

2019 PLS-CADD Advanced Training and User Group

Operating System and Hardware Recommendations

by

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Introduction

- Update from my 2017 talk
- Operating Systems
- Hardware
- Q/A as time permits

Supported Operating Systems

- Version 16.00 supports **32 bit** and **Vista**
- Only x64 editions of Windows supported post 16.00
 - **32 bit EOL** with production version 16.00
 - **Vista EOL** with production version 16.00
 - Less than 1% of clients running 32bit or Vista
- Windows 7 and newer: **Supported**
 - Windows 7 EOL by Microsoft January 14, 2020
 - Windows 7 EOL by PLS ?

Recommended Operating Systems

- **Windows 10 x64**
 - PLS software “Just works”
 - Only OS that makes sense

Hardware Recommendations

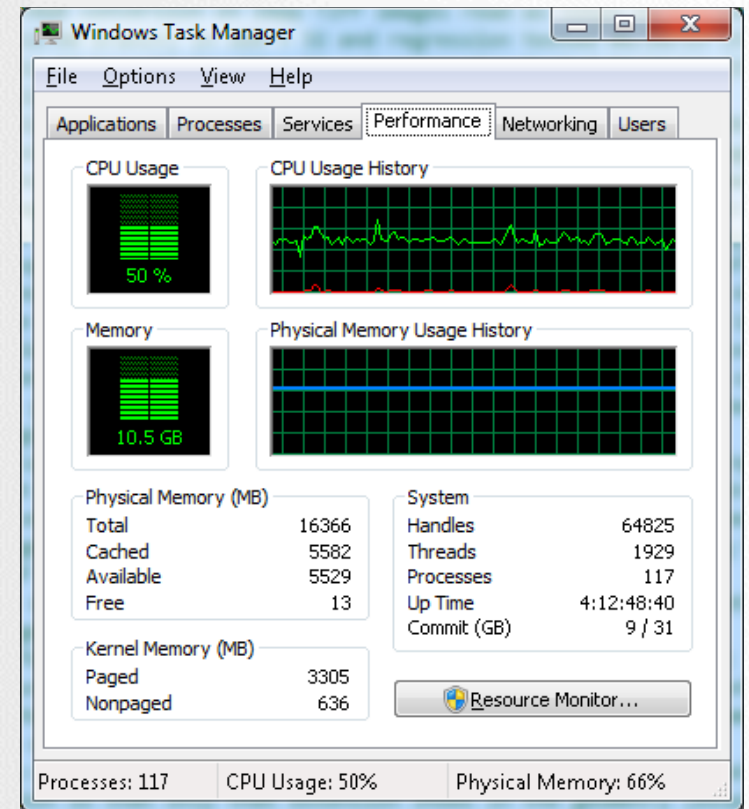
- PLS-CADD vs. PLS-POLE / TOWER
 - PLS-CADD: RAM most important
 - PLS-POLE/TOWER: # cores most important
 - Analysis time proportional to (Load cases) / (# cores)
- For all applications
 - SSD if files stored local (preferably a PCIe NVMe SSD)
 - Gigabit or 10 Gigabit to server if files stored remote
 - If network slow use *Compress XYZ and TIN files* setting in PLS-CADD
 - A 40" 4k or multiple smaller monitors boost productivity
 - Do not need best/fastest GPU – spend the money on RAM and cores instead

Why no GPGPU?

- Performance numbers are peak for single precision. We use double precision typically a factor of 10 slower on GPU.
 - Double = ~16 significant digits
 - Single = ~7 significant digits
- Problems not parallelizable enough
- Do not always guarantee IEEE 754 floating point semantics
 - Our results matter!

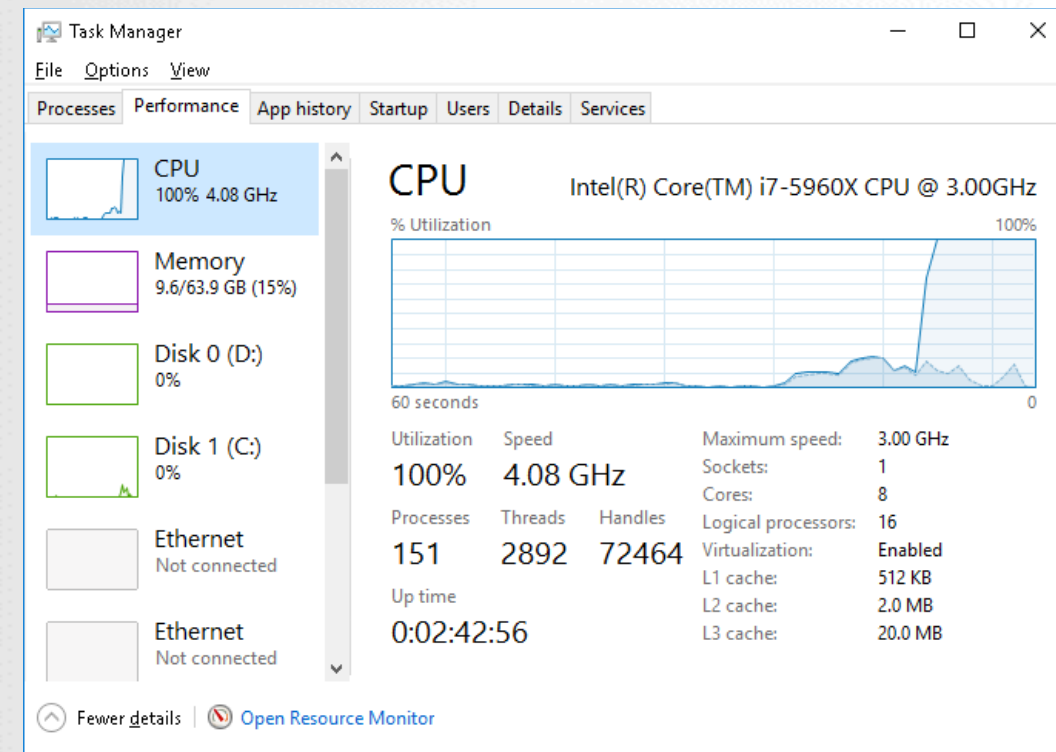
Hardware Limits/Details (Version ≤ 14.40)

- Tested on 32 cores: OK
- Not all cores are equal
 - Hyper-threading (HT)
 - Makes 1 core look like 2
 - Useless for FP bound apps
 - Half of cores Task Manager reports for most processors are HT
 - **50% is full utilization**



Hardware Limits/Details (Version > 14.40)

- Tested on 32 cores: OK
 - 32/64 cores with AMD Threadripper 2990WX, but we have not yet tested
- Hyper-threading (HT)
 - Makes 1 core look like 2
 - Half of cores Task Manager reports for most processors are HT
 - **No longer useless!**
 - **Versions > 14.40 will use HT cores for a 0-30% improvement in performance**

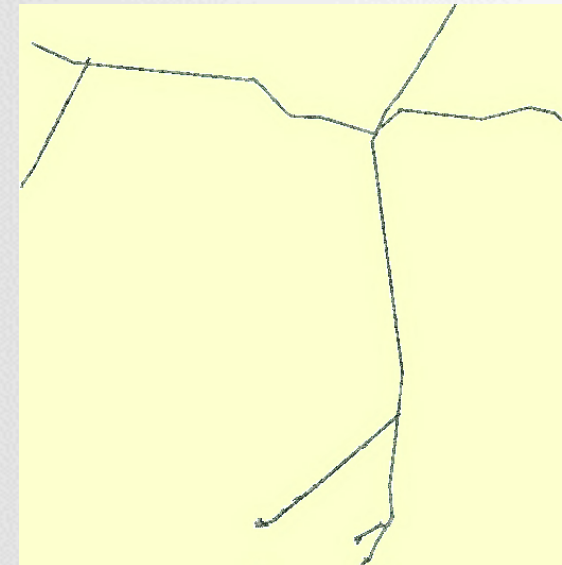


Hardware Limits/Details Continued

- 96 GB of RAM used to load ~1 Billion XYZ points
- Our code is unusually demanding and can reveal hardware and driver faults
 - Overheating processor
 - Improperly cooled RAM
 - Ethernet card driver bug

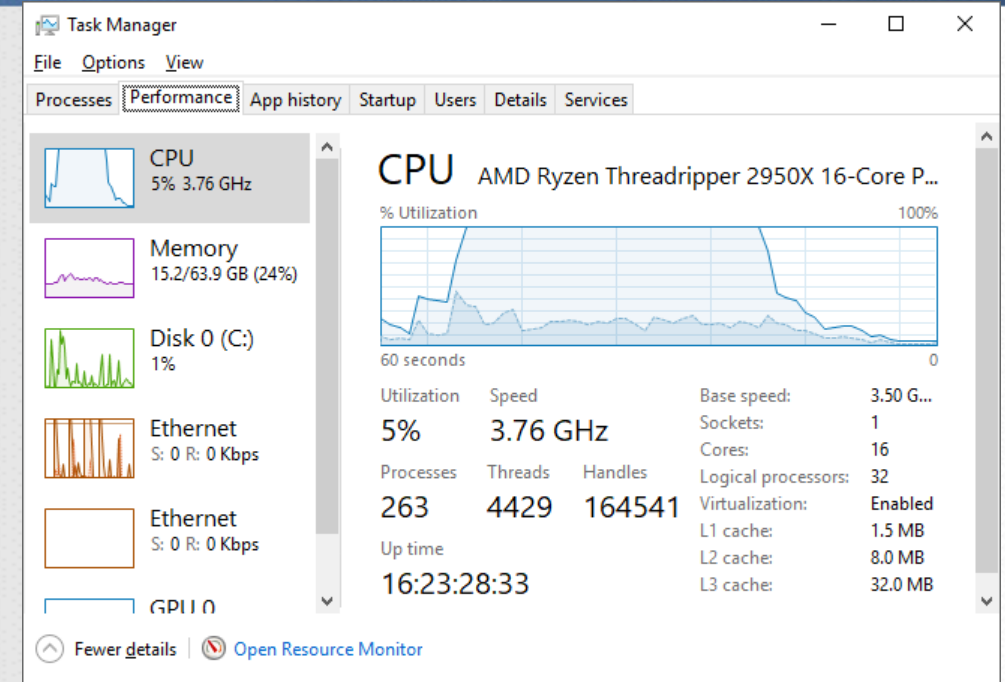
What pushes the limits?

- LiDAR point counts – ever growing
 - Multiple lasers
 - Higher frequency data collection
- 1TB image
 - No compilations!
 - Prefer 10-100 images to 1000+ or just one big image
- Family and Framing Managers
- 500+ Load cases
 - Really?



Miscellany

- Intel best for PLS-CADD
 - Higher clockrate
- AMD ThreadRipper for TOWER and PLS-POLE
 - More cores
- Integrated GPS
 - GPS receiver must be natively supported by Windows
- Touch screens are supported



Budgeting Priorities

- Priority when budgeting
 - RAM (RAM speed matters)
 - Processor frequency (consider water cooled and overclocked)
 - # cores
 - SSD

Swap for TOWER/PLS-POLE vs. PLS-CADD



Sample Laptop - 15" screen

- Core i7-8750H Processor
 - 2.2 - 4.1 GHz
 - 9 MB cache
 - 6 cores (12 with Hyper-threading)
- 16 GB RAM
- 512 GB M.2 PCIe drive
- NVIDIA GTX 1050Ti (4 GB)
- Windows 10 x64

Dell XPS 15

Sample Laptop - 15" screen (\$)

- Core i7-8750H Processor
 - 2.2 - 4.1 GHz
 - 9 MB cache
 - 6 cores (12 with Hyper-threading)
- 16 GB RAM
- 512 GB M.2 PCIe drive
- NVIDIA GTX 1050Ti (4 GB)
- Windows 10 x64
- **US\$1520** (April 13, 2019)

Dell XPS 15

Sample Desktop

- AMD Ryzen 7-2700X Processor
 - 3.7 - 4.3 GHz
 - 20 MB cache
 - 8 cores (16 with Hyper-threading)
- 16 GB RAM
- 256 GB M.2 PCIe drive + 1TB HD
- AMD Radeon RX 580 (4GB)
- Windows 10 x64

Dell Inspiron Gaming Desktop

Sample Desktop (\$)

- AMD Ryzen 7-2700X Processor
 - 3.7 - 4.3 GHz
 - 20 MB cache
 - 8 cores (16 with Hyper-threading)
- 16 GB RAM
- 256 GB M.2 PCIe drive + 1TB HD
- AMD Radeon RX 580 (4GB)
- Windows 10 x64
- **US\$1200** (April 13, 2019)

Dell Inspiron Gaming Desktop

Sample Workstation

- PLS-CADD

- i9-9900K
- 5.0 GHz *
- 16 MB cache
- 8 cores (16 with HT)
- 64 GB RAM

- 500 GB M.2 PCIe drive
- GeForce GTX 1660Ti (6 GB)
- Windows 10 x64

Origin Millenium

TOWER

Threadripper 2950x

4.4 GHz* * = (Water cooled and overclocked)

40 MB cache

16 cores (32 with HT)

32 GB RAM

Sample Workstation (\$)

- PLS-CADD
 - i9-9900K
 - 5.0 GHz *
 - 16 MB cache
 - 8 cores (16 with HT)
 - 64 GB RAM
- 500 GB M.2 PCIe drive
- GeForce GTX 1660Ti (6 GB)
- Windows 10 x64
- **US\$3325** (April 13, 2019)

Origin Millenium

TOWER

Threadripper 2950x

4.4 GHz* * = (Water cooled and overclocked)

40 MB cache

16 cores (32 with HT)

32 GB RAM

Conclusion

- Windows 10 x64 is the way to go
- PLS-CADD
 - Buy RAM. Fast RAM and lots of it.
- PLS-POLE + TOWER
 - Buy cores. Many cores.
- You should have a PCIe NVMe M.2 SSD

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Questions?

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