NVIDIA GRID
DASSAULT CATIA V5/V6 SCALABILITY GUIDE

NVIDIA Performance Engineering Labs

PerfEngDoc-SG-DSC01v1
March 2016

HOW MANY USERS CAN I GET ON A SERVER?

The purpose of this guide is to give a detailed analysis of how many users organizations can expect to get per server based on the application being used and the types of users they have in their environment. The data for this analysis is sourced from a combination of application recommendations from the independent software vendor (ISV), along with customer data from actual deployments. As with any deployment, your usage will depend on your models and equipment, so this Scalability Guide is best used as a starting point for your implementation.

DASSAULT SYSTÈMES CATIA

Dassault Systèmes CATIA is one of the most globally used CAD (Computer Aided Design) applications, being used for almost all aircraft designs in the world and over 80% of the automotive market. As a result, the use of CATIA is pervasive throughout the supply chains supporting these industries. CATIA leverages both CPU and GPU to deliver a high quality user experience so there are several things that need to be considered in architecting your NVIDIA GRID Virtual Workstation (vWS) solution. These include; the size of your data, the concurrency of your users, and the level of interaction with 3D data.

Recommended CATIA Virtual System Requirements

Working with virtualization partners like Citrix and VMware, and alongside our shared customers with tested and/or production environments, we are recommending the following system requirements for deploying CATIA in a virtual environment. Again, this is a starting point and your requirements will depend on your users and data sets, testing with those users will provide the best guidance:

Recommended Virtualization Platforms			
Virtualization Software	Citrix XenServer v6.5 SP1 or later Citrix XenDesktop v7.8 or later VMware vSphere 6 or later VMware Horizon 7 or later		
Virtual Machine Operating System	Microsoft Windows 7 SP1 64-bit: Enterprise, Ultimate, or Professional Microsoft Windows 8.1 64-bit: Enterprise, or Professional		
Host Server Recommendation	**Minimum**	**Recommended**	**Advanced**
CPU	2.3 GHz+ Intel® Xeon E5 v3 or greater	2.6 GHz+ Intel® Xeon E5 v3 or greater	2.6 GHz+ Intel® Xeon E5 v3 or greater
Memory	196 GB	320 GB	320 GB
Networking	1 GB minimum 10 G recommended	10 G	10 G or greater
Storage	~500+ IOPS Per User	~750+ IOPS Per User	~1000+ IOPS Per User

GPU	NVIDIA Tesla M60/M6 or greater NVIDIA GRID K2 or greater	NVIDIA Tesla M60/M6 or greater NVIDIA GRID K2 or greater	NVIDIA Tesla M60/M6 or greater NVIDIA GRID K2 or greater
Virtual Machine Settings	**Minimum**	**Recommended**	**3D & Large Datasets**
Memory	8 GB RAM	16 GB RAM	24 GB RAM or greater
vCPUs	4 vCPUs	4+ vCPUs	6+ vCPUs
Disk Space	100 GB free disk space	100 GB free disk space	100 GB free disk space
Virtual Graphics License & Profile	NVIDIA GRID Quadro vWorkstation License K240Q / M60-1Q profile or greater	NVIDIA GRID Quadro vWorkstation License K260Q / M60-2Q profile or greater	NVIDIA GRID Quadro vWorkstation License K280Q / M60-4Q profile or greater

CATIA SCALABILITY BASED ON CUSTOMER DATA

Based on testing and production results from several customers in the manufacturing space, here are the expected user densities for the different user types on NVIDIA GRID environments with GRID software and NVIDIA Tesla® M60 or GRID K2 cards. Please note that these results are what these customers determined were appropriate for their needs and provide insight into what one might expect. Results vary based on many variables and doing your own testing will determine your specific scalability.

TECH TIP! *It is important to note that mixed user types have produced the best density for some customers, for example placing 1 large and 7 mediums user types per host.*

CATIA User Classifications	Application(s)	Description	Users per server
Small/Standard	Dassault Systèmes CATIA	View-Only or Full application Accessing individual parts or small assemblies Manufacturing shop floor	8-16
Medium	Dassault Systèmes CATIA	View-Only or Full application Accessing medium assemblies Manufacturing shop floor	8-16
Large/Power User	Dassault Systèmes CATIA	Full Application Accessing large assemblies or full model	4-8
Analyst	Dassault Systèmes CATIA	Full Application CUDA/OpenCL Analysis of/or accessing large assemblies or full model	4

TYPICAL CATIA VIRTUAL WORKSTATION BUILDS

Dassault Systèmes and NVIDIA are developing recommendations and certifications for architecting your virtualized CATIA deployment. The following are actual builds from current customers, in production or POC use today, and can provide a starting point for building your own environment. Your own tests with your own models will determine if these recommendations meet your specific needs.

Automotive Manufacturing:

Three automotive manufacturers provided data for CATIA on GRID software with K2 and M6/M60 GPUs. This solution is being used to centralize data and compute into global regions, improving productivity, collaboration, supply chain (see below) integration, and of course security.

Two automotive parts manufacturers provided builds and user profiles that they architect for. These users are either located on a metro area campus setting, or in satellite offices. Having to work with multiple automotive manufacturers requires parts suppliers to work with multiple CATIA versions, and the easiest way to achieve this is with virtual workstations. Virtualization also allows the parts suppliers to centralize their data, collaborate with ease, distribute their workforce, and retain intellectual property.

Resulting User Builds:

User Classification Matrix			
Customer User Classifications	STD CAD Desktop	ADV CAD Desktop	ADV+ CAD Desktop
CATIA Build Spec	4-6 vCPUs 16GB RAM 1GB Frame Buffer (K240Q / M60-1Q)	6 vCPUs 16GB RAM 2GB Frame Buffer (K260Q / M60-2Q)	8-16 vCPUs 16GB RAM 4GB Frame Buffer (K280Q / M60-4Q)
Exported model size	150-200 MB		500-600 MB
Total triangles	~100,000		~1,600,00
Visualization time (CPU vs vGPU	122ms/52ms		937ms/386ms
Users per host (dual CPU, 2 GRID K2's per host)	16	8	4
NVIDIA GRID Software	Virtual Workstation (vWS) Edition		
Users per host (dual CPU, 2 Tesla M60's per host)	32	16	4+ (CUDA / OpenCL req.)

Aerospace manufacturing:

This aerospace manufacturer has four different user profiles that they architect for. They have run production users of CATIA workloads on both GRID K2 GPUs as well as GRID software and with Tesla M60 GPUs. These users were located in satellite offices, connected via enterprise class WAN links where a 70% productivity improvement was reported thanks to file proximity/transfer time savings alone, to those based on the LAN where even then a 30% productivity gain was reported. With Frame Rate Limiting (FRL) turned on, typical and appropriate for production environments, they saw no increase in Frame Per Second (FPS) but were able to double the number of users per host with no reported degradation of end user performance.

Resulting User Builds:

User Classification Matrix				
Customer User Classifications	Small/Standard	Medium/ Moderate	Large/Power User	Jumbo/Analyst
CATIA Build Spec	2vCPU 16GB RAM 1GB Frame Buffer (K240Q / M60-1Q)	4vCPU 32GB RAM 1GB Frame Buffer (K240Q / M60-1Q)	4vCPU 64GB RAM 1GB Frame Buffer (K240Q / M60-1Q)	4vCPU 128GB RAM 1GB Frame Buffer (K240Q / M60-1Q)
Users per host (dual CPU, 2 GRID K2 per host)	16	16	8	4
NVIDIA GRID Software	Virtual Workstation (vWS) Edition			
Users per host (dual CPU, 2 GRID M60 per host)	32	32	16	8

We will continue to collect field data from customers and partners to further refine this data. If you would like to share your data please reach out to your local NVIDIA team and let us know.

ANALYSIS SUMMARY

Dassault Systèmes CATIA requires significant CPU resources, so investing in higher CPU speeds and more cores will pay off on performance and scalability. Smaller workloads can leverage the 1GB vGPU profile, but for medium to large models, 2GB or greater vGPU profile performance generally produce better results. Since each situation is different, you must test with your own models to ensure the most accurate results.

To test NVIDIA GRID in your environment you can choose to get started with a certified NVIDIA partner or start a POC yourself with a certified server and our 90-day evaluation licenses.

Important things to remember during your POC:

1. **Define "acceptable" user experience:** Defining user experience (UX) requires careful examination of user and application interaction. This can be obvious, like the rendering time for an image to appear, or smoothly panning across that image. It can also be less obvious, like the ability to smoothly scroll down a page or the "snappy" reaction for a menu to appear after a right click. Ask users to report metrics, and to judge specific activities or functions using finite scales (e.g. 1-5, 5 being best), to avoid generic feedback.
2. **Compare real world workloads:** In virtual environments, time-slicing of resources allows users to get the same level of performance even when sharing resources. This is due to user "think time" which includes any time the user is not actually interacting with the application, or when not using the application or even sitting at their workstation. Add up all the time away from the application (meetings, lunch, out of office, etc.) and one could expect to get even more benefits from shared resources. These benefits equate to more resources for the user's session and typically a more responsive application, thus a better-perceived experience by the end user, as opposed to peak workload benchmarks with inhuman like uninterrupted work.
3. **Test with real users:** It's important to actually look at the application running be sure that the experience is enjoyable for users. That being said, it's also important to maintain perspective, especially if you are not a regular user of applications like Dassault Systèmes CATIA. While a data center admin deploying CATIA in a virtual environment might view a testing desktop and think the experience is slow or sluggish, a user who works with it daily might find it normal. The feedback from an actual 3D designer using the application in a virtual desktop is the ultimate test of success. Add in the point above about real world workloads and you see why real users are the most accurate means of testing.

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