



# Structural Mechanics Cluster Extension

System Requirements

If you have any questions regarding our products and services, do not hesitate to contact us:

**Europe, Australia, Latin America (without Mexico), Africa:**

Volume Graphics GmbH, 69115 Heidelberg, Germany

**Sales:**

E-mail: [sales@volumegraphics.com](mailto:sales@volumegraphics.com)

Phone: +49 6221 73920 60

**Support:**

E-mail: [support@volumegraphics.com](mailto:support@volumegraphics.com)

Phone: +49 6221 73920 80

**Japan:**

Volume Graphics Co., Ltd., Nagoya 462-0837, Japan

**Sales:**

E-mail: [sales@volumegraphics.jp](mailto:sales@volumegraphics.jp)

Phone: +81 52 508 9682

**Support:**

E-mail: [support@volumegraphics.jp](mailto:support@volumegraphics.jp)

Phone: +81 50 5305 1829

**North America (Canada, USA, Mexico):**

Volume Graphics, Inc., Charlotte, NC 28217, USA

**Sales:**

E-mail: [sales-us@volumegraphics.com](mailto:sales-us@volumegraphics.com)

Phone: +1 704 248 7736

**Support:**

E-mail: [support-us@volumegraphics.com](mailto:support-us@volumegraphics.com)

Phone: +1 704 248 7736

**China, including Mainland China, Hongkong, Macao, and Taiwan:**

Volume Graphics (Beijing) Technology Co., Ltd., Beijing 100600, China

**Sales:**

E-mail: [sales@volumegraphics.cn](mailto:sales@volumegraphics.cn)

Phone: +86 10 8532 6305

**Support:**

E-mail: [support@volumegraphics.cn](mailto:support@volumegraphics.cn)

Phone: +86 10 8532 6305

**Singapore and other parts of Asia (except China and Japan):**

Volume Graphics Pte. Ltd., Singapore 049908

**Sales:**

E-mail: [sales@volumegraphics.sg](mailto:sales@volumegraphics.sg)

Phone: +86 10 8532 6305

**Support:**

E-mail: [support@volumegraphics.sg](mailto:support@volumegraphics.sg)

Phone: +86 10 8532 6305

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The Structural Mechanics Cluster Extension is a high performance computing solution for performing structural mechanics simulations with VGSTUDIO MAX. It distributes the computational load required for structural mechanics simulations to many computers and thus enables you to

- calculate large projects which require more memory than exists in one computer and/or
- calculate large projects faster than with only one computer.

FEATURE	DESCRIPTION
Product name	Structural Mechanics Cluster Extension
Release	3.2
Document ID	SystemRequirements-115-v001-002-en

**TABLE 1-1: PRODUCT DETAILS**

## GENERAL INFORMATION

The Structural Mechanics Cluster Extension works in conjunction with the VGSTUDIO MAX software. The cluster extension consists of a scheduler service (VGCLUSTER SCHEDULER) and several network-connected computers running a worker software (VGCLUSTER WORKER). VGCLUSTER SCHEDULER is usually installed on one of the worker computers (or on the same computer as VGSTUDIO MAX or on any other computer) and distributes the jobs among the worker computers. The cluster extension makes the CPU and RAM resources of all worker computers accessible to VGSTUDIO MAX in connection with the Structural Mechanics Simulation add-on module.



VGCLUSTER SCHEDULER, VGCLUSTER WORKER and VGSTUDIO MAX must be of the same software version and service pack.

All computers belonging to the Structural Mechanics Cluster Extension system must be connected via the same local network:

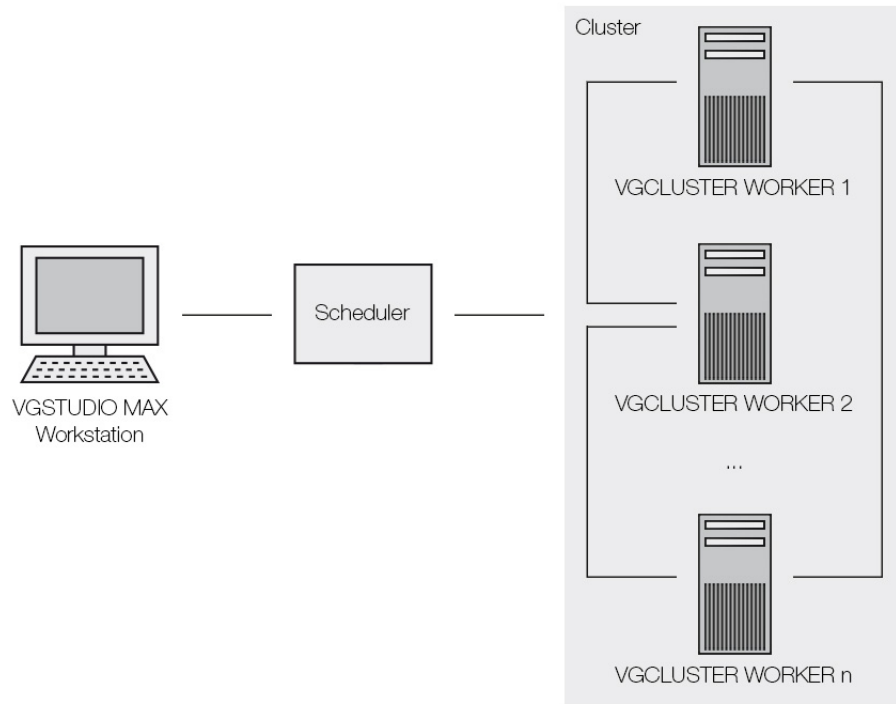


FIGURE 2-1: COMPONENTS OF A STRUCTURAL MECHANICS CLUSTER EXTENSION SYSTEM



VGCLUSTER WORKER and/or VGCLUSTER SCHEDULER may be installed on the same computer as VGSTUDIO MAX. In this case, it is recommended to increase the RAM on this computer.

VGCLUSTER SCHEDULER may also be installed on one of the worker computers or on any other computer.

## OPERATING SYSTEM

The software has been tested and approved for the following operating systems:

PLATFORM	OPERATING SYSTEM
Windows:	Windows 7 Professional SP1 64 bit Windows 8.1 Professional 64 bit Windows 10 Professional 64 bit
Linux:	Please contact Volume Graphics.

TABLE 2-1: SUPPORTED OPERATING SYSTEMS

## PROCESSOR

- Minimum:  
Intel® Core™2 Penryn, Intel® Core™ i, or AMD Bulldozer.
- Recommended:  
Latest Intel or AMD multi-core processors, e.g., Intel® Core™ i7 or Xeon® E5 processors with 2.4 GHz or higher.



All worker computers should have approximately the same CPU power (number of cores and clock rate). The weakest worker computer determines the cluster performance.

## RAM

All worker computers should be equipped with at least 32 GB of RAM, recommended is 64 GB or more.



All worker computers should have approximately the same amount of RAM. The weakest worker computer determines the cluster performance.

The scheduler computer should be equipped with at least 4 GB of RAM.

For the requirements for the computer running VGSTUDIO MAX, please also refer to VGSTUDIO MAX System Requirements.

## DISK SPACE

Except for the files created during installation (approx. 25 MB) and the log files created during operation, no further disk space is required on the worker and scheduler computers.

## **NETWORK**

TCP network communication must be enabled between VGSTUDIO MAX, scheduler and worker computers. The default ports are 13022 to 13033 and 8677.

The worker and scheduler computers should be interconnected with 1 Gbps Ethernet or better. The data transfer rate between the VGSTUDIO MAX computer and the worker and scheduler computers should be at least 100 Mbps Ethernet (preferably 1 Gbps).

Faster interconnections and lower latency will allow you to efficiently distribute your projects to more worker computers.

## **USER RIGHTS**

Make sure every user either has user or administrator rights. The license might not work when using guest accounts.

## **USER ADMINISTRATION**

The Windows services installed by this software run under the same user account. It is recommended to create a dedicated user (domain user or local users on each computer) for this purpose.

## **THIRD PARTY SOFTWARE**

The Structural Mechanics Cluster Extension is based on Microsoft MPI (MS MPI) 8.0.12438.0. Unless already present, the Structural Mechanics Cluster Extension installers will automatically install the required version of MS MPI on the worker and scheduler computers.



QUESTION	ANSWER
Where are the log files located?	Usually, they are located in the directory <i>C:\Users\mpiuser\AppData\Local\Volume Graphics</i> .
How much RAM do I need on the computer running VGSTUDIO MAX?	When using the cluster extension, the amount of RAM needed on the local VGSTUDIO MAX computer is considerably smaller compared to a fully local computation (i.e., without cluster extension). However, in order to set up simulation structures and view the results, a considerable amount of RAM is still required. The minimum recommended amount of RAM for the computer running the VGSTUDIO MAX application can be computed as follows: number of voxels in the CT volume x 10 bytes.
How many worker computers at a time can I use in total with the Structural Mechanics Cluster Extension for 4/16 licenses?	You can use a total of up to 4 or 16 worker computers, respectively, for a given job.
How can I test the Structural Mechanics Cluster Extension before I purchase a license?	Two worker computers can be used with a normal license for a <b>Structural Mechanics Simulation</b> module. For more worker computers, please contact Volume Graphics to obtain an evaluation license.
Can the worker computers run different versions of Microsoft Windows?	Yes. The Structural Mechanics Cluster Extension has been tested in a mixed setup of Windows 7, Windows 8.1, and Windows 10 worker computers.
Can I use the Structural Mechanics Cluster Extension with my Linux cluster?	Yes. Please contact Volume Graphics if you would like to set up a Linux cluster.
Can I set up the cluster on a cloud service?	Yes. The Structural Mechanics Cluster Extension has been tested with the Amazon Elastic Compute Cloud. Please contact Volume Graphics if you would like to set up a Linux cluster.
Can I use the cluster over a slow web connection?	The computation will be as fast as when using a fast web connection, but the speed for transmitting data to and from the cluster at the start and end of the job can be very low for large data sets.
Can I assign a worker computer to several schedulers?	No. This is not the intended setup and will lead to an undefined behavior. A worker computer must be included in one cluster (i.e., assigned to one scheduler) only.

TABLE 3-1: FREQUENTLY ASKED QUESTIONS