

Hardware & Operating System Recommendations

Version 2025



Contents

Important Notices1

 Hyper-Threading Recommendation.....1

System Recommendations2

 Recommended Configuration for 2-Socket Workstation2

 Recommended Configuration for 2-Socket Server.....3

Model Centric Recommendations4

 Minimum Hardware4

 Recommended Hardware.....4

 Recommended Hardware for Simulation of Models Greater than 250,000 Active Blocks4

 Recommended Hardware for Model Visualization.....5

 Technical Assistance.....5

Network Recommendations.....6

Important Notices

Starting with the 2022 General Release, CMG software is no longer supported on Windows 7, and Red Hat Enterprise Linux 6.x, 7.0 nor 7.1. The 2021 General Release version is compatible with these older operating systems.

CMG only supports 64-bit operating systems and hardware; customers using 32-bit systems should use the 2012 release or older.

CMG no longer tests, ships or supports software releases on the Windows[†] XP operating system. Customers using Windows XP are recommended to use the 2014 release or older.

Hyper-Threading Recommendation

For optimal performance, releases prior to 2018.10 recommended that hyper-threading be disabled. This is no longer required for Linux_x64 but is still required for Windows, with the following considerations:

1. Setting KMP_AFFINITY to non-default values is no longer required. If running a single job while reserving the whole server for a dual socket Ice Lake Xeon Gold 6338 or Milan EPYC 7513 with RHEL 8.4, then using default settings may provide a benefit. See the accompanying Performance Recommendations .pdf for more details. Note that for older AMD processors, setting KMP_AFFINITY (KMP_AFFINITY works with AMD Milan EPYC processors) to a non-default setting may cause the simulators to crash beginning with the 2020.10 versions. Please set "KMP_AFFINITY=" to the default setting and use "OMP_PROC_BIND=CLOSE" or "OMP_PROC_BIND=SPREAD" instead for older AMD processors.
2. Extensive testing, using Intel processors, has shown that better performance is achieved when hyper-threads are not used. This is now the default simulator behavior, on Linux_x64, which means that the number of threads (requested for the simulation) cannot exceed the number of physical cores, unless the command line option '-htuse' is used. GEM™ also allows use of keyword *HTUSE *ON in the data file.
3. Furthermore, when the number of physical + hyper-thread cores in a machine is greater than 64, the use of Linux_x64 executable is strongly recommended; the affinity setting is not effective (at more than 64 cores) on numerous Windows OS variants.
4. The '-htuse' command line/keyword has no effect on machines where hyper-threading is off. It also has no effect on machines with operating systems that do not respond to thread-binding by setting KMP_AFFINITY.

Hyper-threading effects could depend on processor type, hardware configuration and number of jobs scheduled per node. Please consult your IT department and/or CMG support for further guidance.

System Recommendations

Recommended Configuration for a 2-Socket Workstation

	RECOMMENDATION
Number of Sockets	2 Sockets
Processor	Dual Intel® Xeon® Gold 6548N (64 core*) or newer 5th Gen Intel Xeon / AMD EPYC (supporting DDR5 memory).
Memory	192GB - 384GB ECC DDR5 memory All memory channels per socket populated for maximum memory performance.
Graphics Card	NVIDIA ⁺ Quadro RTX4000 or newer that supports OpenGL version 4.6 or greater
Disk Drive	256GB SSD/NVME drive for OS disk, 500 GB – 1 TB SSD for data disk

Recommended Configuration for a Laptop

	RECOMMENDATION
Processor	Intel® Core Ultra 7 165H (16 core*, including 8 performance cores), 64GB RAM, NVIDIA RTX 2000 Ada gen or newer.
Memory	64GB RAM or greater
Graphics Card	NVIDIA ⁺ RTX 2000 Ada gen or newer
Disk Drive	256GB SSD/NVME drive for OS disk, 500 GB – 1 TB SSD for data disk

* May require Parallel tokens from CMG to use all the cores in the system.

Recommended Configuration for a 2-Socket Server

	RECOMMENDATION
Number of Sockets	2 Sockets
Processor	Dual Intel® Xeon® Gold 6548N (64 core*) or newer 5th Gen Intel Xeon / AMD EPYC (supporting DDR5 memory).
Memory	512GB - 1TB ECC DDR5 memory All memory channels per socket populated for maximum memory performance
Graphics Card	Not Applicable; Servers not to be used for Visualization Most Servers have a built in Video Card on Motherboard and are not configurable
Disk Drive	256GB SSD/NVME drive for OS disk, 500 GB – 1 TB SSD for local data disk, larger storage arrays/NAS fileshares may be required for ongoing project work.
Operating System	Windows Server 2019 Standard or newer OR Red Hat Enterprise Linux 8.9 (64-bit)***

* May require Parallel tokens from CMG to use all the cores in the system.

*** Linux benchmarking tests show it to outperform Windows Server platforms for overall simulation run times. Latest Red Hat Enterprise Linux (RHEL) 9 or other compatible Linux systems like Rock Linux or Amazon Linux can also be used as CMG servers. We recommend joining Linux computers to HPC cluster and submitting jobs from CMG Launcher to a scheduler (HPC cluster head node). Typical HPC cluster packages are Microsoft HPC Pack 2019, IBM LSF, Slurm, or PBS Pro.

Model Centric Recommendations

Minimum Hardware

- Small/Medium Black Oil less than 250,000 active blocks and/or WinProp™
 - Intel 8-core or higher, or equivalent AMD-based PC, 16 GB RAM or higher, Windows 10† 64-bit versions (or Windows 11), OpenGL†-capable video card.

Recommended Hardware

- See previous section for the recommended configuration for a 2-socket workstation

Recommended Hardware for Simulation of Models Greater than 250,000 Active Blocks

- | | | |
|----|--------|---|
| a) | IMEX™ | up to 10,000,000 active blocks |
| | GEM™ | up to 5,000,000 active blocks |
| | STARS™ | up to 5,000,000 active blocks |
| | | • 2 sixteen-core CPU's Intel Xeon Gold 6326 or AMD EPYC 7343 or similar |
| | | • 128 GB RAM or more |
| b) | IMEX™ | More than 10,000,000 active blocks |
| | GEM™ | More than 5,000,000 active blocks |
| | STARS™ | More than 5,000,000 active blocks |
| | | • 2 thirty-two CPU's Intel Xeon Gold or AMD EPYC 7513 or similar |
| | | • 256 GB RAM or more |

Notes: For (a) and (b), double the RAM is recommended for larger numbers of components.

Recommendations for the number of cores to be used also depend on:

- Grid aspect ratio
- Direction of highest transmissibility
- Horizontal wells
- Modelling Fractured Reservoirs

Recommended Hardware for Model Visualization

Smooth visualization of reservoir simulation results requires a video card that can handle large amounts of data quickly, and has the rendering capabilities to support all display features. While high-end gaming video cards may be able to do this, CMG recommends the use of an up-to-date, professional-level video card with up-to-date drivers. The hardware and software integration of professional cards is better than that of consumer cards and generally, drivers are updated more frequently. For this reason, CMG has been buying cards from the NVIDIA Quadro/RTX line for its developers and support staff. Other vendors may offer similar quality cards.

The Quadro/RTX line has lower-, middle-, and upper-tier cards. Besides processor speed, the main difference between these cards is the amount of video memory on the card. The amount of video memory is directly correlated to the size of the model that can be displayed. CMG is using "middle-tier" cards to display and interact with models up to several tens of millions of cells.

Factors that influence the model size that can be displayed and manipulated include, but are not limited to:

- Total number of grid cells
- Number of active grid cells
- Number of refinements
- Number of wells and trajectories
- Number of amalgamated cells

Note: OpenGL version 4.6 or higher is recommended for full support of visualization features. Integrated Intel HD graphics cards (2nd, 3rd, 4th and 5th generation) may also experience some degradation in visualization performance.

For running our visualization software through a remote setup we recommend using Windows⁺ 10 with the latest Remote Desktop drivers to ensure smooth and consistent performance.

Technical Assistance

If you require technical assistance, or have specific questions about the hardware and operating system recommendations which are not discussed here, please contact CMG at:

Email: support@cmgl.ca

Phone: +1.403.531.1300

Network Recommendations

In case of a Server/Client system (such as HPC cluster server where workstations submit jobs to the cluster), CMG recommends a 1 Gigabit/sec connection on workstations, and 10 Gigabit/sec on the server. This is important because the network speed affects the data transfer speed back and forth between the cluster and the workstation.

NVIDIA/Mellanox Infiniband network devices and 100 Gigabit/sec links are recommended if you are running CMG MPI simulators.

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