Operator Exchange test files or developed around Dassault Systèmes' demo part models. Some of the models used are shown in Figure 1. These files cover many areas of the CATIA 4.2.4 R2 product including part modeling, surface intersection, drawing layout, parametric modification and updates, the skin function, finite element analysis, fitting simulation, kinematics simulation, walk through analysis, NC tool path generation, sheet metal part modeling, studio image rendering and viewing and model storage and retrieval from disk. Combined, these files represent thousands of user interactions and many hours of operator seat time.

Figure 1 – Some of the CATIA models used for TAGITT/CATIA

TAGITT/CATIA also includes CATIA Image Viewer and DMU Navigator tests. For the CATIA Image Viewer test, the time for displaying an image generated by the Studio function as recorded by the Image Information function is used.

For ENOVIA DMU tests, many different CATIA V4, V5 and CGR models are combined and rendered in wireframe, shaded, shaded with edges, hidden line, shaded with material, single light, dual light, dual light with edges, neon and neon with edges modes. These models are each rotated panned and zoomed via CATScript macros. Tests are run with and without cached "cgr" files. The combination of models used for the testing of both of these functions is large and complicated enough such that the operations are generally not interactive (i.e. less than 0.5 seconds). Some of the models used for the ENOVIA DMU test are shown in Figure 2.

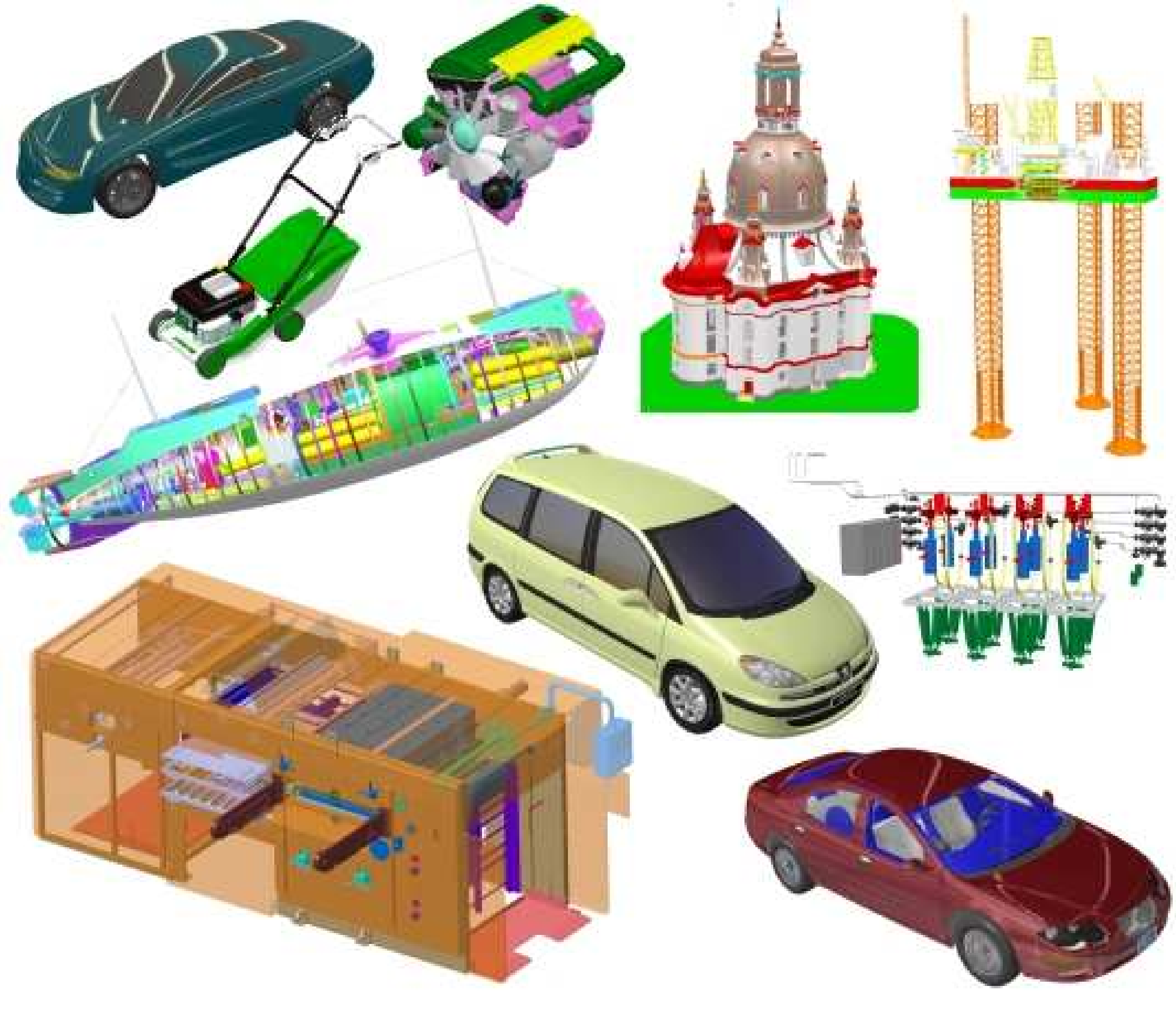


Figure 2 – ENOVIA DMU Navigator Test Models

Test Weighting

While running the TAGITT benchmark, the times for individual operations and scenarios are recorded. To produce Application, Graphics and Overall throughput results, weighted sums of appropriate individual test results are used. Albert-Battaglin Consulting Group sets the weighting factors for each type of operation based on its judgment of the relative importance of each operation. The weighting is Albert-Battaglin Consulting Group's best judgment for a "typical" CATIA/DMU user, whether from aerospace, automotive or any other industry. The weights are applied to actual times by averaging the results measured across the various workstations and applying the appropriate factor.

The results presented in this report represent a cross section of different types and sizes of models that can act as a guide for overall workstation performance.

Overall V4 Throughput numbers consist of the weighted sum of the Application, Graphics and Miscellaneous portions of the test. Application tests measure the times required to complete application related tasks such as changing a solid model, generating a multi-view drawing, making a STL model or running a FEM analysis. Graphics portions of the test measure exclusively viewing-related functions such as generating a shaded image or dynamically rotating that image. Miscellaneous tests include the times needed to start and exit CATIA, change CATIA functions or options, save models, and select geometry. The weighting used is shown in Figure 3.

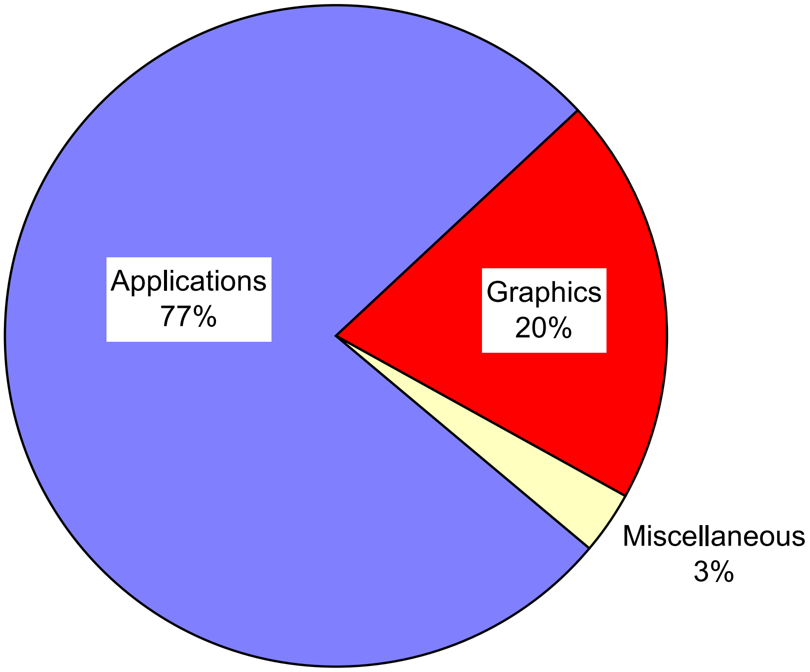


Figure 3 – V4 Overall Throughput Weighting

The Application time for this TAGITT test is the weighted sum of the Solid and Surface Analysis, Sheet Metal Part Development, Detail View Generation, Finite Element Analysis (ANSOLID), Fitting Simulation, Kinematics Simulation, Solid Modeling Creation and Modification, NC STL Generation, Studio, Image Viewer, and Walk Through portions of the test. The weightings used are shown in Figure 4.

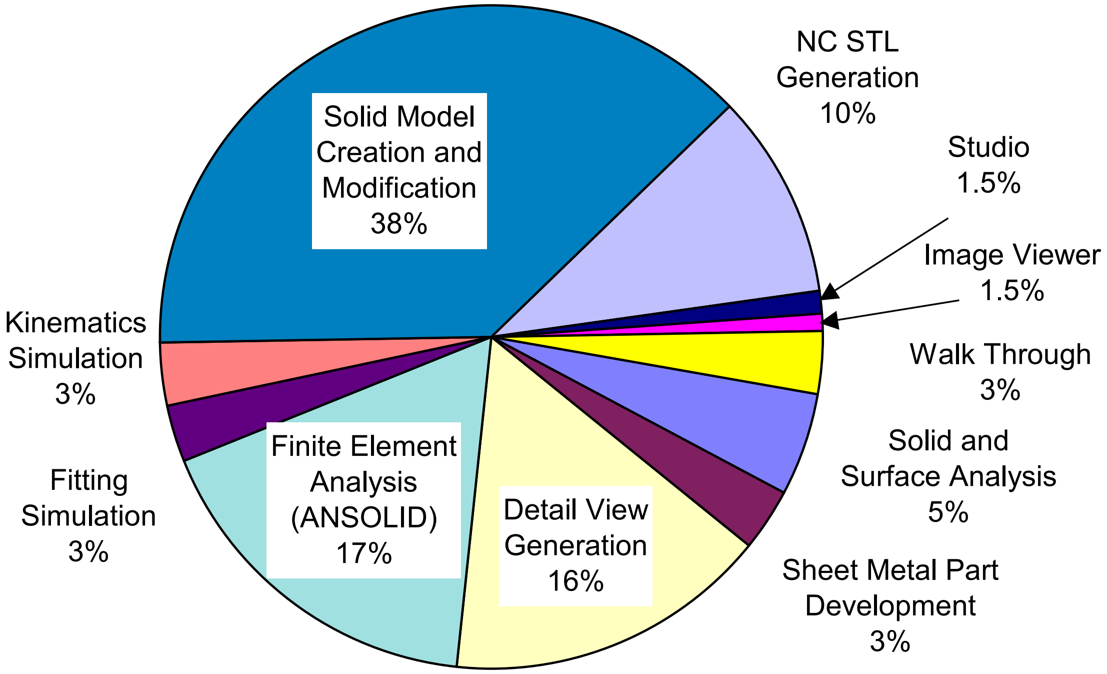


Figure 4 – V4 Application Weighting Factors

V4 Graphics throughput is calculated based on the weighted times for the various graphics tests (refer to Figure 5) so as to present one representative number for this aspect of each workstation. These operations include not only the often measured dynamic graphic manipulation (dial turning) functions, but also the "graphics compute" functions which often occur the first time one accesses these operations on a given part. This combined measurement gives a better overall picture of graphic performance during typical work sessions from a user perspective. Isolated evaluations of dynamic shading or hidden line processing may be good for tuning tasks, but they do not adequately take into account the mix of operations encountered by a user. These graphic compute operations are always much longer than the dynamic manipulations themselves and are also dependent on CPU performance and its interactions with the graphics processor. The V4 Graphics Throughput Time for this TAGITT test is the weighted sum of the Graphics Compute, Hidden Line, Shaded Image and Wireframe portions of the test which are each sums from the various (10) models used throughout the testing.

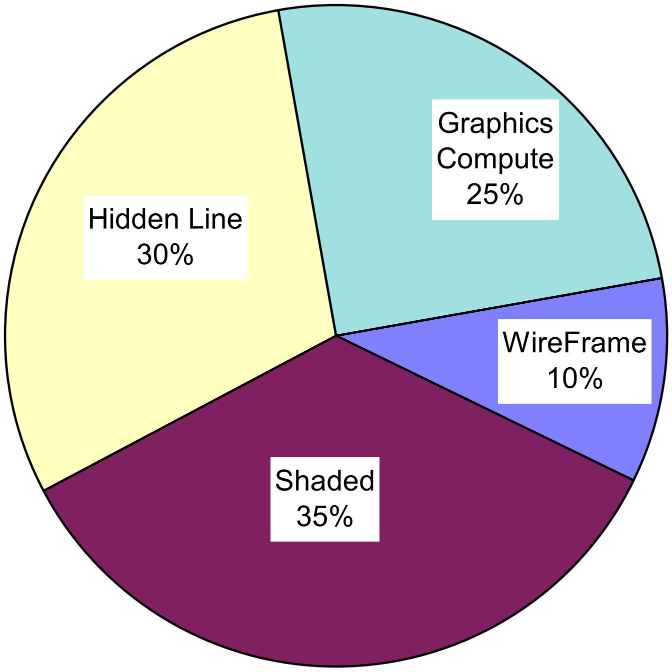


Figure 5 – V4 Graphics Weighting Factors

It should be noted that user perceptible differences in display performance would, in general, only be found when processing large complex models. Overall workstation and graphic performance across the industry has progressed to where "simpler" models can be easily transformed interactively. Unfortunately, we found no easy method for defining a "simple" model. Model size and the number of geometric elements (surfaces, planes, lines, etc.) did not correlate with graphic performance. The performance is based on the complexity of the various geometric components, which is not easy for the user to determine. It is difficult to determine what class of workstation offers "sufficient" performance without examining explicitly the types of models and displays commonly used.

V4 Responsiveness is calculated based on the weighted sum of the CATIA start and exit times, the times to change options or "load" V4 function, and the time required to select geometry in very large models. As with all TAGITT measurements, the emphasis is placed on interactions which generally take more than one second and can take up to thirty seconds on some systems. The weightings used are shown in Figure 6.

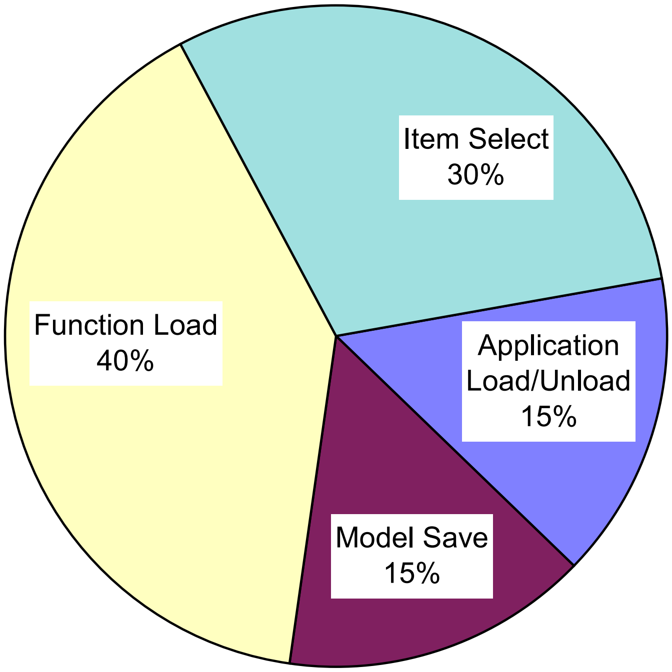
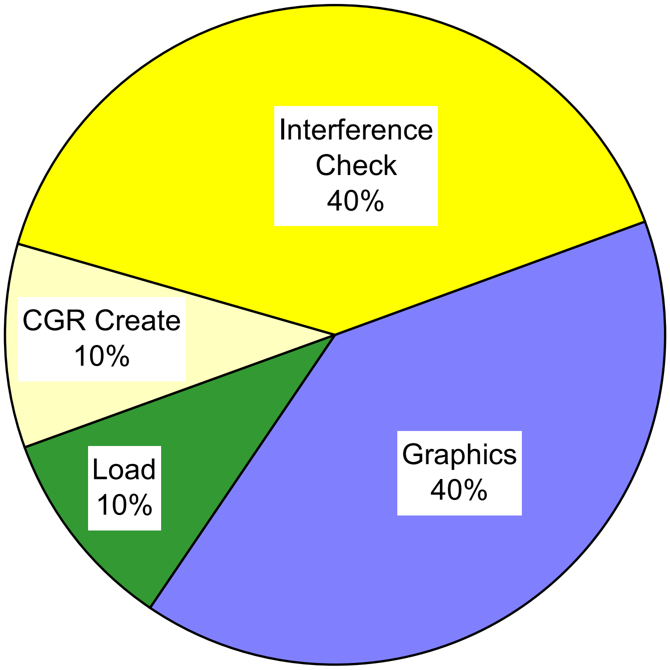


Figure 6 – V4 Responsiveness Weighting Factors

ENOVIA DMU Navigator throughput is calculated based on the weighted sum for the Graphics, Load, Interference Check and CGR Create tests. The weighting factors are shown in Figure 7.



.Figure 7 – ENOVIA DMU Navigator Weighting Factors

ENOVIA DMU Navigator Graphics weighting factors are shown in Figure 8.

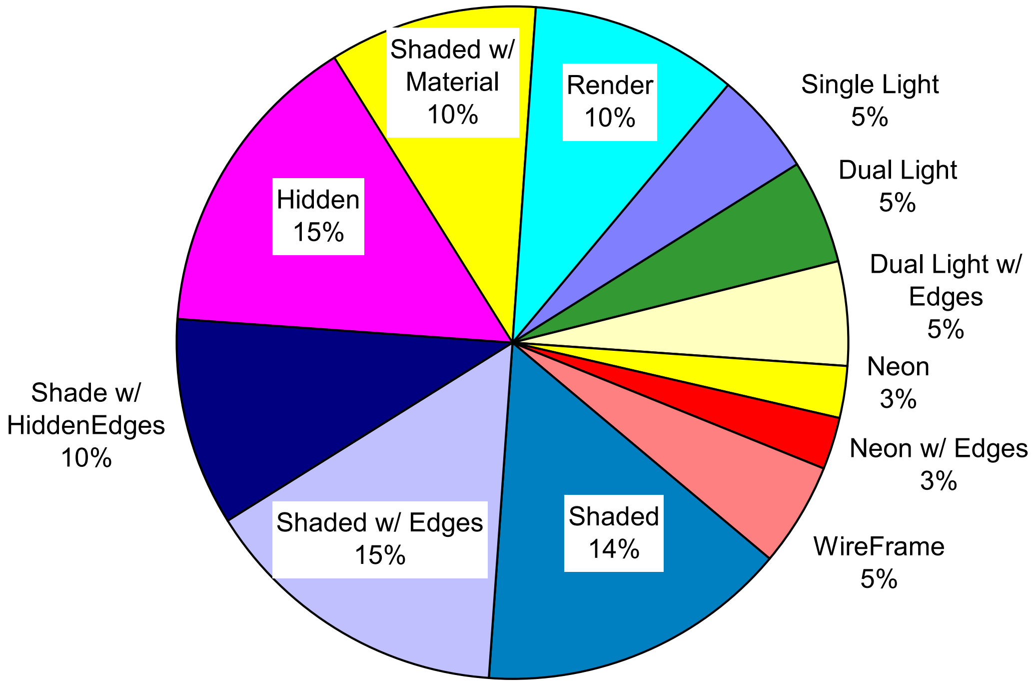


Figure 8 – ENOVIA DMU Graphics Navigator Weighting Factors

Machines Evaluated

The following table shows the machines tested and their configurations. All machines were configured with 2GB main memory, 5GB swap, 19”/21” color monitor, CD/DVD ROM drive, Ethernet interface, mouse, keyboard and 100GB or larger hard disk, operating system, and 3D API. Note: throughout the report, references to the HP and Sun machines include the graphics accelerators listed below.

Vendor	Model	Graphics	CPU	L2 Cache MB	CPU MHz	OS	Abbreviation used in report and on charts
IBM	IntelliStation POWER 285	GXT6500P	POWER5+™ (2w)	1.9*	1900	AIX 5L™ V5.3	IBM POWER 285 (2w) GXT6500P
IBM	IntelliStation POWER 285	GXT6500P	POWER5+ (1w)	1.9*	1900	AIX 5L V5.3	IBM POWER 285 (1w) GXT6500P
IBM	IntelliStation POWER 185	GXT6500P	PowerPC® 970 (2w)	1	2500	AIX 5L V5.3	IBM POWER 185 (2w) GXT6500P
IBM	IntelliStation POWER 185	GXT4500P	PowerPC 970 (2w)	1	2500	AIX 5L V5.3	IBM POWER 185 (2w) GXT4500P
IBM	IntelliStation POWER 185	GXT6500P	PowerPC 970	1	2500	AIX 5L V5.3	IBM POWER 185 (1w) GXT6500P
IBM	IntelliStation POWER 185	GXT4500P	PowerPC 970	1	2500	AIX 5L v5.3	IBM POWER 185 (1w) GXT6500P
IBM	IntelliStation POWER 275	GXT6500P	POWER4+™	1.5**	1450	AIX 5L V5.3	IBM POWER 275 (1.45 GHz) GXT6500P
HP	c8000	ATI FireGL X3	PA-8800 (2w)	1.5(L1) 32(L2)	1000	HP-UX 11i	HP c8000 (2w 1.0 GHz) Fire GL-X3
Sun	Blade 2500	XVR-1200	UltraSparc-IIIi	1	1600	Solaris 5.10	Sun Blade 2500 (1.6 GHz) XVR1200
Sun	Blade 1500	XVR-1200	UltraSparc-IIIi	1	1500	Solaris 5.10	Sun Blade 1500 (1.5 GHz) XVR1200

*Also has 36MB of L3 cache

**Also has 8MB of L3 cache

NOTE FOR ALL PERFORMANCE CHARTS: All performance charts in this report show the throughput for each system compared versus the slowest system for each test. For this reason longer bars mean better performance. A bar value of 100% means that the given system is twice as fast as the slowest system. The numbers to the right of the bars represent throughput time. For these values lower numbers represent better performance.

TAGITT-CATIA/ENOVIA DMU Results

Overall V4 Throughput

Chart 1 compares the overall weighted throughput for the CATIA V4 interactive scenarios including the graphics tests. Albert-Battaglin Consulting Group feels that this number gives the best overall rating of workstation performance running CATIA V4. The chart shows the IBM POWER 285 (2w) GXT6500P and the IBM POWER 285 (1w) GXT6500P to be the fastest machines overall. Tied for second place about 10% slower were all of the IBM POWER 185 configurations. The third place IBM POWER 275 (1w) GXT6500P machine was 37% slower than the leaders in overall throughput. The HP c8000 (2w) FireGL X3 was the fastest machine from a competitor, a substantial 63% slower than the leaders. The Sun Blade 1500 (1w) XVR-1200 was a disappointing 144% slower than the leaders.

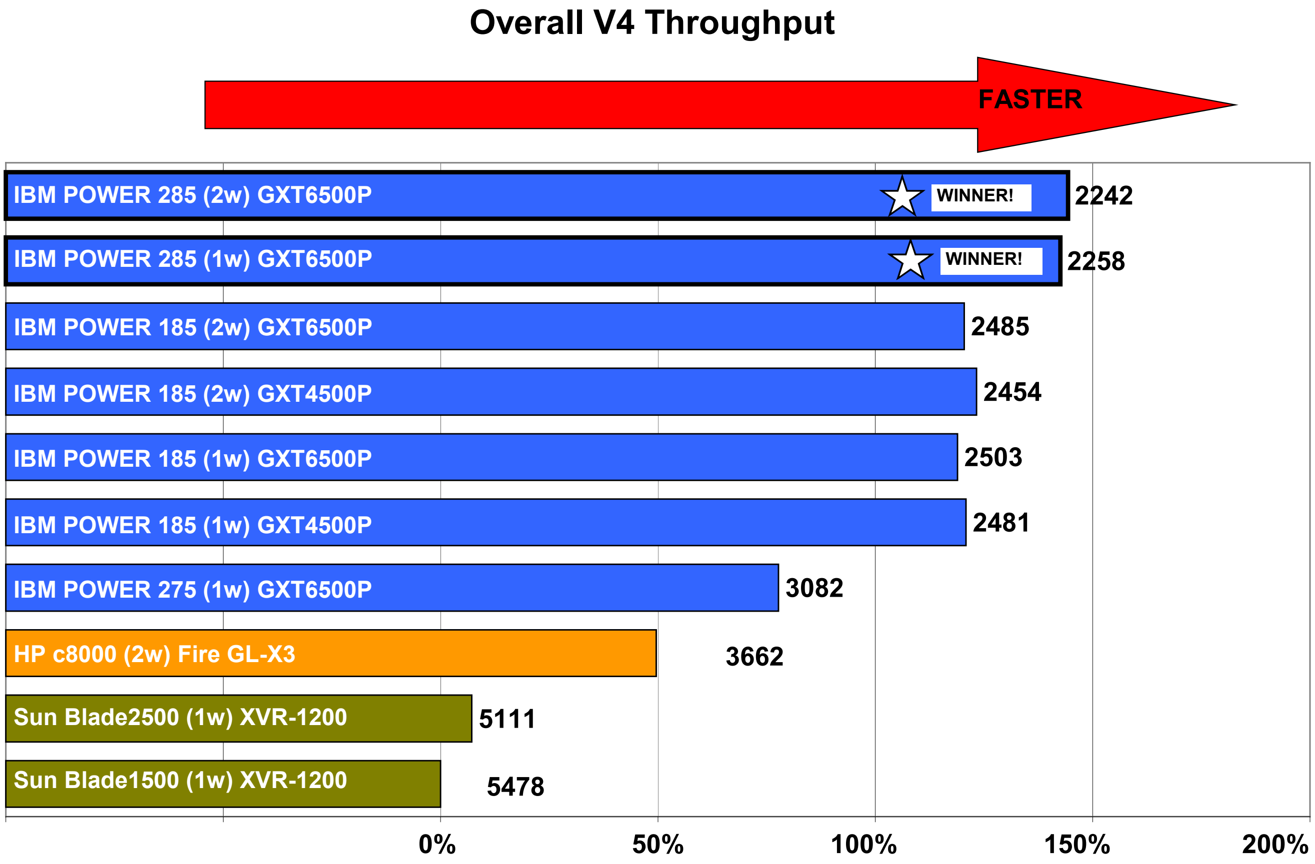


Chart 1 – Overall V4 Throughput Relative to Slowest Machine
Test time in seconds shown next to bars (smaller numbers faster)
Longest bar wins! (★)

V4 Graphics Throughput

Chart 2 shows the weighted cumulative time to complete V4 graphic view manipulation operations of parts and assemblies. As described earlier, the Albert-Battaglin Consulting Group Graphics Throughput time includes both initial “loading” of graphics as well as dynamic manipulation times. The HP c8000 (2w) FireGL X3 was the fastest machines in this test with a time 9% faster than the second place IBM POWER 285 (1w) GXT6500P and IBM POWER 285 (2w) GXT6500P machines. In third place, the IBM POWER 185 (2w) GXT4500P was 15% slower than the leader. The Sun Blade 1500 (1w) XVR-1200 finished last in this test, twice as slow as the leader.

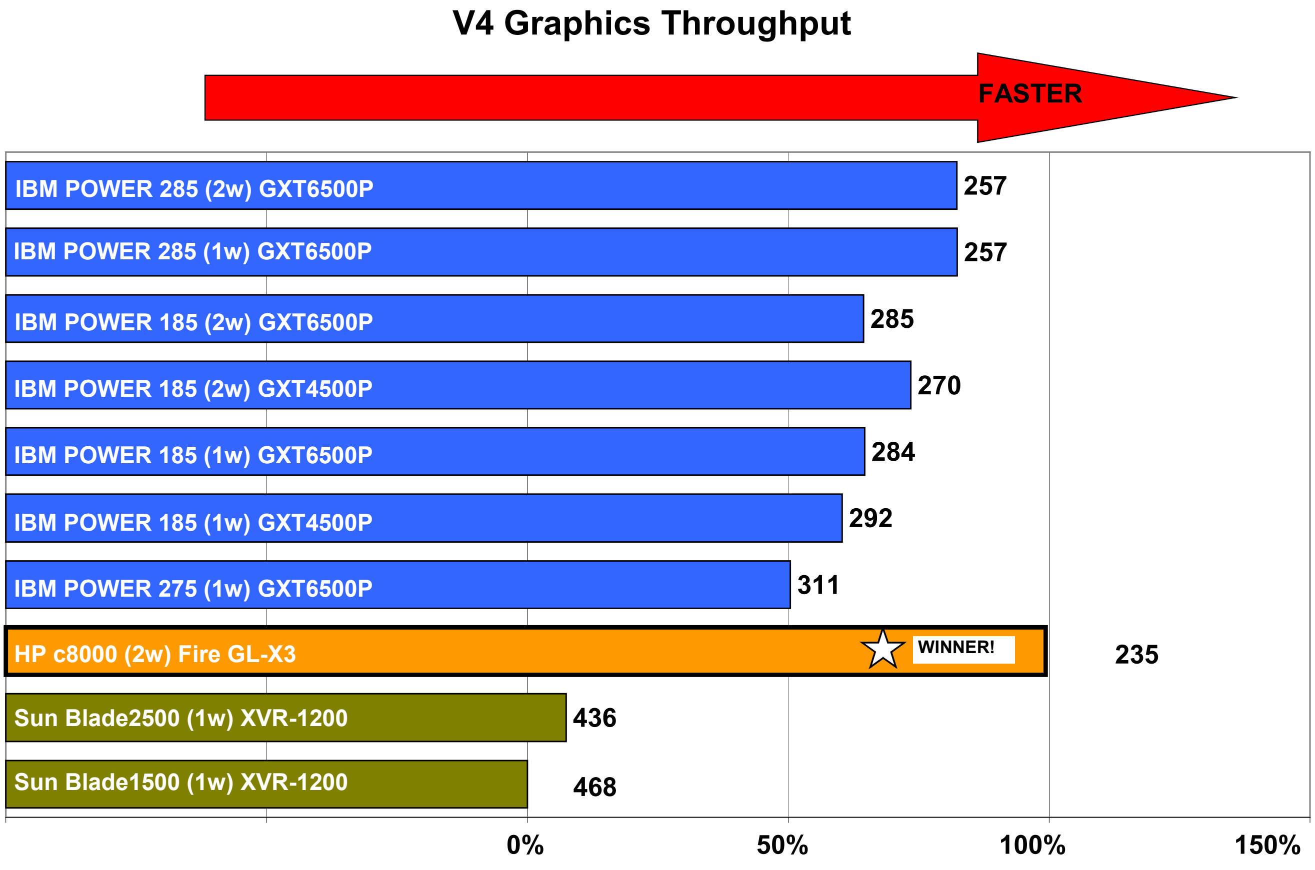


Chart 2 – V4 Graphics Throughput Relative to Slowest Machine
Test time in seconds shown next to bars (smaller numbers faster)
Longest bar wins! (★)

V4 Application Throughput

Chart 3 shows the weighted cumulative time to complete all of the CPU intensive application-specific tasks in the V4 benchmark such as solid modeling operations, drafting and detailing operations, FEM functions and NC computations. Again the IBM POWER 285 (2w) GXT6500P and IBM POWER 285 (1w) GXT6500P workstations were the fastest. In a four-way tie for second place, the IBM POWER 185 workstations were about 11% slower than the leaders. The third place IBM POWER 275 (1w) GXT6500P machine finished 43% slower than the leaders, while the Sun Blade 1500 (1w) XVR-1200 finished 168% slower than the leaders.

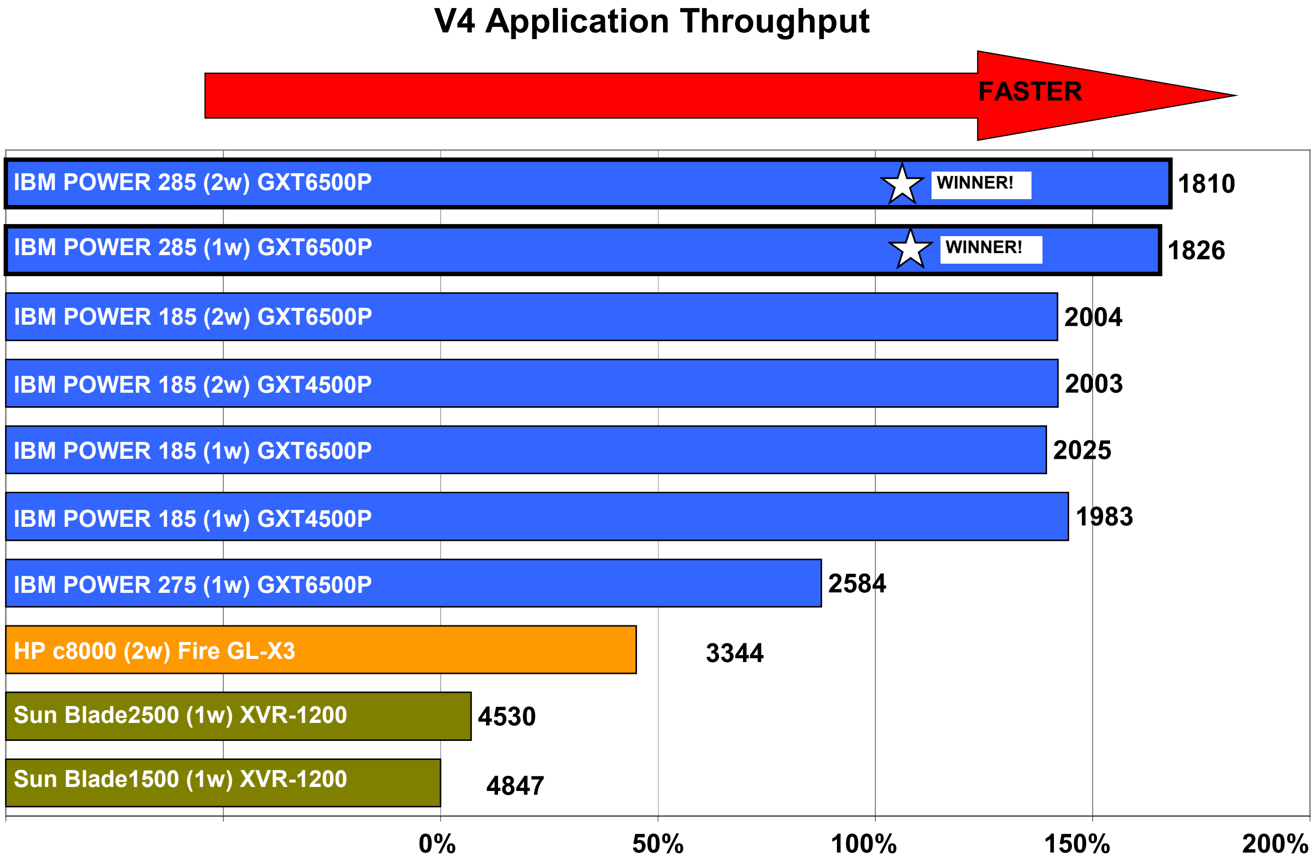


Chart 3 – V4 Application Throughput Relative to Slowest Machine
Test time in seconds shown next to bars (smaller numbers faster)
Longest bar wins! (★)

V4 System Responsiveness

Chart 4 shows the cumulative time to complete all of the V4 system responsiveness tests in the benchmark. The tests measure the "quickness" of the system, doing common CATIA V4 tasks such as starting and exiting the application, changing functions and selecting elements. Again IBM POWER 285 (2w) GXT6500P and IBM POWER 285 (1w) GXT6500P workstations were the overall winners of this test. Tied for second place, the IBM POWER 185 machines were between 11% and 13% slower than the leading machines the variance being mostly the result of differences in IO operations. In third place, the IBM POWER 275 (1w) GXT6500P machine finished 34% slower than the leaders. The Sun Blade 2500 (1w) XVR-1200 and Sun Blade 1500 (1w) XVR-1200 outperformed the HP in this test with times 46% and 63% slower than the fastest machines. In this set of tests, the HP c8000 (2w) FireGL X3 finished last, about twice as slow as the leaders.

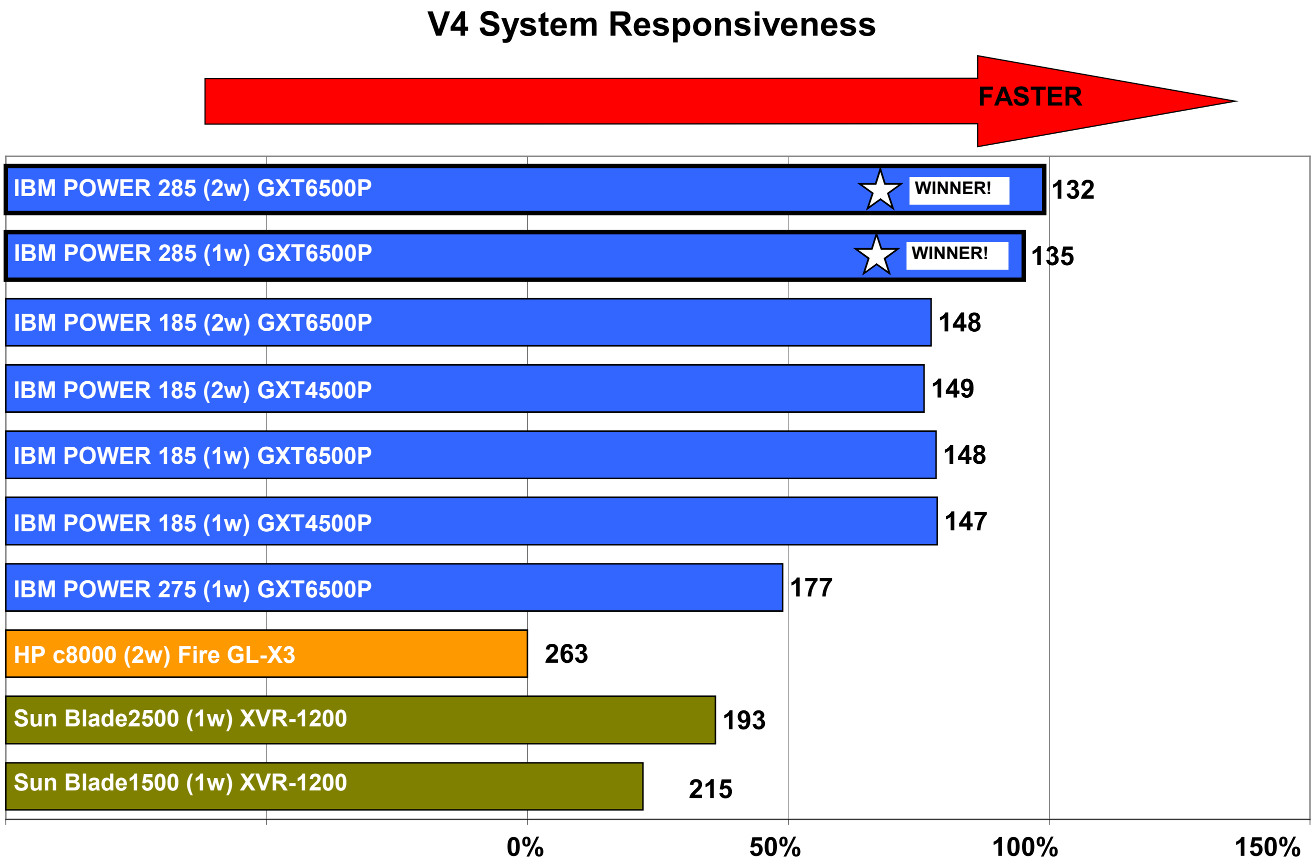


Chart 4 – V4 System Responsiveness Relative to Slowest Machine
Test time in seconds shown next to bars (smaller numbers faster)
Longest bar wins! (★)

V4 Dynamic Graphic Throughput

Chart 5 shows the comparative throughput performance of the V4 dynamic graphics tasks in the benchmark including wireframe, shaded and hidden line dynamic graphic operations. These results do not include the longer graphic computation times that are included in the overall graphics throughput results. The winner of this test was the HP c8000 (2w) FireGL X3, finishing a strong 42% faster than the IBM POWER 285 (2w) GXT6500P and IBM POWER 285 (1w) GXT6500P that tied for second place. The IBM POWER 185 (2w) GXT4500P machine tested 52% slower than the leading machine in third place. Tied for forth place the IBM POWER 185 (2w) GXT6500P and IBM POWER 185 (1w) GXT6500P machines were 63% slower than the leader. The Sun Blade 1500 (1w) XVR-1200 finished a disappointing 132% slower than the leader.

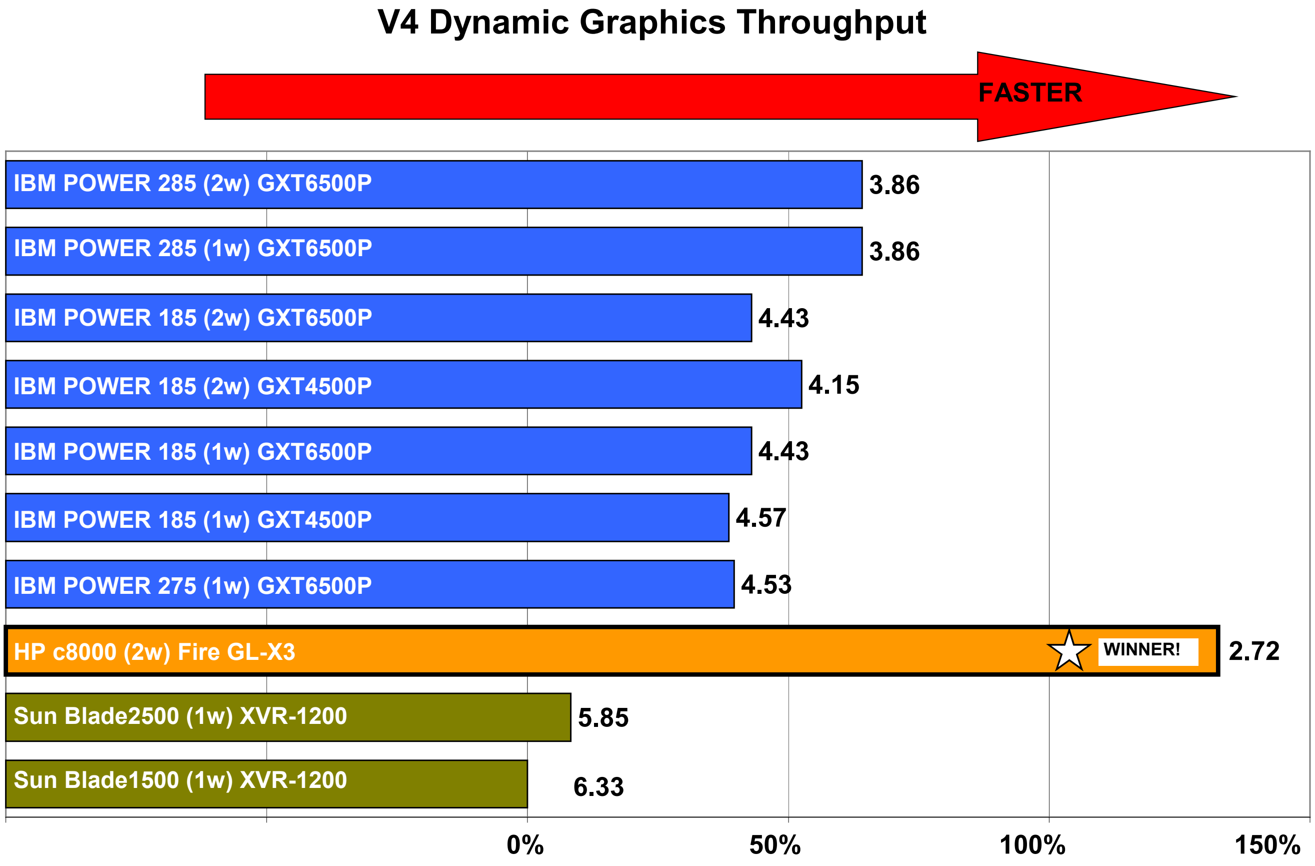


Chart 5 – V4 Dynamic Graphic Throughput Relative to Slowest Machine
Test time in seconds shown next to bars (smaller numbers faster)
Longest bar wins! (★)

ENOVIA DMU Navigator Overall Throughput

Chart 6 shows the weighted cumulative time to complete all of the ENOVIA DMU Navigator tests in the benchmark. The ENOVIA DMU Navigator uses OpenGL graphics and the TAGITT tests work with V4, V5 and “cgr” data so these results are important for users working with both CATIA V4 and CATIA V5. The overall winner of this test was the IBM POWER 285 (2w) GXT6500P. In second place, the IBM POWER 185 (2w) GXT6500P and IBM POWER 285 (1w) GXT6500P machines were 17% and 21% slower than the leader. The third place IBM POWER 185 (2w) GXT4500P machine was 29% slower than the leader. The HP c8000 (2w) FireGL X3 finished the test 75% slower than the leaders while the Sun Blade 1500 (1w) XVR-1200 lagged behind 245% slower than the fastest machines.

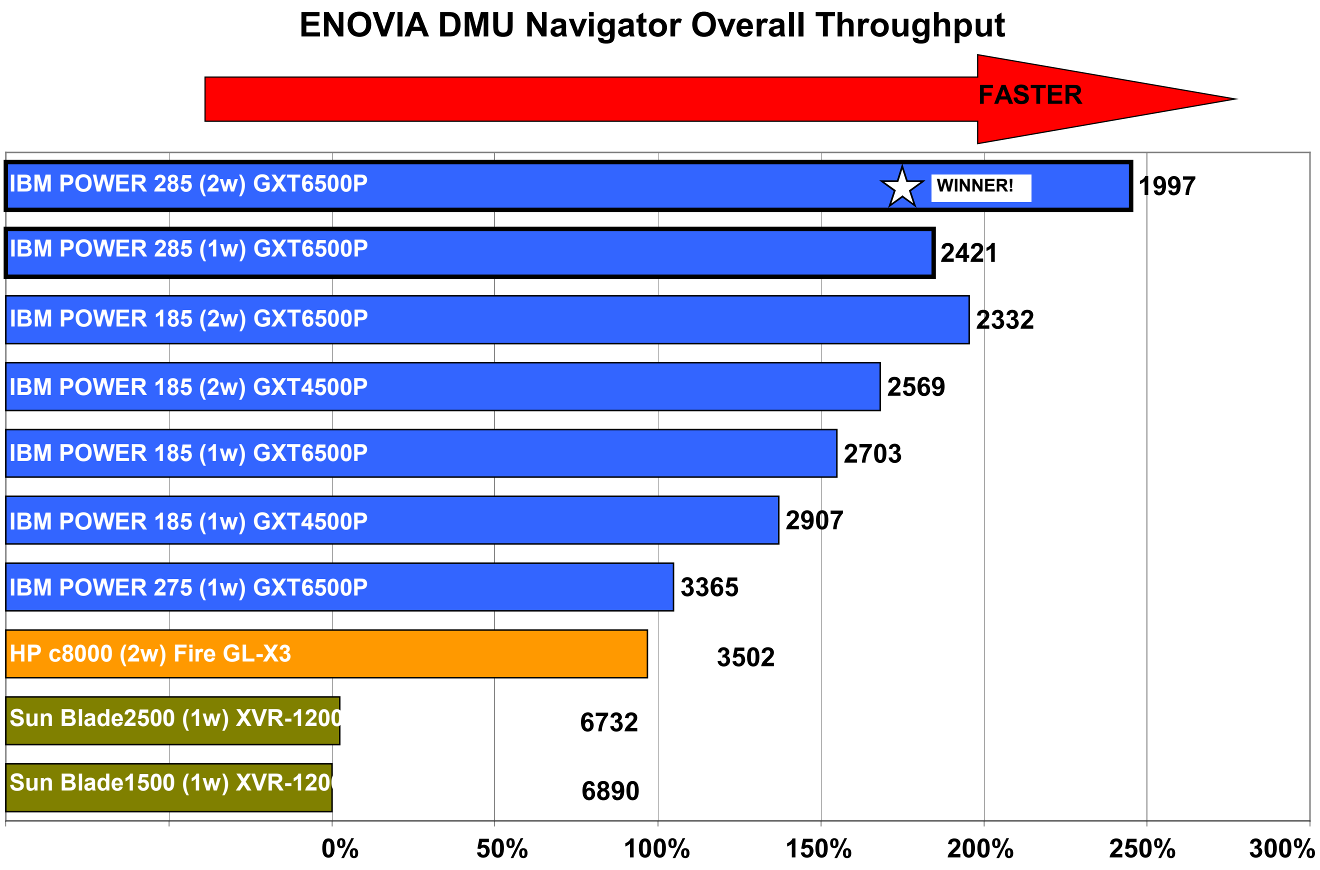


Chart 6 – ENOVIA DMU Navigator Overall Throughput Relative to Slowest Machine
Test time in seconds shown next to bars (smaller numbers faster)
Longest bar wins! (★)

ENOVIA DMU Navigator Graphics Throughput

Chart 7 shows the comparative throughput for the ENOVIA DMU Navigator graphic tests in the benchmark. Because the DMU navigator is so often used for exploring and checking designs visually, this capability was highly weighted in the testing. As with all TAGITT graphics test, these results concern themselves with very complicated scenes involving between 1.9 and 22.9 million triangles. With these complex scenes all systems are tested to their limits. The overall winners of this test were the IBM POWER 285 (2w) GXT6500P and IBM POWER 285 (1w) GXT6500P. In second place, the IBM POWER 185 (1w) GXT6500P and IBM POWER 185 (2w) GXT6500P machines were just under 30% slower than the leader. The third place IBM POWER 275 (1w) GXT6500P machine was 47% slower than the leader. The HP c8000 (2w) FireGL X3 finished the test 62% slower than the leaders while the Sun Blade 1500 (1w) XVR-1200 lagged behind 165% slower than the fastest machines.

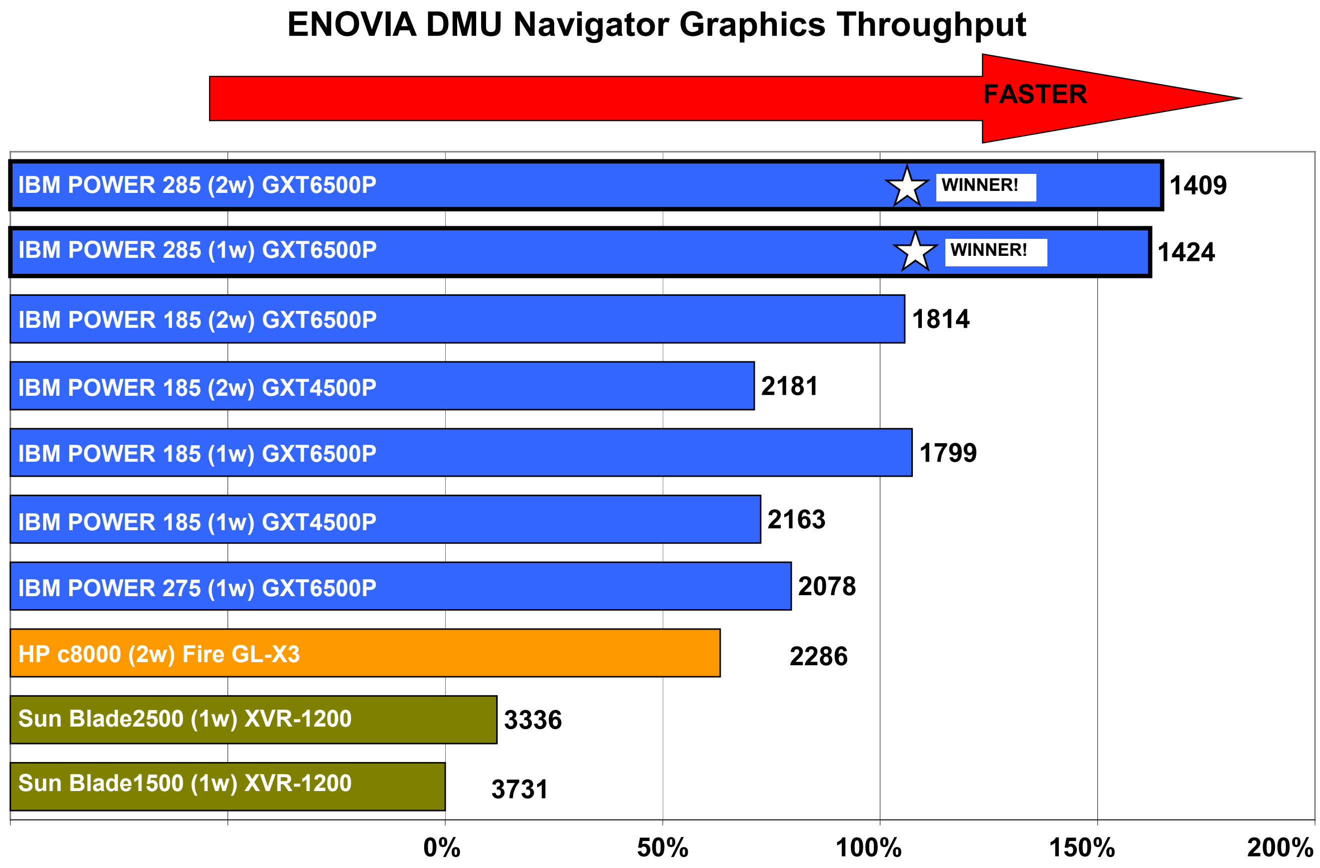


Chart 7 – ENOVIA DMU Navigator Graphics Throughput Relative to Slowest Machine
Test time in seconds shown next to bars (smaller numbers faster)
Longest bar wins! (★)

ENOVIA DMU Navigator Interference Check Throughput

Chart 8 shows the comparative throughput for the ENOVIA DMU Navigator Interference Computation tests in the benchmark. Because these operations can be very time consuming, this capability was highly weighted in the testing. The overall winner of this test was the IBM POWER 285 (2w) GXT6500P. In second place, the IBM POWER 185 (2w) GXT6500P and IBM POWER 185 (2w) GXT4500P machines were about 10% slower than the leader a clear advantage for the dual-core configurations. The fastest single-core configurations were the IBM POWER 185 (1w) GXT6500P, IBM POWER 285 (1w) GXT6500P and IBM POWER 185 (1w) GXT4500P that finished over 80% slower than the leader. The HP c8000 (2w) FireGL X3 machine was 147% slower than the leader despite being a two-way system. The Sun Blade 1500 (1w) XVR-1200 was incredibly slow in this particular test, taking more than 6 times longer to finish.

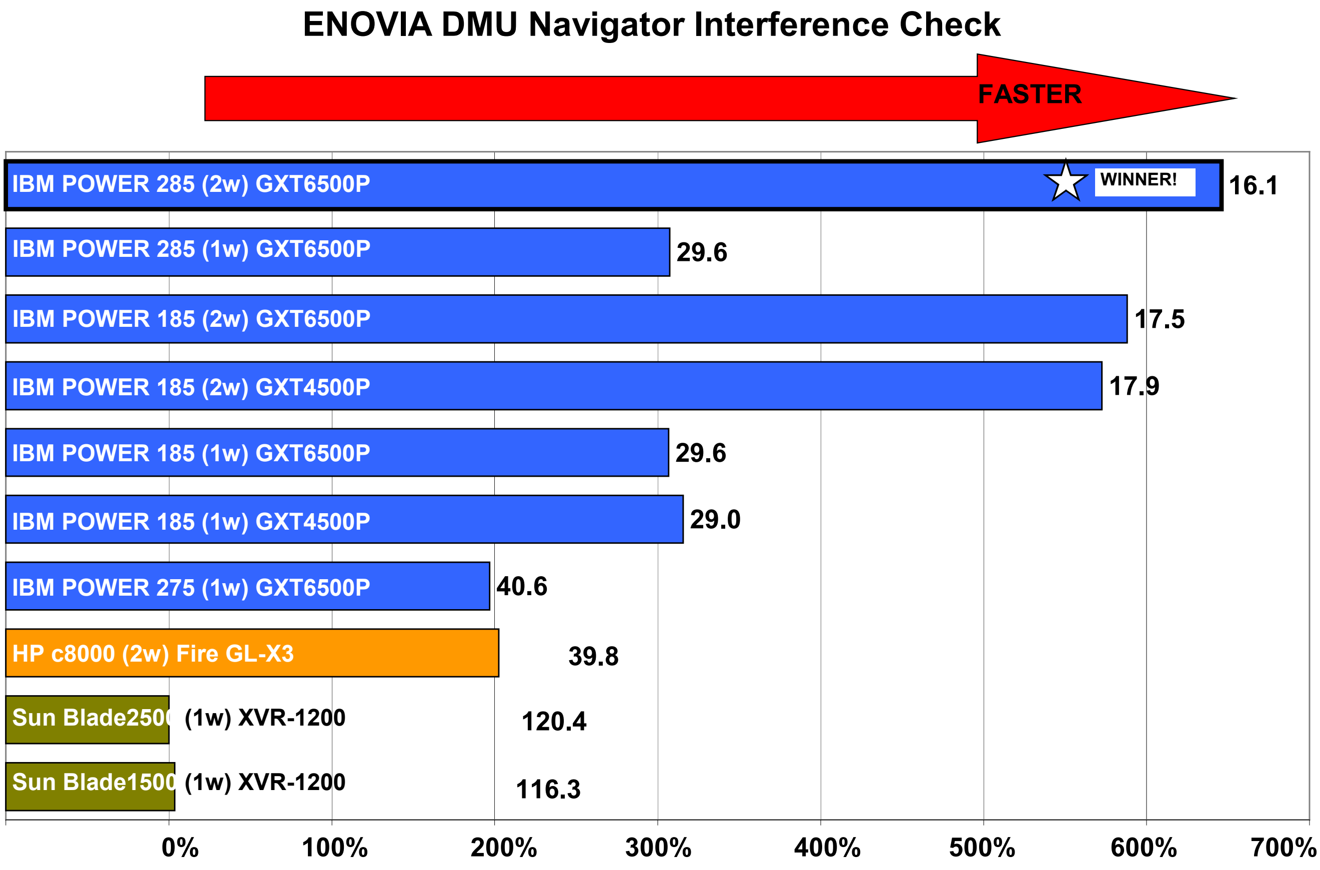


Chart 8 – ENOVIA DMU Navigator Interference Check Throughput Relative to Slowest Machine
Test time in seconds shown next to bars (smaller numbers faster)
Longest bar wins! (★)

Conclusions

The results of the TAGITT-CATIA V4/ENOVIA DMU evaluation show IBM to have significantly improved its workstation offering with the new IBM POWER 185 machine. While for ultimate performance the IBM POWER 285 workstation remains the leader, the new IBM POWER 185 workstation based on the PowerPC 970 processor offers an attractively priced alternative with overall performance only about 10% slower.

In V4 tests, the IBM POWER 185 machines tested were an average of 47% faster overall than the nearest competitive machine, the HP c8000 (2w) FireGL X3. The Sun Blade 1500 (1w) XVR-1200 was no match for the new IBM POWER 185 machine with overall performance times a disappointing 119% slower than the new IBM workstation.

In ENOVIA DMU testing, the IBM POWER 285 (2w) GXT6500P was again the fastest machine overall. The IBM POWER 185 (2w) GXT6500P finished in second place, 17% slower than the leader. The closest competitive machine, the HP c8000 (2w) FireGL X3, was 58% slower than the leader. The Sun Blade 1500 (1w) XVR-1200 was considerably slower than the other machines tested, finishing the ENOVIA DMU tests 237% slower than the leader.

The new IBM POWER 185 workstations tested were overall about 27% faster than 1.45GHz IBM POWER 275 workstation. In the ENOVIA DMU testing, the difference was 20% for the single-core systems.

In terms of overall V4 graphic performance, the HP c8000 (2w) FireGL X3 was the fastest performer. For pure dynamic graphics response, the HP c8000 (2w) FireGL X3 outperformed the IBM POWER 285 (2w) GXT6500P and IBM POWER 285 (1w) GXT6500P by 42%. Sun's dynamic graphics results were notably poor; the Sun Blade 1500 (1w) XVR-1200 finished 132% slower than the fastest HP box and the faster Sun Blade 2500 (1w) XVR-1200 was still 115% slower.

In terms of overall ENOVIA DMU Graphics performance, the full OpenGL hardware acceleration of the GXT6500P combined with the fast POWER5+ processor(s) proved a winning combination. The IBM POWER 285 (2w) GXT6500P and IBM POWER 285 (1w) GXT6500P were the clear winners in this testing. The IBM POWER 285 machines outperformed the second place IBM POWER 185 (1w) GXT6500P and IBM POWER 185 (2w) GXT6500P by just under 30%. The HP c8000 (2w) FireGL X3 tested 62% slower.

The wide range of application testing in TAGITT showed performance differences between various CATIA functions. It is impossible to tell from the TAGITT evaluation the reasons for these differences. Although the 1.90 GHz IBM POWER 285 machines won nearly all of the individual application tests, there were exceptions. As stated before, the HP c8000 (2w) FireGL X3 won the dynamic graphics test as well as the Walk Through tests. In the Geometric Analysis tests on the other hand, the Sun Blade 2500 (1w) XVR-1200 machine outperformed the HP c8000 (2w) FireGL X3. In addition, the performance advantage of the IBM POWER 285 was greater in some tests than others. In the floating-point intensive Finite Element computation test, the IBM POWER 285 machines were about 30% faster than the IBM POWER 185 machines.

Although the HP c8000 machine tested was dual-core, no clear advantage was apparent in this configuration when running CATIA V4 or ENOVIA DMU Navigator. Since CATIA V4 and ENOVIA DMU is mostly single threaded code, we have typically found very little advantage to dual-core configurations. In fact, the c8000 machine did not outperform the single-core IBM POWER 275 machine in the Studio Viewer tests, which in the past have benefited from multiprocessor technology.

The dual-core IBM POWER 285 and IBM POWER 185 configurations did show performance advantages in several tests. In the Studio tests, which generate photo realistic images using a ray-tracing algorithm, the dual-core IBM POWER 285 GXT6500P was 64% faster than the single-core unit. The dual-core IBM POWER 185 machines were about 50% faster than the single-core in the same test. In the Image View application, the dual-core IBM POWER 285 and POWER 185 machines were almost twice as fast as single-core configurations. In the ENOVIA DMU Interference computation tests, the dual-core IBM POWER 285 and POWER 185 machines were 70% to 80% faster than single-core configurations.

IBM added to its overall CATIA V4 and ENOVIA DMU performance leadership position with its new IBM POWER 185 workstations. The TAGITT-CATIA/ENOVIA DMU test shows the IBM POWER 185 machines to be excellent all around performers in the CATIA environment second only to the IBM POWER 285 with the POWER5+ processor. The combination of excellent CPU speed, well-balanced graphic performance and attractive pricing in the IBM POWER 185 workstation line, make them excellent choices in CATIA engineering environments. Companies can choose from a range of performance levels and prices depending on their specific needs while continuing to use the same operating system.

Methodology

All tests were conducted by Albert-Battaglin Consulting Group personnel. Test conditions were set up to minimize any environmental differences with the various systems. Systems were tested in “lab” environments so that they were isolated from network interference. Albert-Battaglin Consulting Group saw no evidence to suggest that performance was impacted by extraneous network activity. Almost all timing data was automatically recorded and transferred directly into spreadsheets for analysis. All tests were run at least three times and the average times were used for comparison. For the overall test, the time differences between runs were typically less than 1.5% and in most cases as low as 0.1%.

All TAGITT-CATIA V4/ENOVIA DMU tests were completed using released CATIA 4.2.4 R2 and ENOVIA R15 SP 2 software. In all cases, the software and data and licenses were loaded locally on each workstation. Manufacturers’ required and recommended software “patches” or upgrades for CATIA V4 and ENOVIA V5 were installed on all systems prior to testing. IBM machines were tested with simultaneous multithreading turned off.

Appendix

The following charts show the results for individual application tests that were combined to form the overall application and overall throughput times for TAGITT-CATIA V4/ENOVIA DMU.

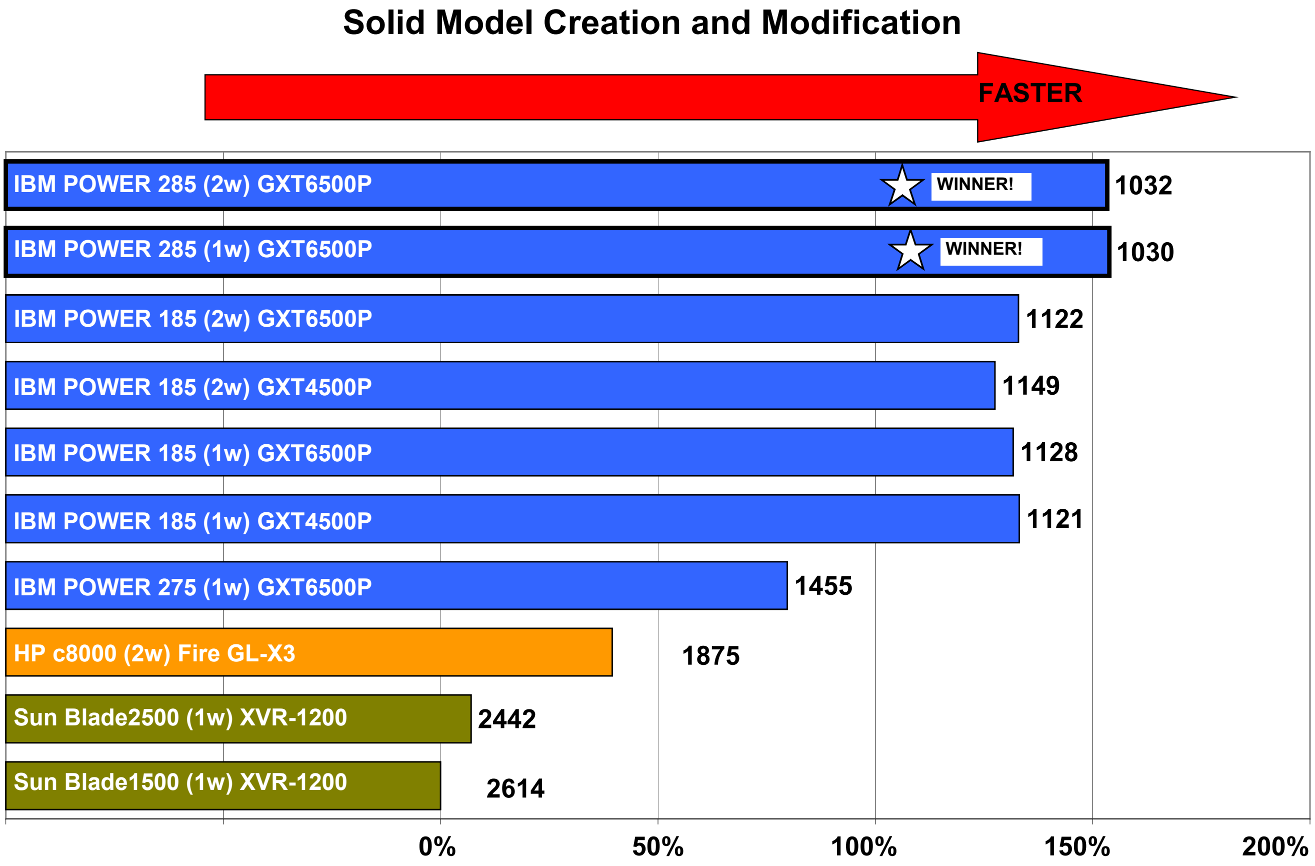


Chart 9 – Solid Model Creation and Modification Throughput Relative to Slowest Machine
Test time in seconds shown next to bars (smaller numbers faster)
Longest bar wins! (★)

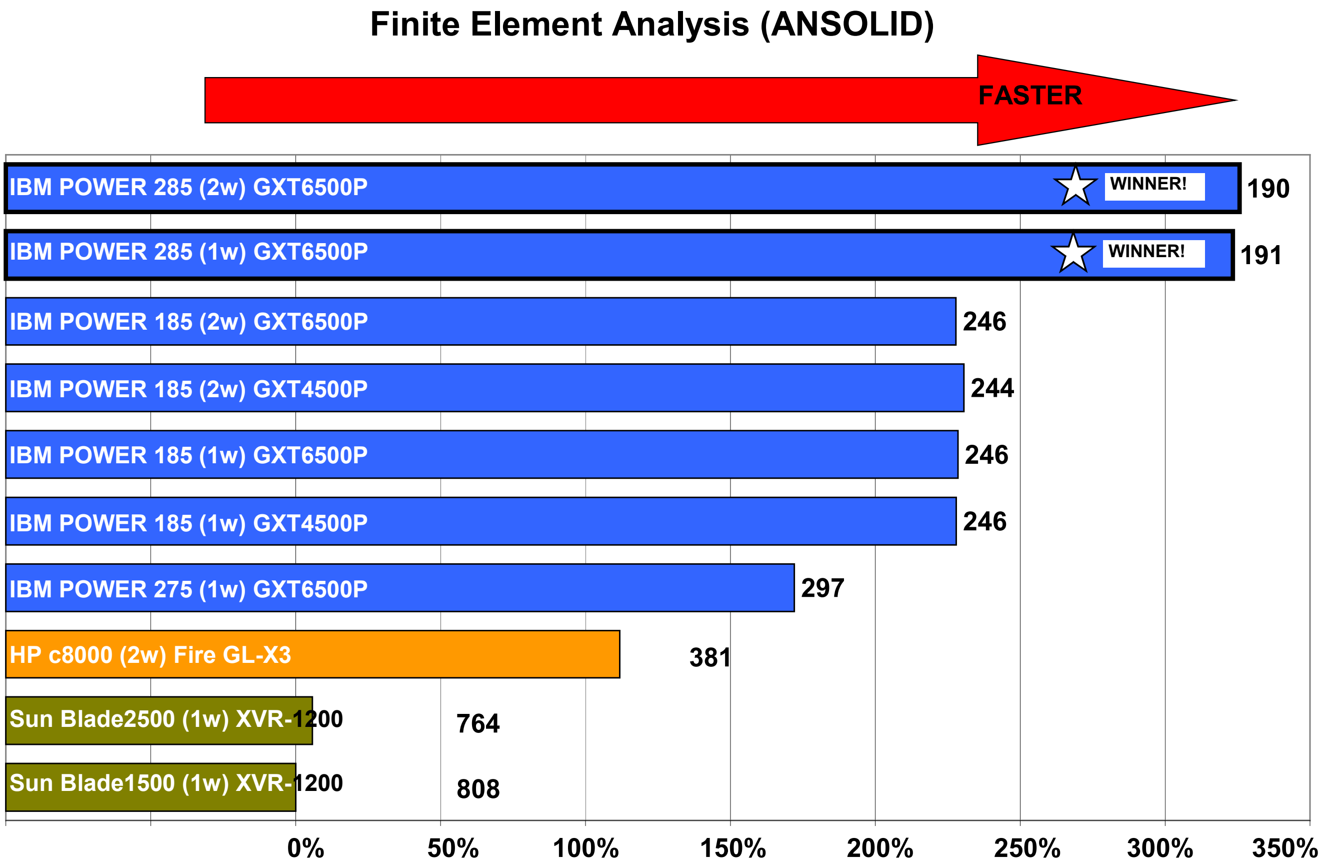


Chart 10 – Finite Element Analysis (ANSOLID) Throughput Relative to Slowest Machine
Test time in seconds shown next to bars (smaller numbers faster)
Longest bar wins! (★)

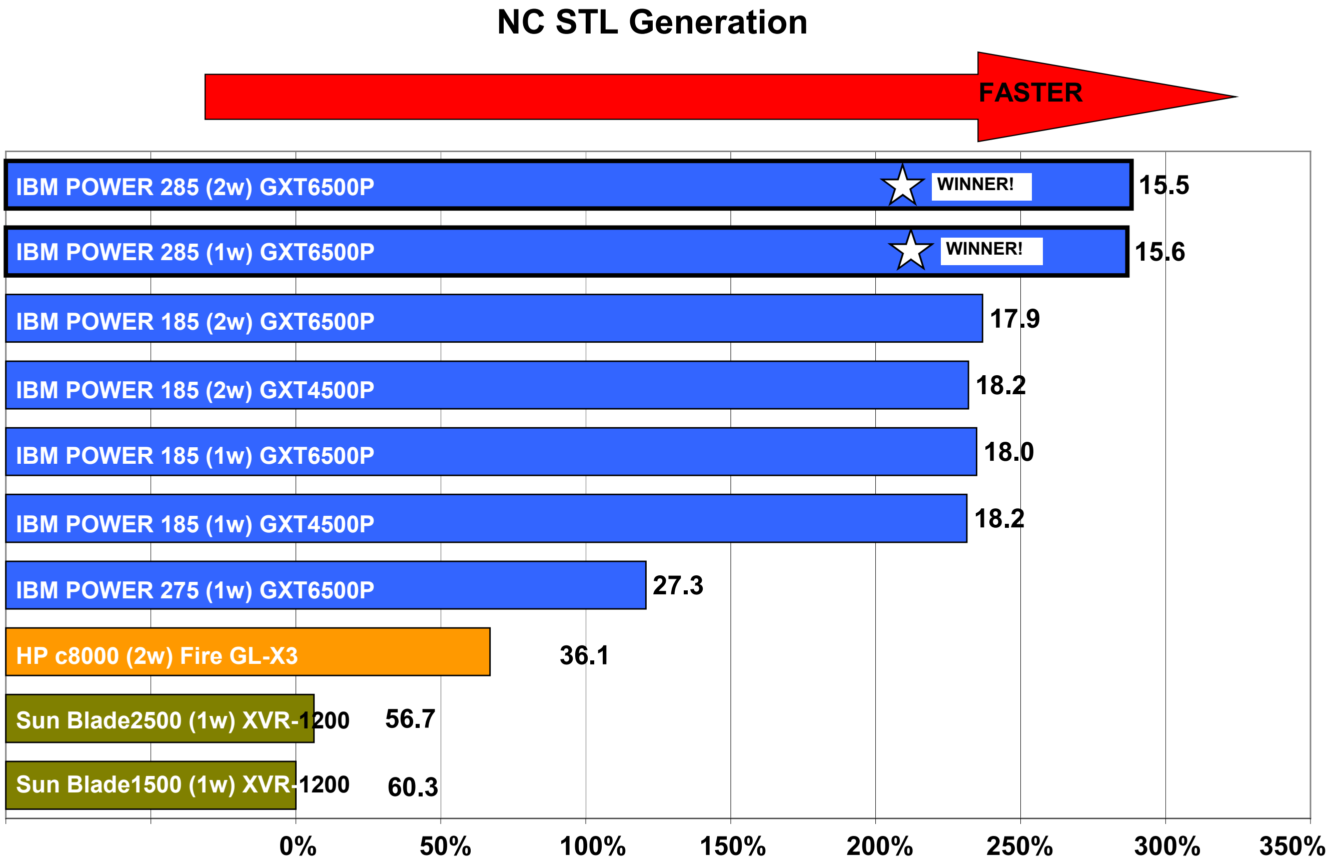


Chart 11 – NC STL Generation Throughput Relative to Slowest Machine
Test time in seconds shown next to bars (smaller numbers faster)
Longest bar wins! (★)

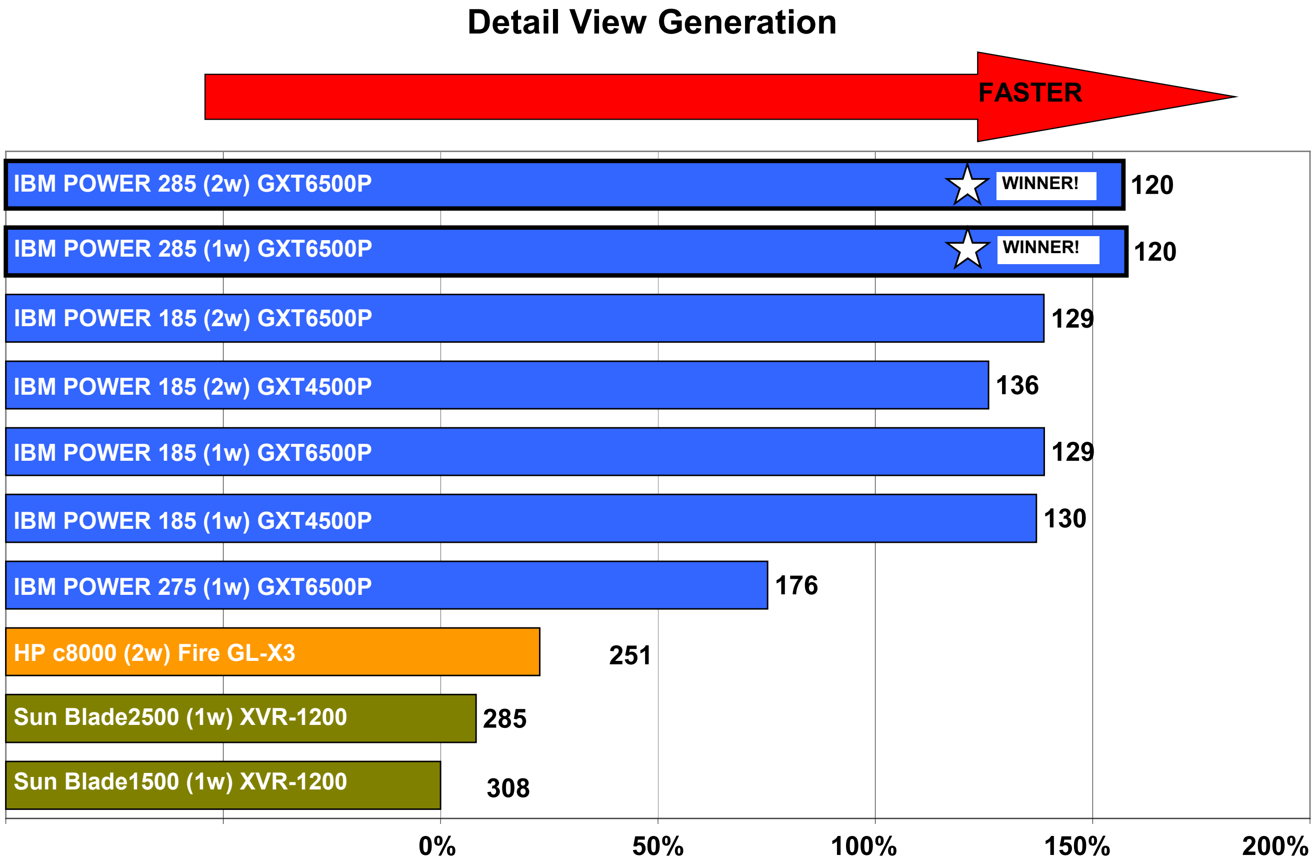


Chart 12 – Detail View Generation Throughput Relative to Slowest Machine
Test time in seconds shown next to bars (smaller numbers faster)
Longest bar wins! (★)

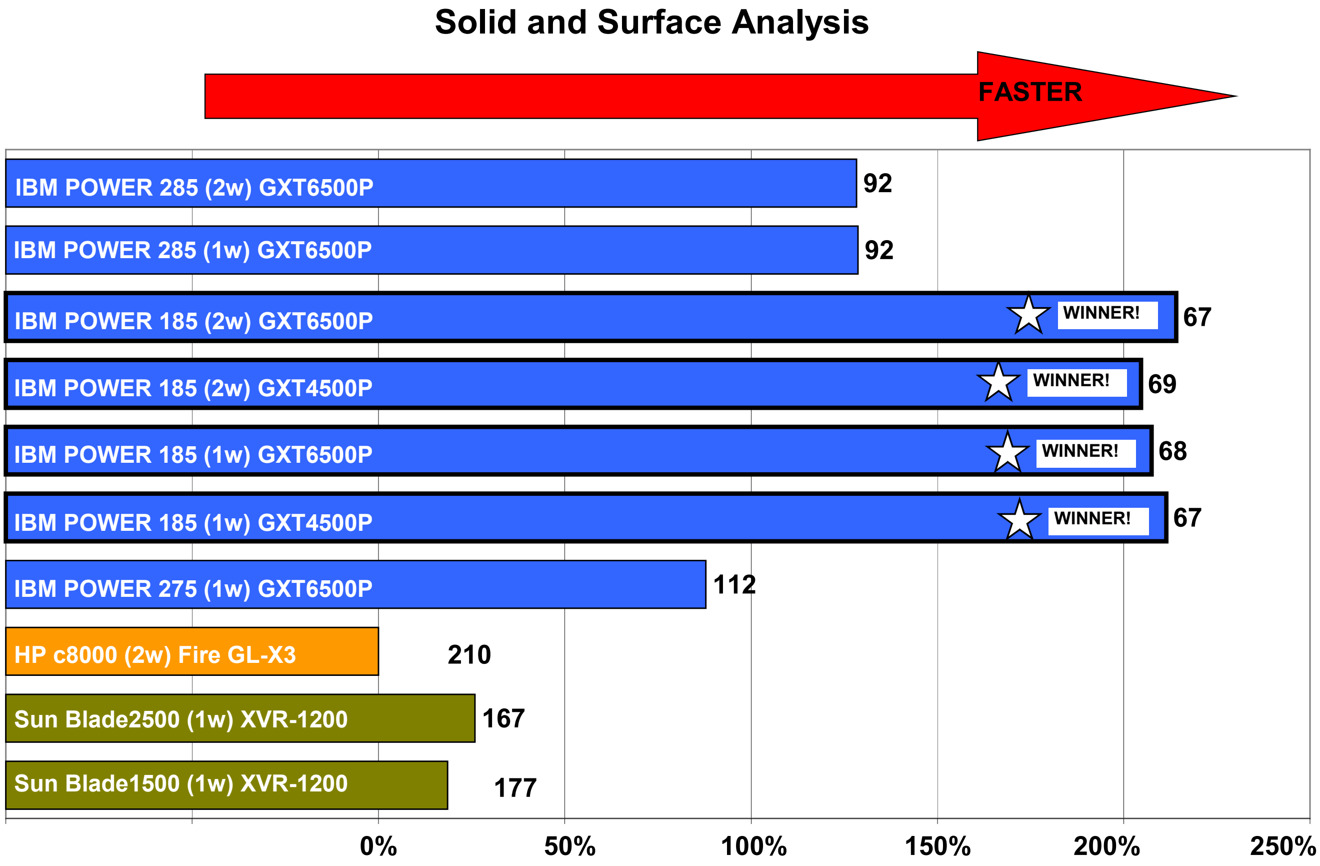


Chart 13 – Solid and Surface Analysis Throughput Relative to Slowest Machine
Test time in seconds shown next to bars (smaller numbers faster)
Longest bar wins! (★)

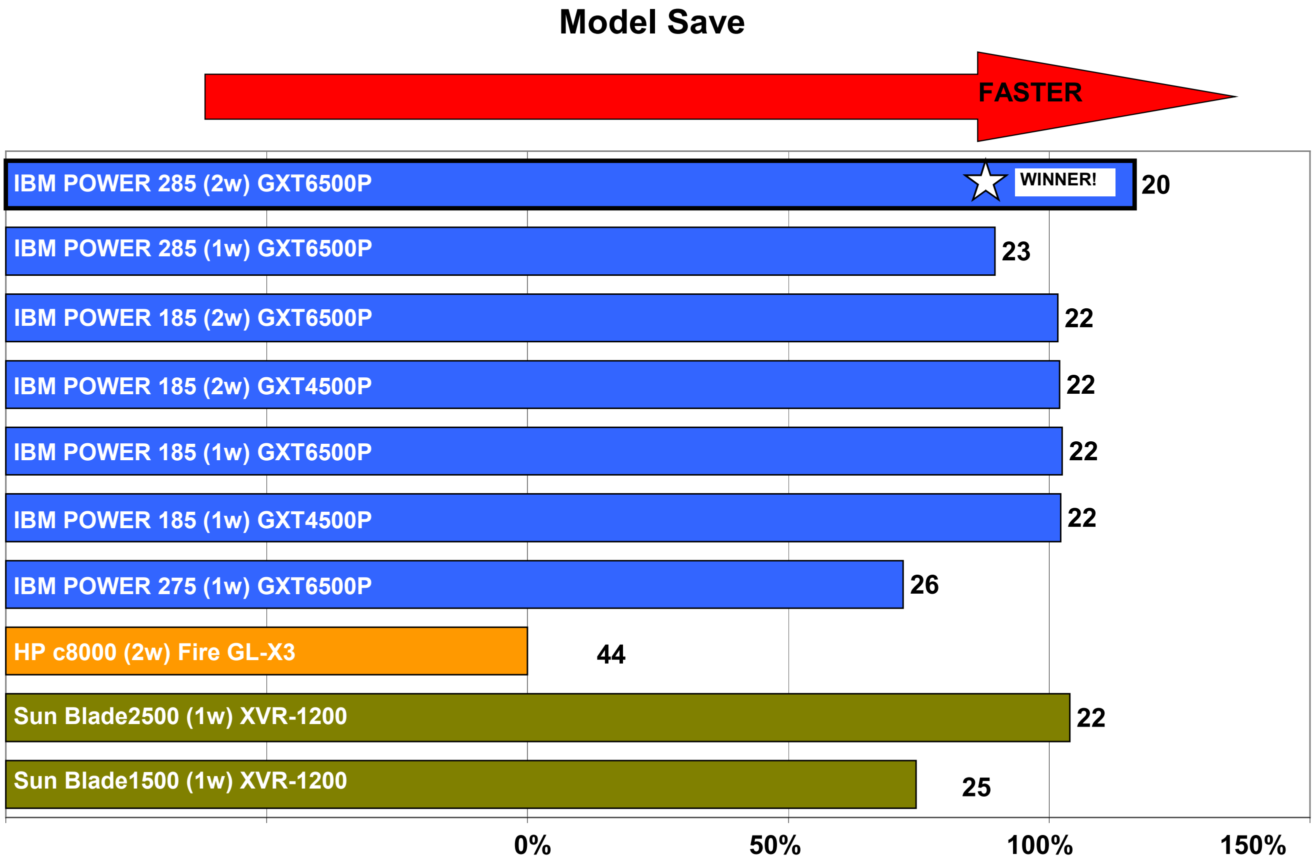


Chart 14 – Model Save Throughput Relative to Slowest Machine
Test time in seconds shown next to bars (smaller numbers faster)
Longest bar wins! (★)

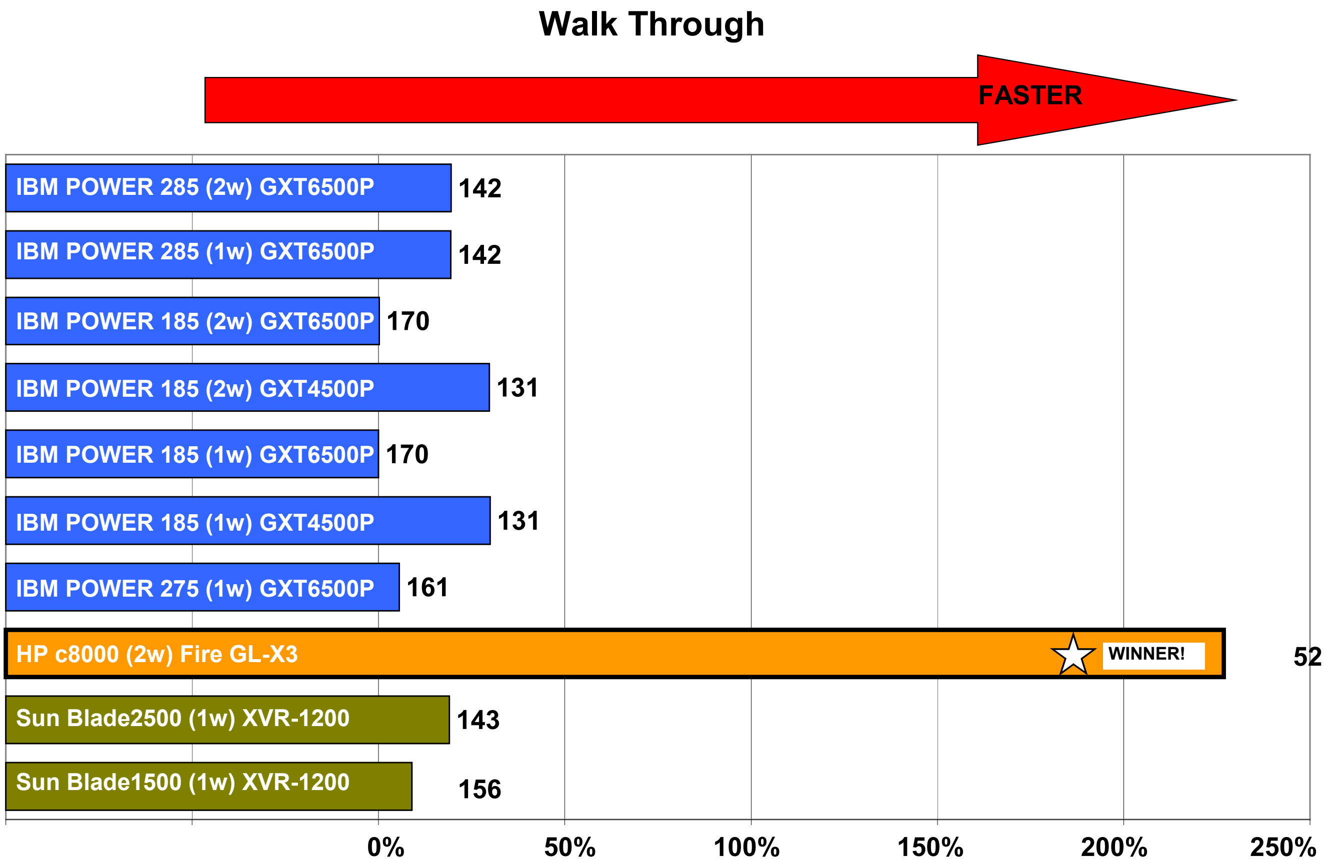


Chart 15 – Walk Through Throughput Relative to Slowest Machine
Test time in seconds shown next to bars (smaller numbers faster)
Longest bar wins! (★)

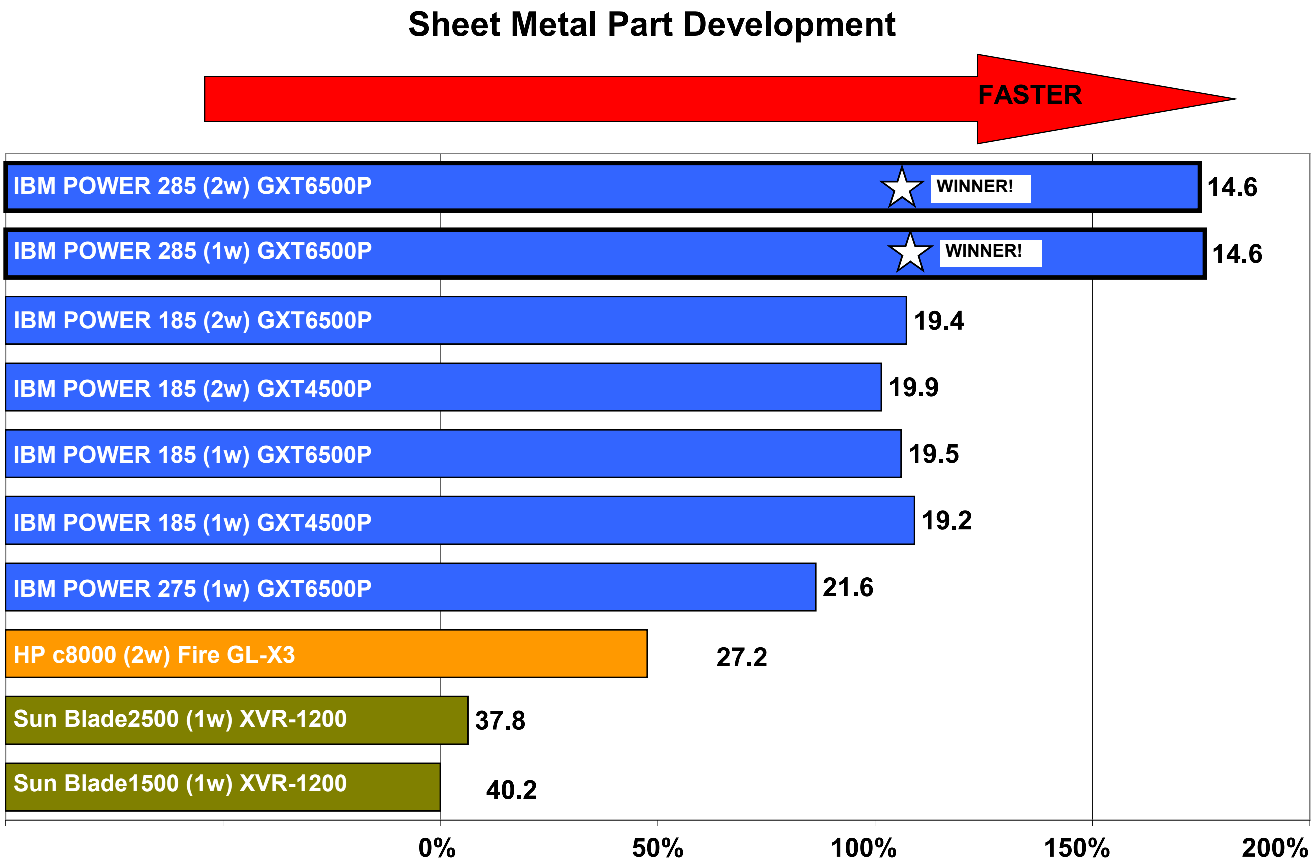


Chart 16 –Sheet Metal Part Development Throughput Relative to Slowest Machine
Test time in seconds shown next to bars (smaller numbers faster)
Longest bar wins! (★)

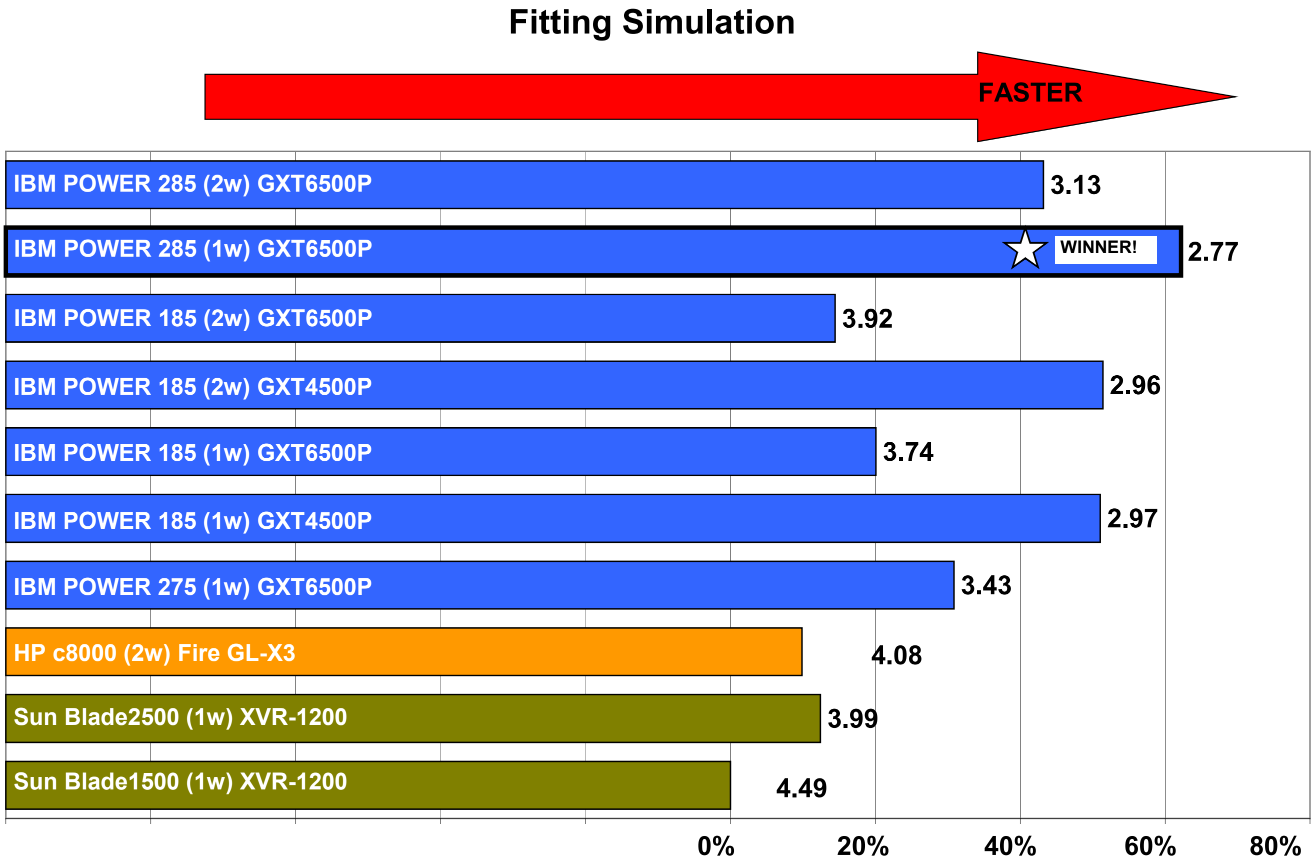


Chart 17 – Fitting Simulation Throughput Relative to Slowest Machine
Test time in seconds shown next to bars (smaller numbers faster)
Longest bar wins! (★)

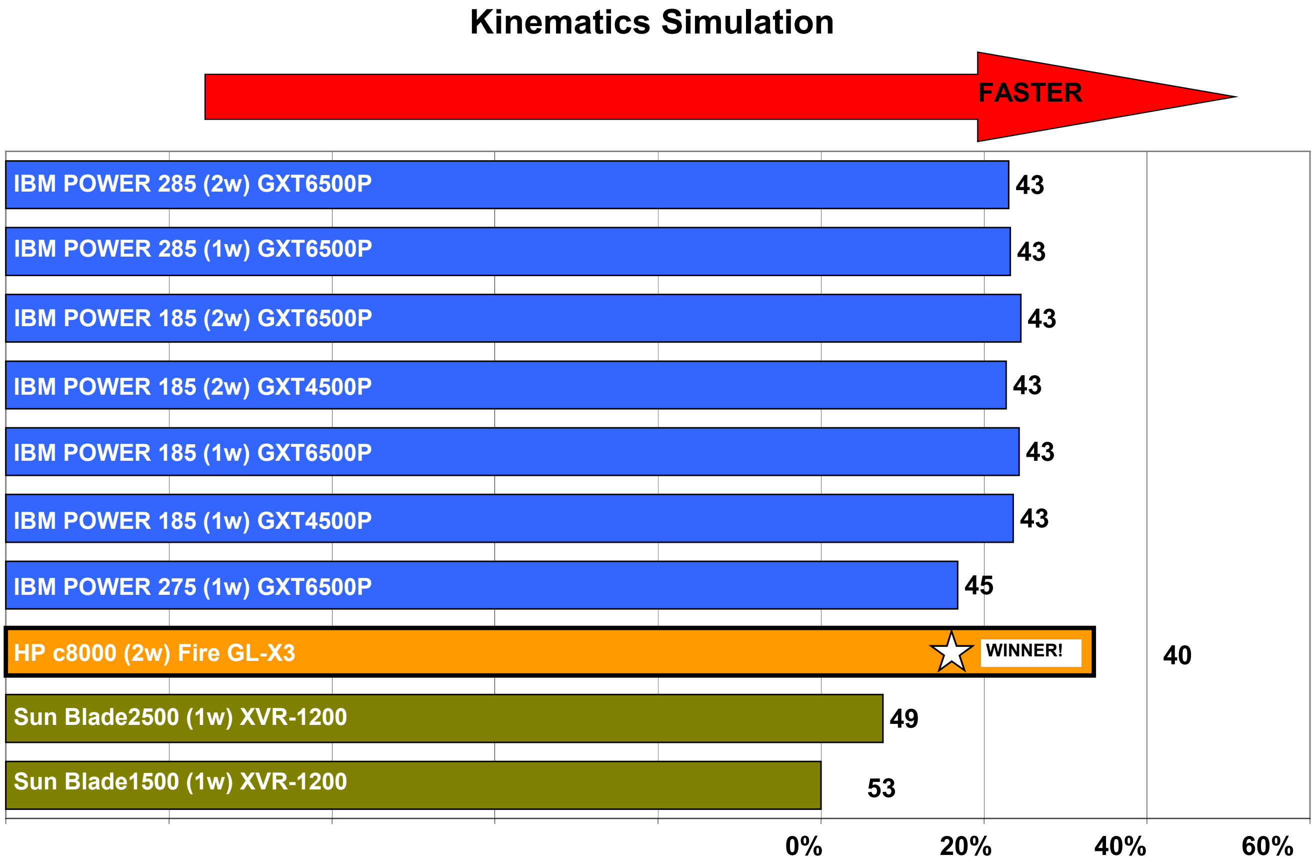


Chart 18 – Kinematics Simulation Throughput Relative to Slowest Machine
Test time in seconds shown next to bars (smaller numbers faster)
Longest bar wins! (★)

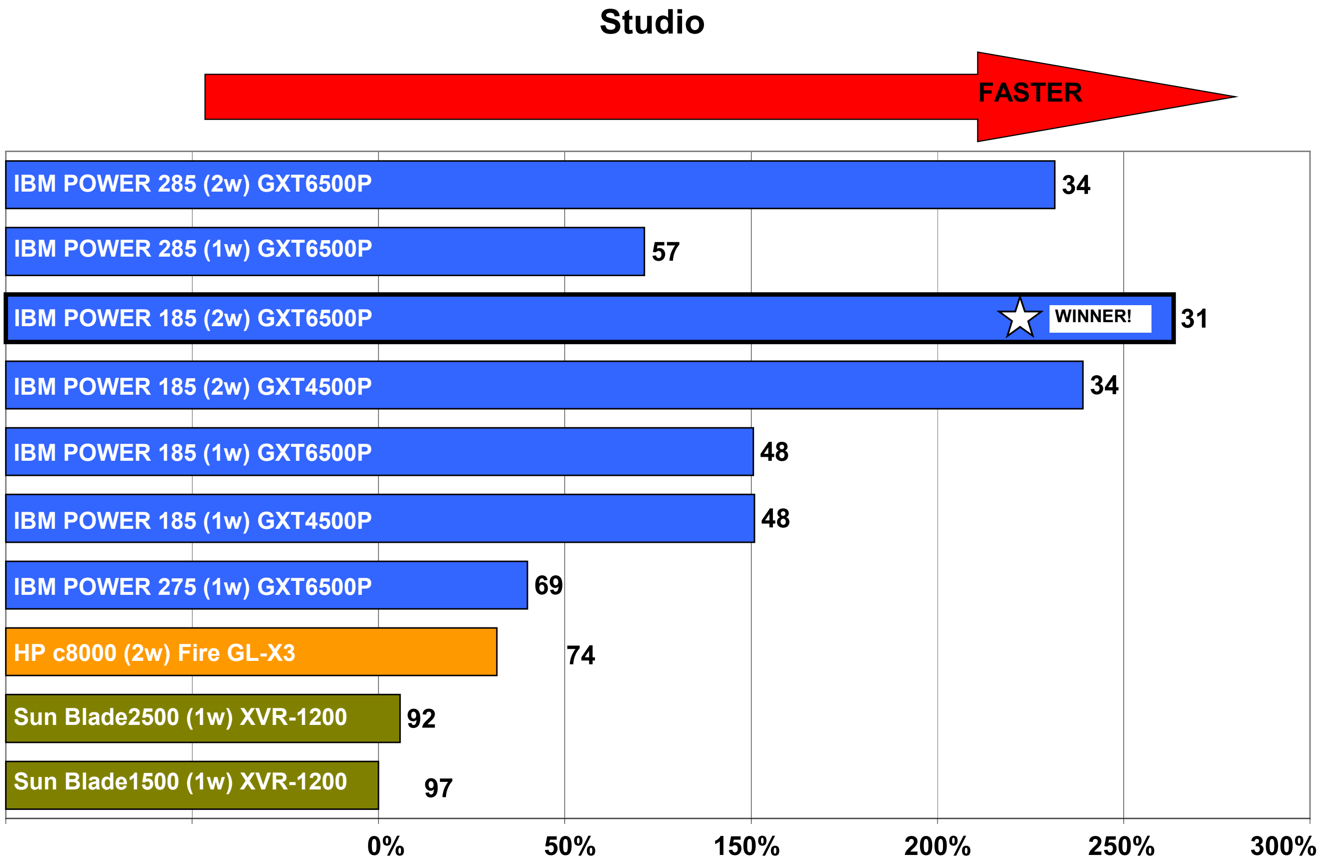


Chart 19 – Studio Throughput Relative to Slowest Machine
Test time in seconds shown next to bars (smaller numbers faster)
Longest bar wins! (★)

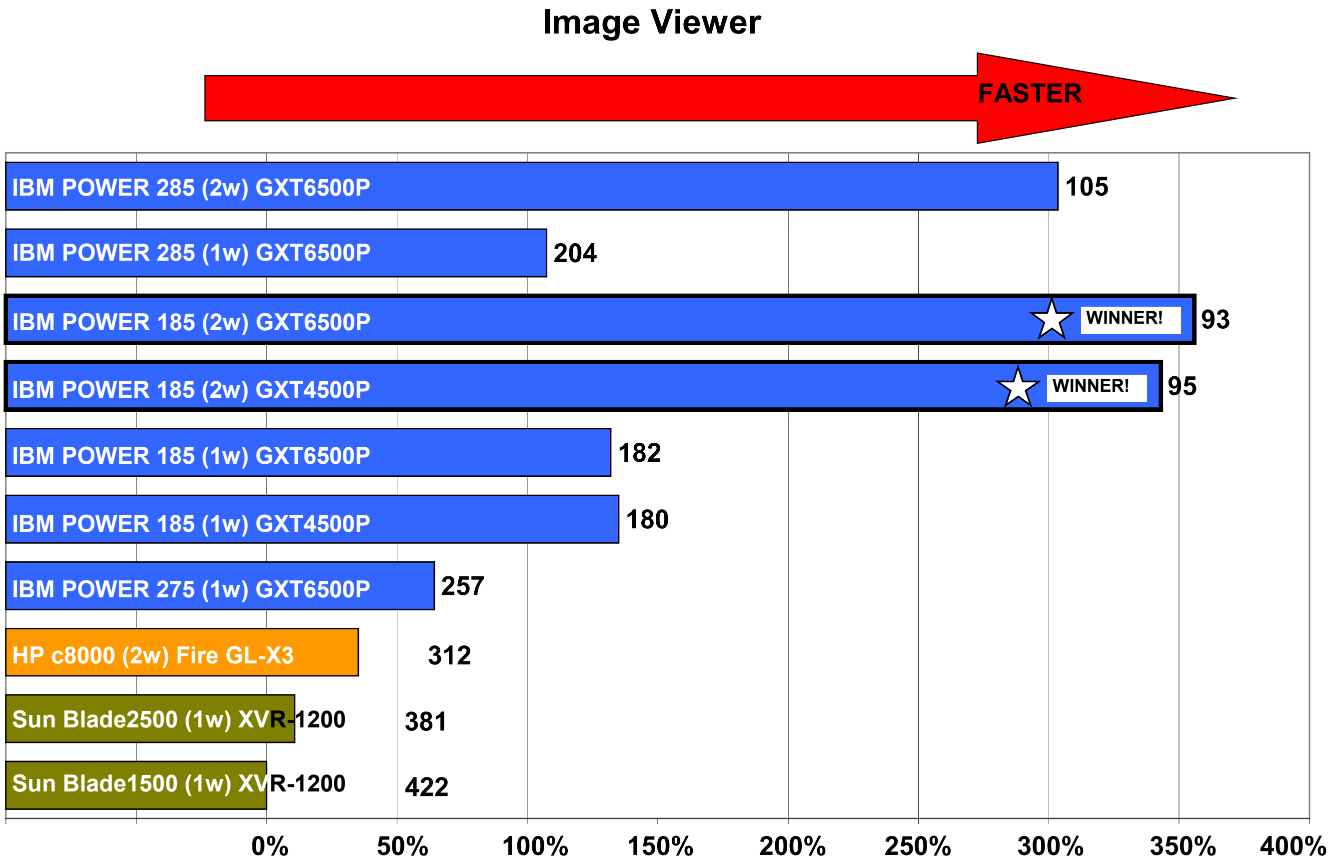


Chart 20 – Image Viewer Throughput Relative to Slowest Machine
Test time in seconds shown next to bars (smaller numbers faster)
Longest bar wins! (★)

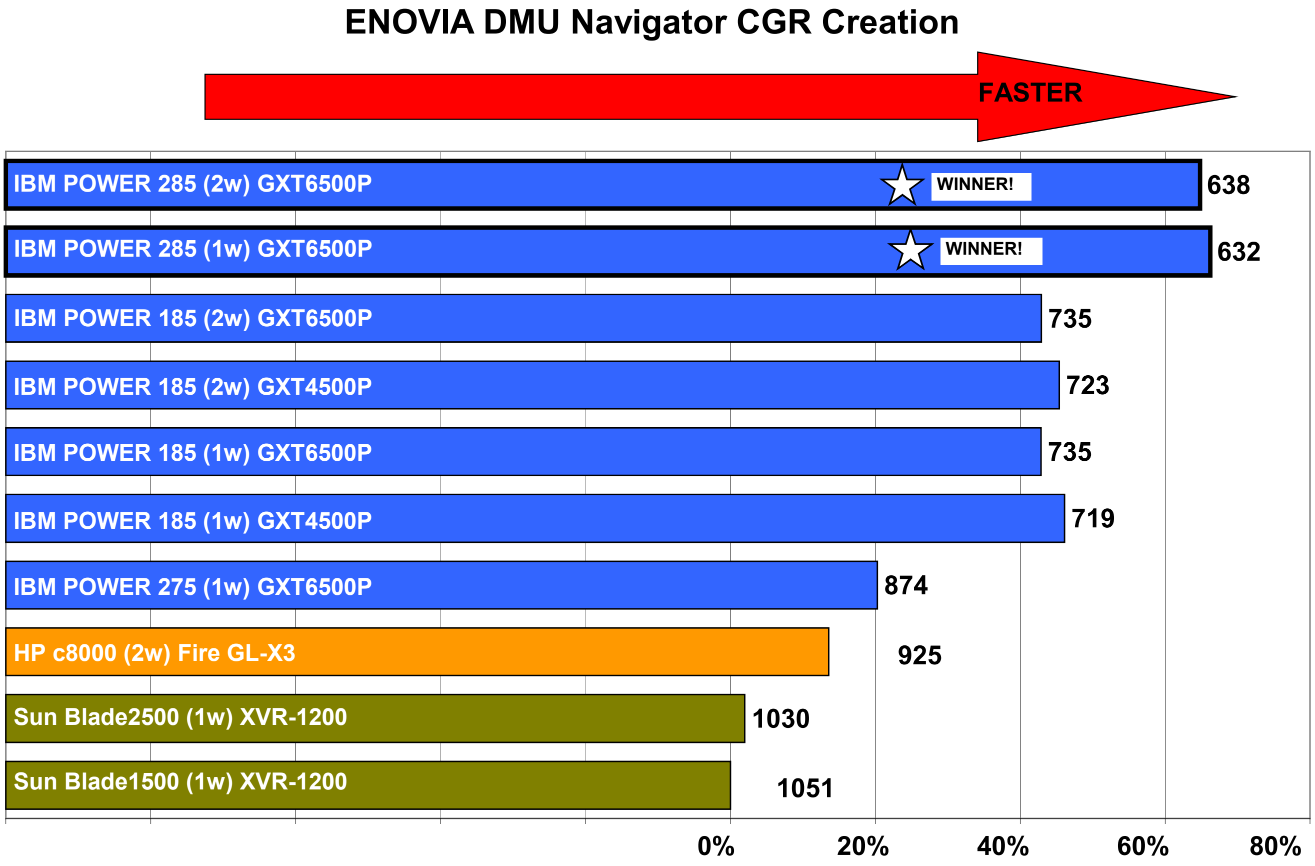


Chart 21 – ENOVIA DMU Navigator CGR Creation Throughput Relative to Slowest Machine
Test time in seconds shown next to bars (smaller numbers faster)
Longest bar wins! (★)

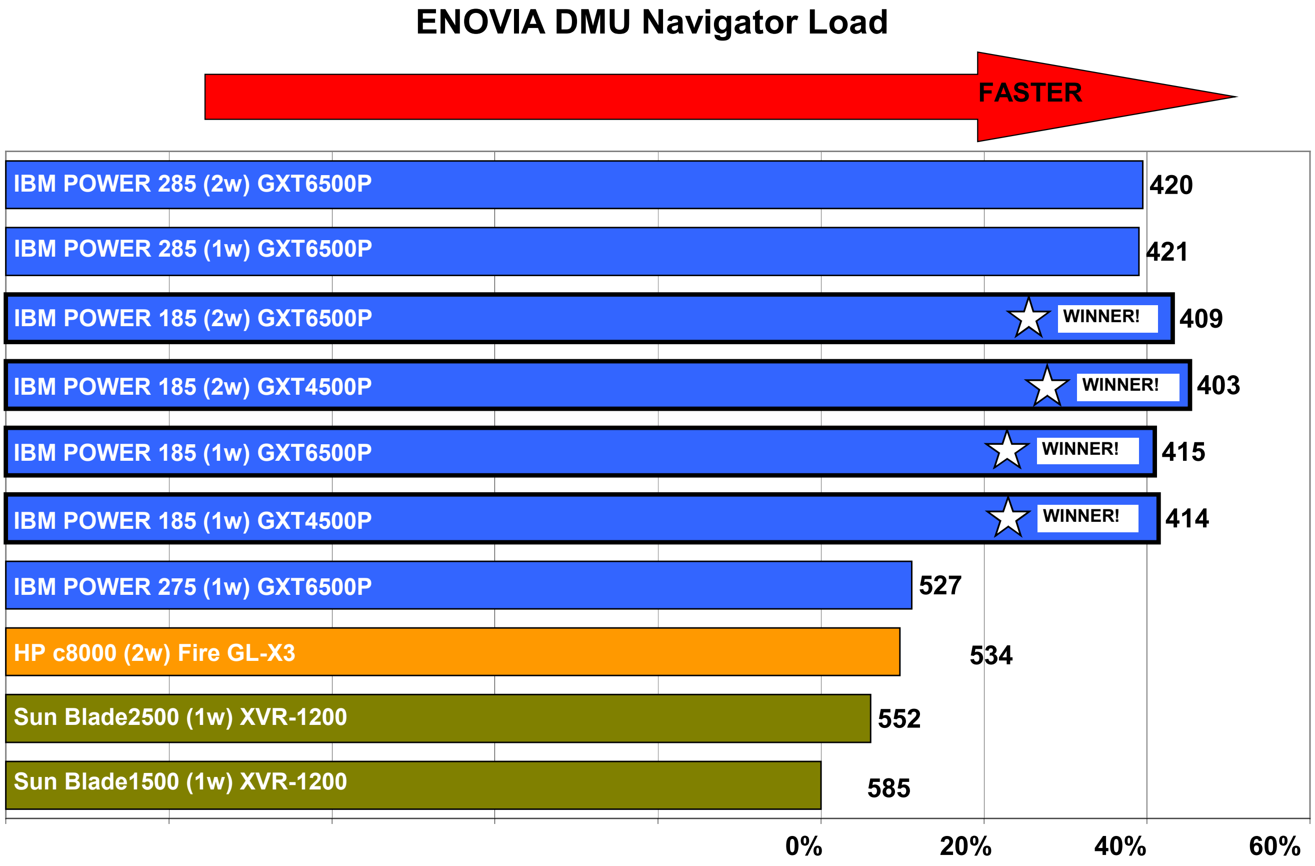


Chart 22 – ENOVIA DMU Navigator Load Throughput Relative to Slowest Machine
Test time in seconds shown next to bars (smaller numbers faster)
Longest bar wins! (★)