Workstation Technology

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NVIDIA

Lenovo

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The Importance of Efficiency

Efficiency

- Important at every stage of the project lifecycle
- Never more so than post-project deadlines
- Underlying foundations of business needing to be strong, agile & efficient
- Industry leading software & talented workforce only get you so far
- Underlying IT hardware can be the root cause of many project bottlenecks

~~Information~~ *Intelligent* Technology

- Latest hardware innovations and intelligent computing can transform projects
- Delivering cost savings at every area of the business
- Typically greater than the upfront financial investment
- Real-time ROI can be gauged quickly and easily

£ = 

So Why IT?

Who Here Doesn’t Want a New Workstation?

Computer Hardware

Hardware…

- Boring ☹
- Expensive ☹
- Depreciates ☹

But a Hugely Important Part of ANY Digital Workflow!

- Who has control, input or Influence over their companies IT investments?

- Who spends <£2500 on their Workstation?
- £2500 > £5000?
- £5000+?

It’s not what you spend, but how you spend it!

Today’s Challanges

Market Today?

- Broad Range of Workstations (*Shapes, Sizes & Configurations*)
- PC Workstations Typically Provided by IT Staff
  - *Get what you're given, and not necessarily what you want or need*
- Adequate or Good Performance at Best
- Rarely a 100% Match to your Software Stack, Projects & Workflow
- Not Ultimate Performance/ROI
- IT Staff Like Easy Lives - *Minimal Platforms to Maintain*
- Dated or n-1 Generation Hardware

Projects Today?

- More Demanding Clients
- Ever More Complex Projects
- With Shorter Project Time-Scales – Deadlines ☹
- Increased Software Stack & Complexity
- Increased use of Design Visualisation Tools/Techniques
- VR - Virtual Reality
- Colour Calibration, Multi-Display & 4K Workflows

Who Struggles Here…

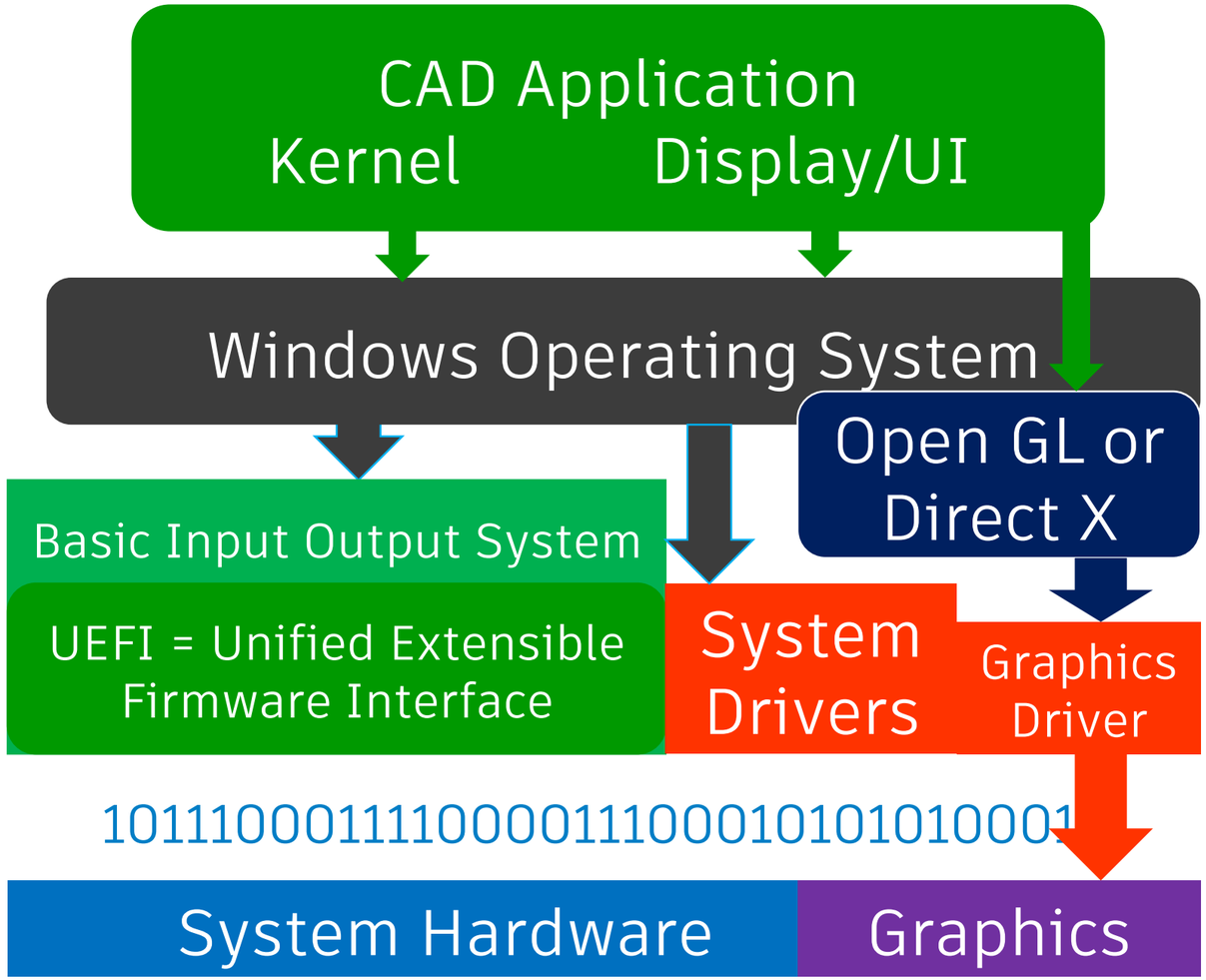
- Slow/Inefficient Design Modeling/Viewports?
- Slow Simulation and/or Rendering?
- Taking Forever to Load Projects?
- System Crashing or Freezes?

Making the Right Choice…

Not as Simple as is Sounds…

The Basics of How a System Works

Software Components/Plug-Ins



Confused?

What?

- How Much Processing Power Do I Need?
- How Much Memory?
- How Many Processors? How Many Cores?
- What About Graphics?
- Is Storage Important?
- What About SSDs?
- Can I Work Remotely?

How to Make Choices?

- List your Commonly Used Software Applications
- Understand Workflow
  - *% Ratio Split – Where/When Do You Spend Your Time*
- Learn Bottlenecks & Pain Points?
- Lenovo has Software/Tools to Help ☺

Facts….

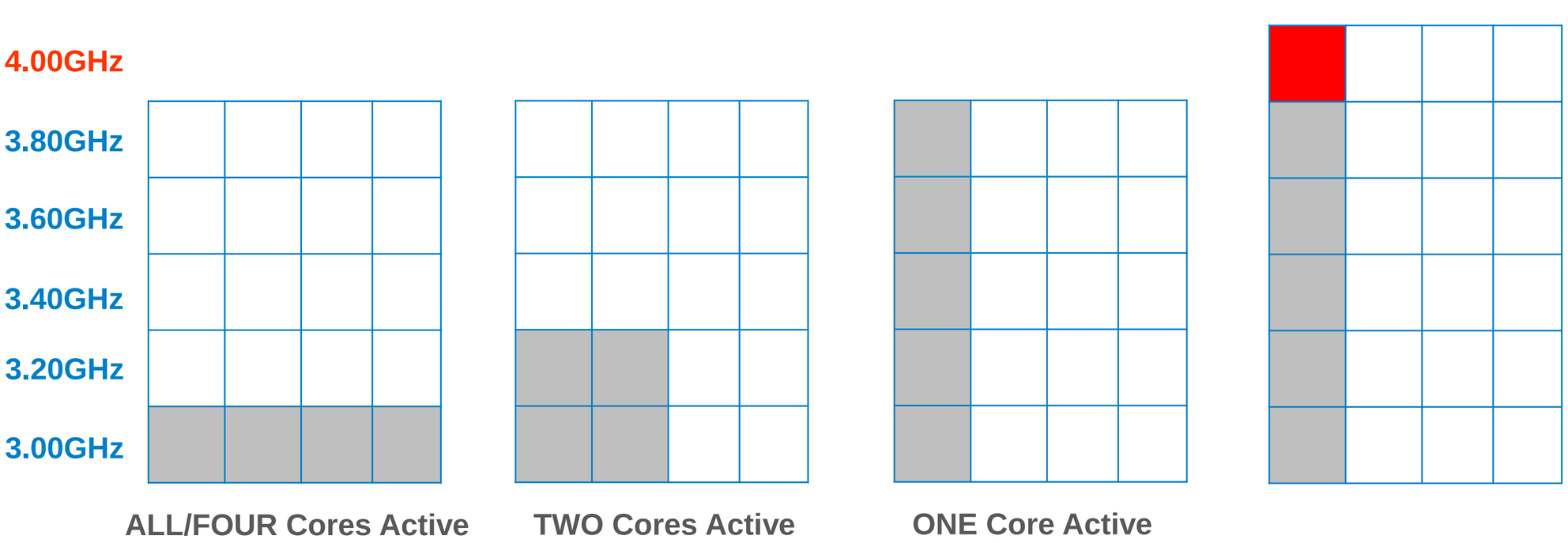
- Not All Software is Created Equal
- Software is Single or Multi-Threaded (*Sometimes Both*)
  - Single Threaded – CANNOT Scale/Thread onto Multiple CPU Cores
  - Multi-Threaded – CAN Scale/Thread onto Multiple CPU Cores
- CPU Spec/Detail is Important
  - Clock Speed/GHz, Core Count, Cache Memory, Turbo Boost etc
- Memory can be the 2nd Largest Bottleneck (*Behind the CPU*)
  - Not Just Capacity, But Bandwidth, Clock Speed & Latency
- Cheap Can Become Very Expensive!

Configuring a Workstation - Processors

Processors

- Always Choose Intel Workstation Processors

Faster 'Turbo' Clock Speeds, More Cache, More Cores, ECC Memory



Turbo Boost Max 3.0

Power & Thermal Headroom Dependant

Intel® Turbo Boost Max Technology 3.0

4 Processors with **Threads** of up to **GHz** max frequency

- How does it work?
  - Identifies the best performing core
  - Provides increased performance
  - Requires OS awareness (Intel's core driver)
- What are the benefits to the user?
  - Delivers peak performance for frequency-bound applications (i.e. single threaded)
  - Configurable to a specific application (*CAD application or rendering in the background*)

Core 1	Core 2	Core 3	Core 4
Core 5	Core 6	Core 7	Core 8

"Best Core" available in CPU

Xeon E5-1630 v4 **Xeon E5-1650 v4** **Xeon E5-1660 v4** **Xeon E5-1680 v4**

CPU/Processors

- Always Choose Intel Xeon Processors
  - *Faster 'Turbo' Clock Speeds, More Cache, More Cores, ECC Memory*
- Choose Between One or Two Processors Per Workstation
  - *Dual 6C CPUs @ 2.5GHz = 30GHz / 3.2GHz (Boost)*
  - *Single 8C CPU @ 3.2GHz = 25.6GHz / 4.0GHz (Boost)*
- Choose The Right Balance of CPU Clock Speed & Core Count
  - *Consider Intel Turbo Boost & £££ Cost Per GHz For Maximum ROI*
- Rule-out Adding a 2nd CPU Later
  - *Matched CPU Stepping, High Cost (Option), Availability, Downtime*

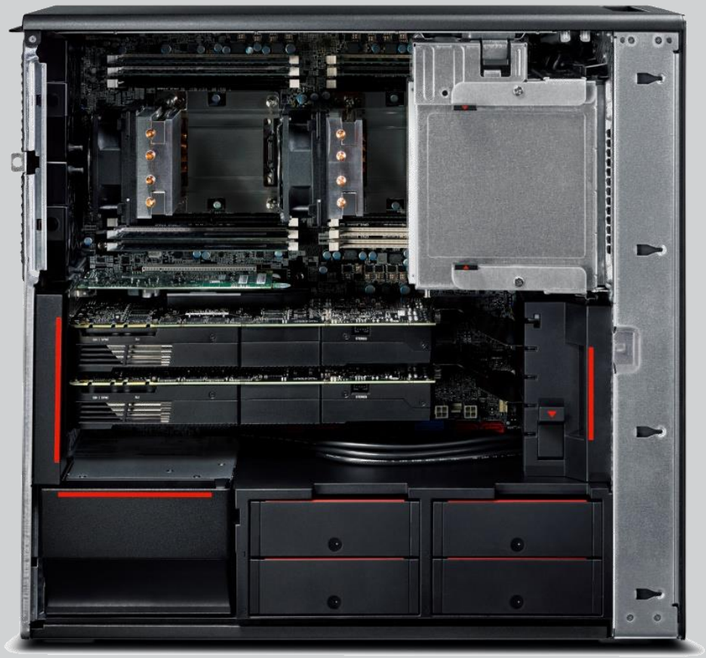
Questions?

CPU/Processors

ThinkStation P510

Mainstream – 1S

ThinkStation P710



Compact Performance – 2S

ThinkStation P910

Extreme Performance – 2S

Good **Better** **Best**

Configuring a Workstation - Memory

Memory

Capacity: *More The Merrier - Minimum of 4GB Per Core (Ideally 8GB+)*

Type: *Dual Data Rate 4 (DDR4) Is The Current Highest Standard*

Size/Rank: *Single-Rank (SR), Dual (DR) or Even Quad (QR) Modules Available*

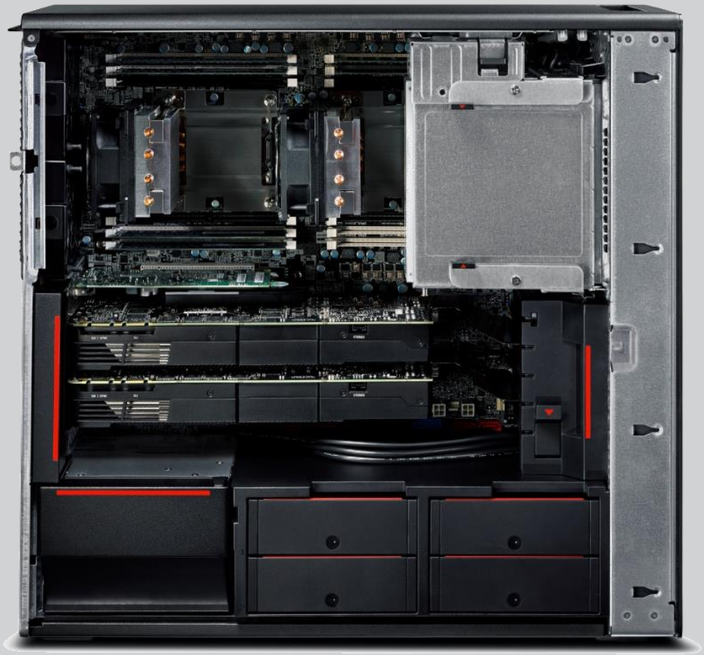
Speed: *Clock Speed, Much Like a CPU – 2400MHz Current 2S Standard*

Channels: *More The Merrier – Quad-Channel (4) Per CPU is Best*

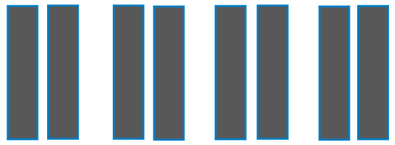
Optimize, Optimize, Optimize

Memory

ThinkStation P510



CPU



ThinkStation P710

CPU

CPU

ThinkStation P910

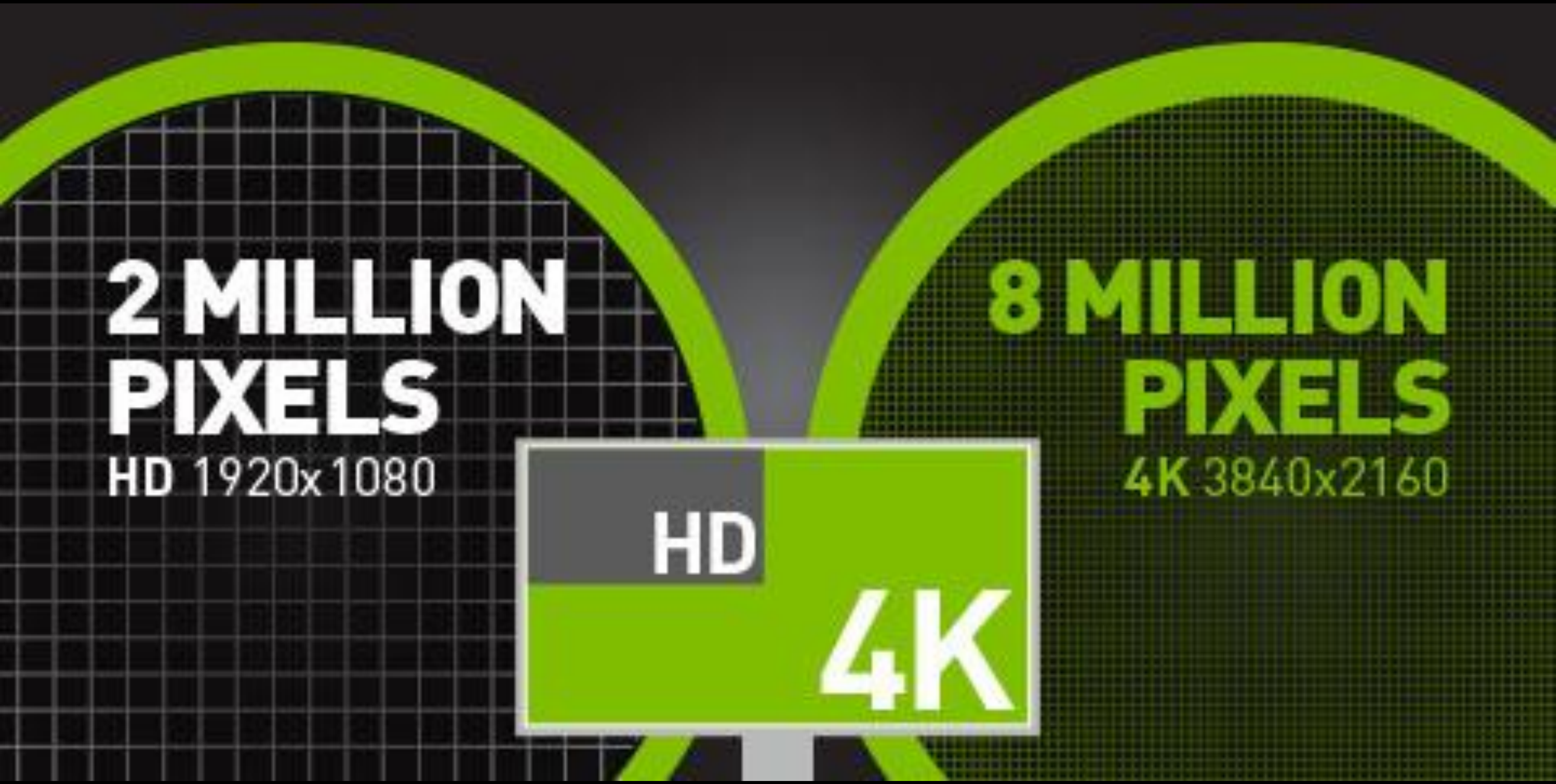
CPU

CPU

Configuring a Workstation - Graphics

Graphics – *How to Choose….*

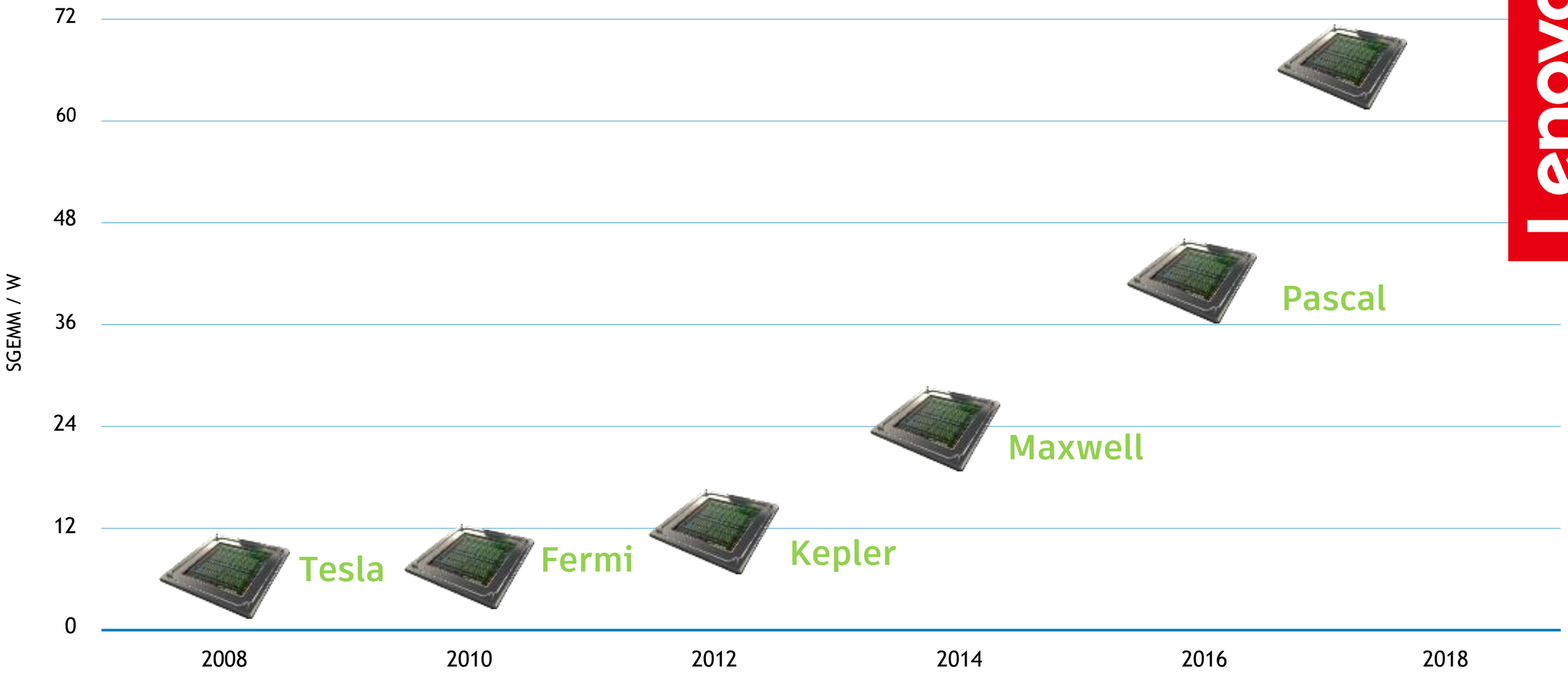
- How Large or Complex are your 3D Models?
  - No. of Parts per Assembly, Polygons, Textures etc.
- Screen Resolution / No. of Pixels – 4K?
- No. of Monitors – Total Desktop Real Estate?


2 MILLION
PIXELS
HD 1920x1080
8 MILLION
PIXELS
4K 3840x2160
HD
4K

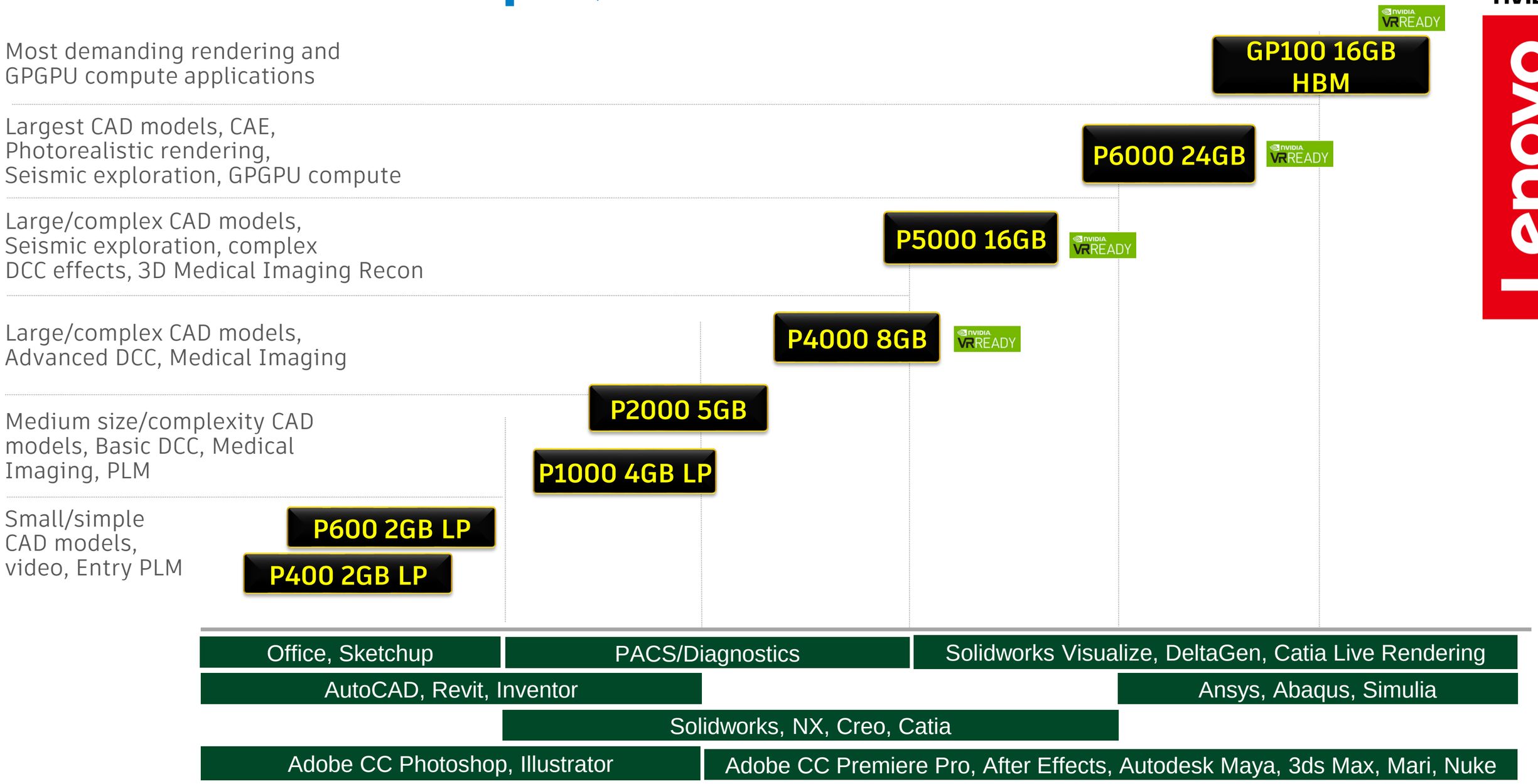
Graphics – *How to Choose….*

- How Large or Complex are your 3D Models?
  - No. of Parts per Assembly, Polygons, Textures etc.
- Screen Resolution / No. of Pixels – 4K?
- No. of Monitors – Total Desktop Real Estate?
- Frequent Model Rotation?
- Colour Accuracy - 8 or 10Bit Colour?
- High Frame Rates (VR)?
- Ray Tracing & GPU Rendering?
- Advanced Lighting Effects?
- How Many Different Software Apps?

NVIDIA GPU Roadmap



NVIDIA Desktop Quadro Products



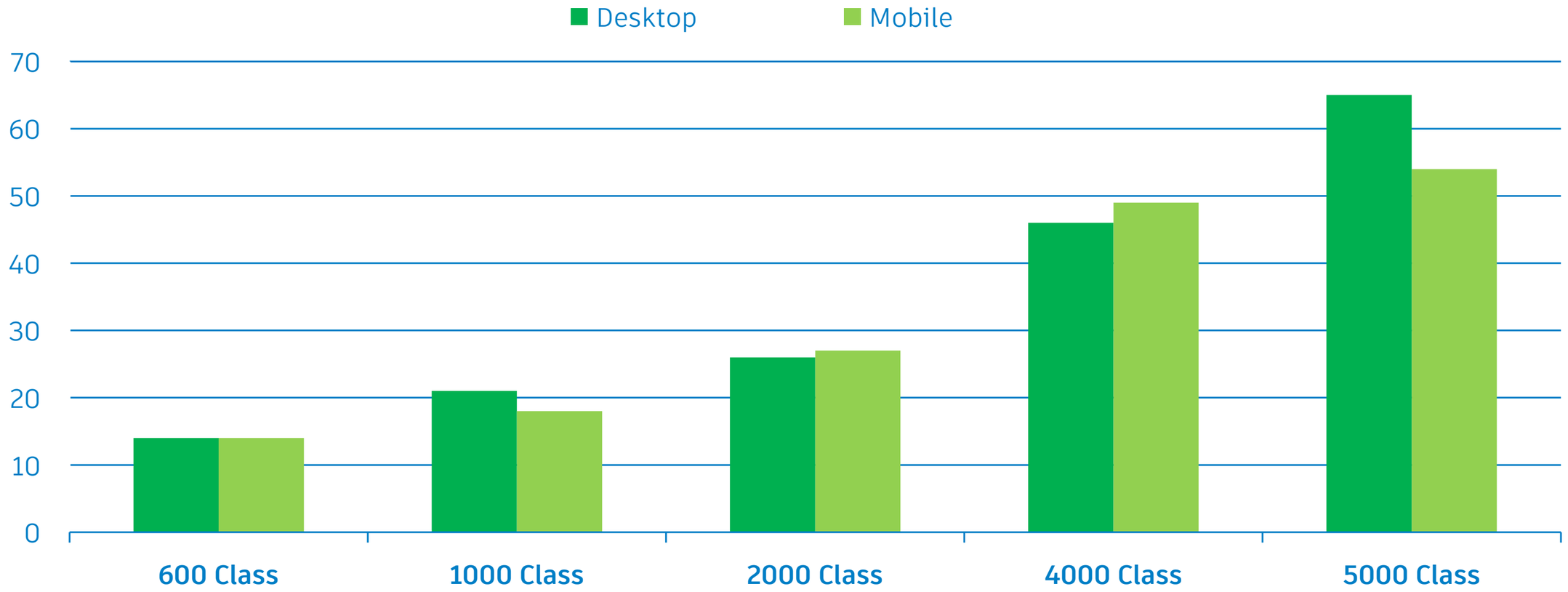
NVIDIA Quadro P4000

GPU ARCHITECTURE	Pascal
CUDA CORES	1792
MEMORY CAPACITY	8 GB GDDR5
VR Ready	Yes
DISPLAY CONNECTORS	4x DP 1.4
DISPLAY SUPPORT	4X 4096x2160 @ 120Hz 4X 5120x2880 @ 60Hz
FORM FACTOR	Single Slot

NVIDIA Quadro P2000

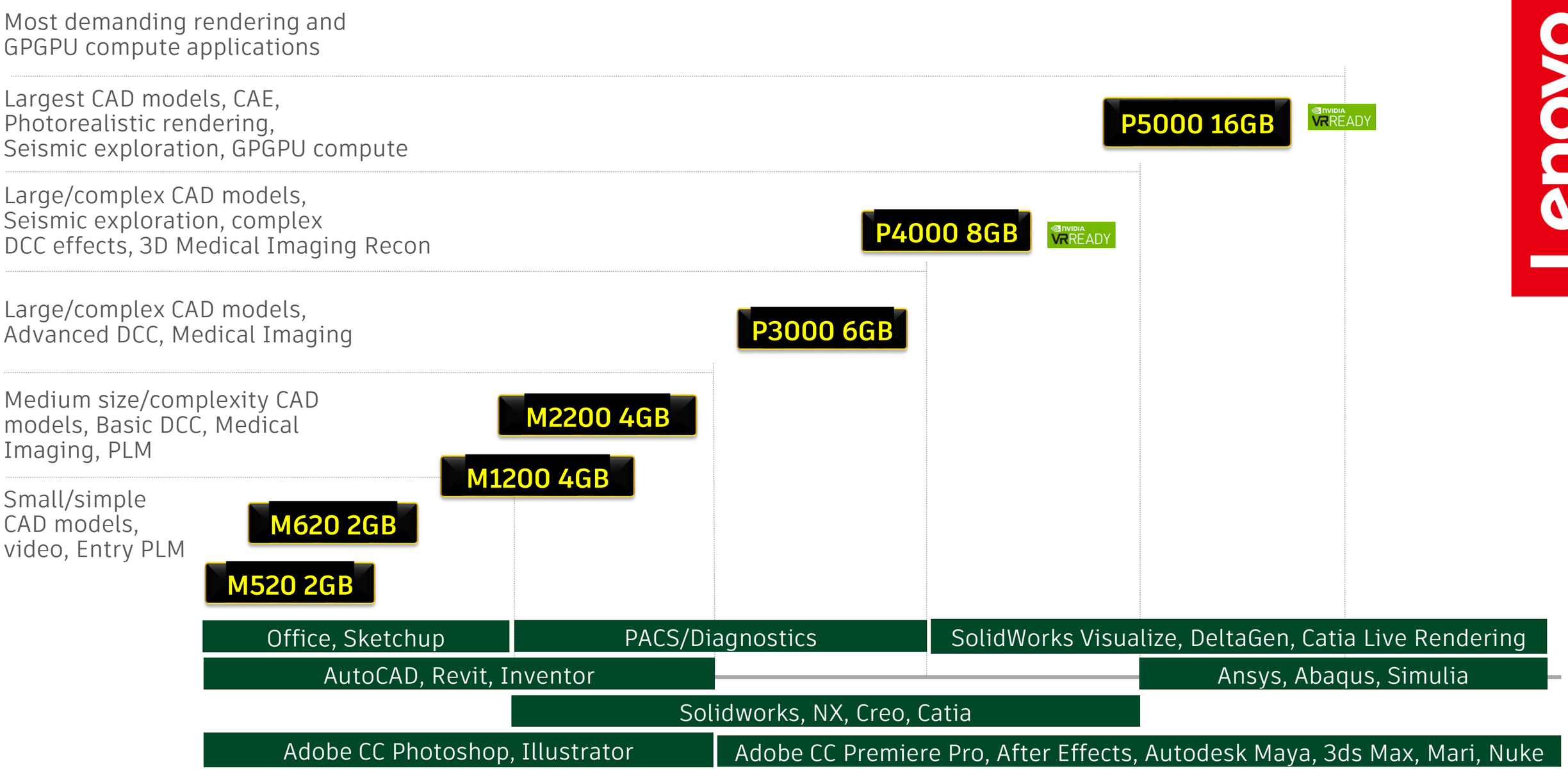
GPU ARCHITECTURE	Pascal
CUDA CORES	1024
MEMORY CAPACITY	5 GB GDDR5
VR Ready	No
DISPLAY CONNECTORS	4x DP 1.4
DISPLAY SUPPORT	4X 4096x2160 @ 120Hz 4X 5120x2880 @ 60Hz
FORM FACTOR	Single Slot

Convergence in Performance



SPECviewperf 12 Benchmark

NVIDIA Mobile Quadro Products



QUADRO: The #1 Choice For Professionals

PERFORMANCE

- Application specific feature development & tuning
- Driver optimizations to maximize GPU features
- Unique features to support pro workflows
- IT tools for easy deployment & management

RELIABILITY

- Application specific testing by NVIDIA
- 100+ professional application certifications by ISVs
- Certified across workstation platforms by leading OEMs
- Unified rock-solid driver with deterministic release schedule
- Designed and built by NVIDIA to a single specification for 24x7 reliability & stability

SUPPORT

- Deep workflow experience across vertical industries
- Long-Life Cycle availability and support
- Bulk availability for large Enterprises
- Global technical pre-sales and post-sales support


NVIDIA
VRREADY
NVIDIA
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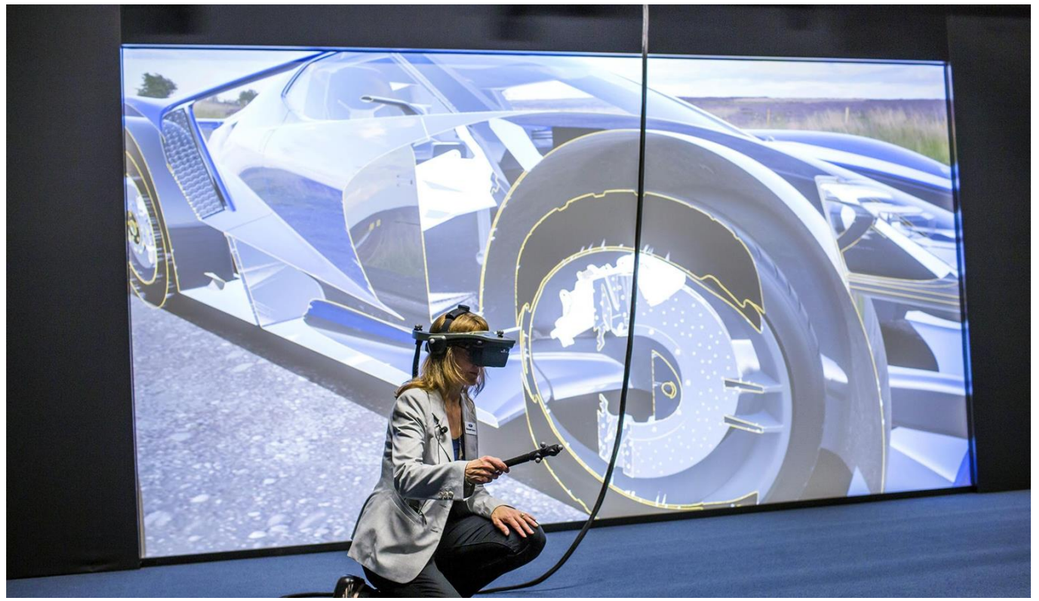
ProVR Solutions

VR Experiences

360 Degree Panoramic

Immersive VR



VR Performance Demands

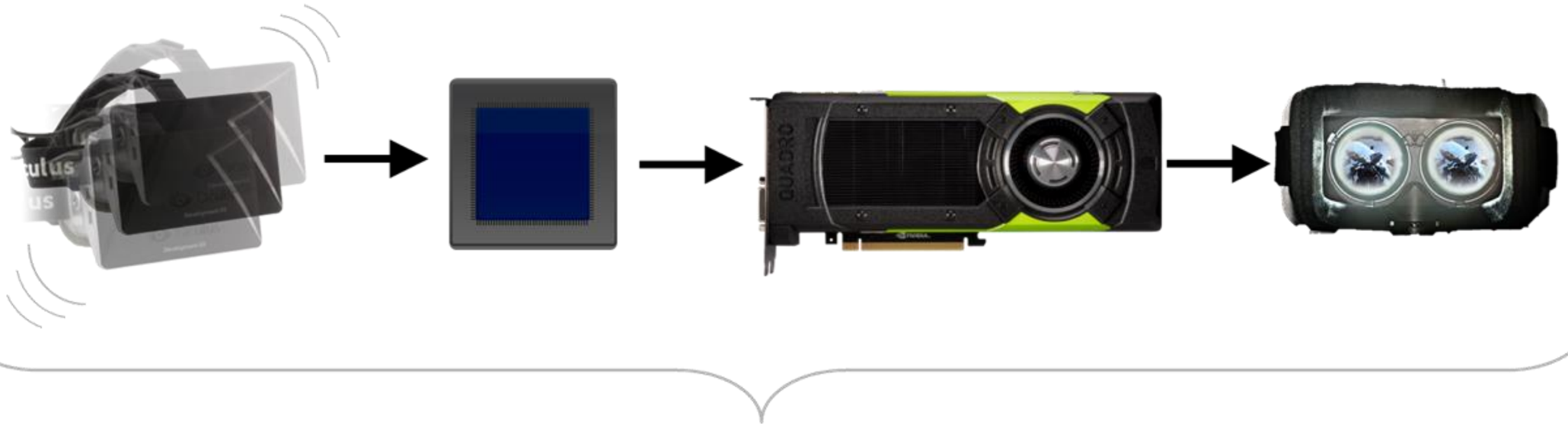
TRADITIONAL = 60 MP/S
(1920 X 1080 @ 30 FPS)

VIRTUAL REALITY = 450 MP/S
(3024 X 1680 @ 90 FPS)*

**VR render resolution*

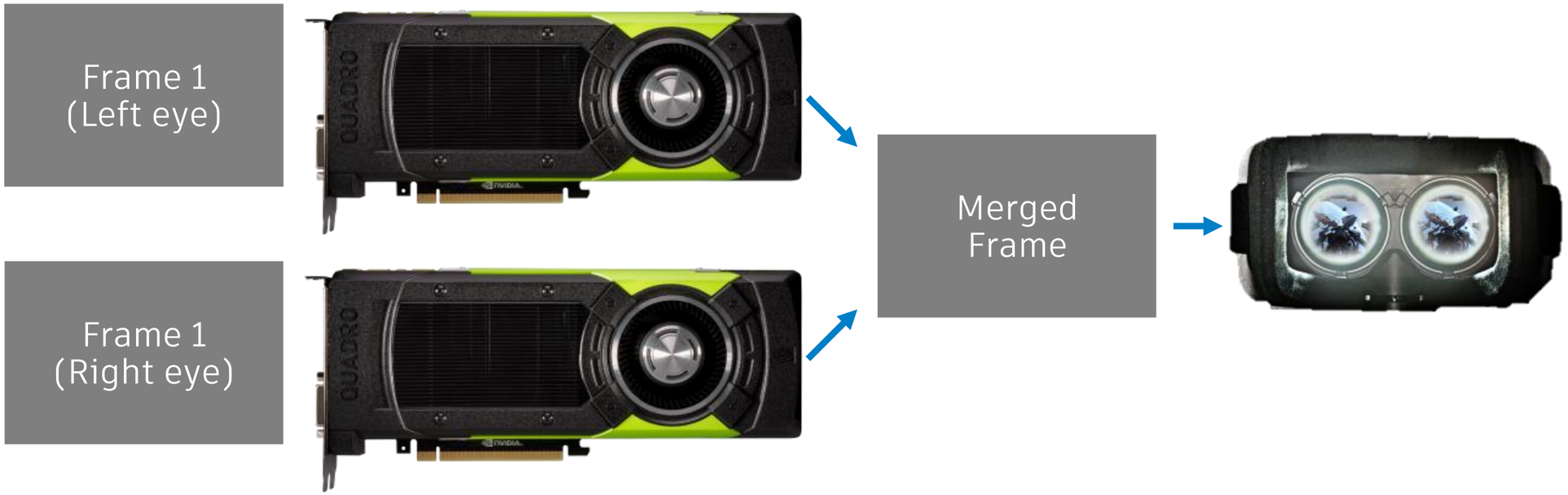
7.5x Increase!

Ultra-Low-Latency



Motion to Photon: ≤ 20 ms

VR Works – VR SLI

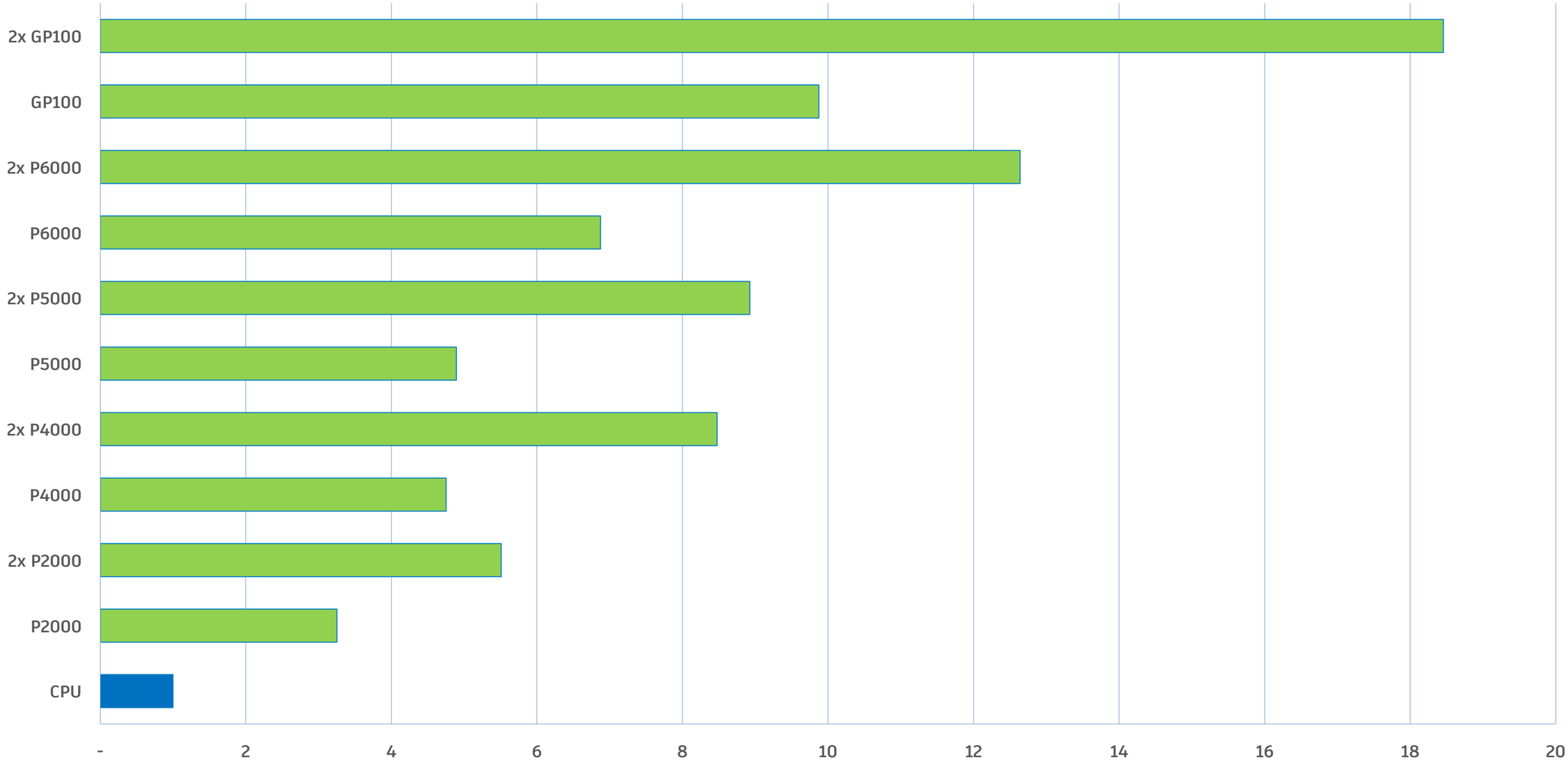


Scales Performance Across 2x GPUs

GPU Rendering

- Use NVIDIA Quadro GPUs for Immense Ray Trace Performance
- Scale Multiple GPUs & Frame Buffers for the Highest Visual Quality Results
- *Up to* Near Real-Time Results

Render Time Ratio – GPU vs. CPU

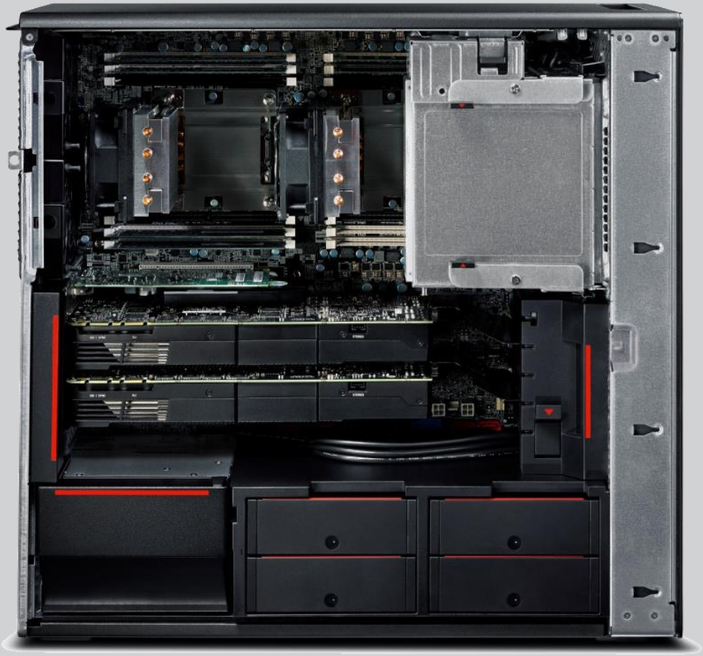


CPU = Intel Xeon E5-2697 V3, 14 cores 2.6Ghz, 32GB RAM, Win 7 64Bit SP1, driver version 375.86

ThinkStation GPU Support

ThinkStation P510

ThinkStation P710



ThinkStation P910

Configuring a Workstation – Storage & I/O

Storage

- Two Different Types of Data Storage Technology

  Spinning Platter & Solid State Disk Drives

- Seven Different Types of Data Storage Interface/Sub-System Technologies

  SATA HDD (Spin) – 7.2K & 10K – Low Cost & High Capacity

  SATA SHHD (Hybrid) – 7.2K + SSD Cache – "Above" + Good Performance

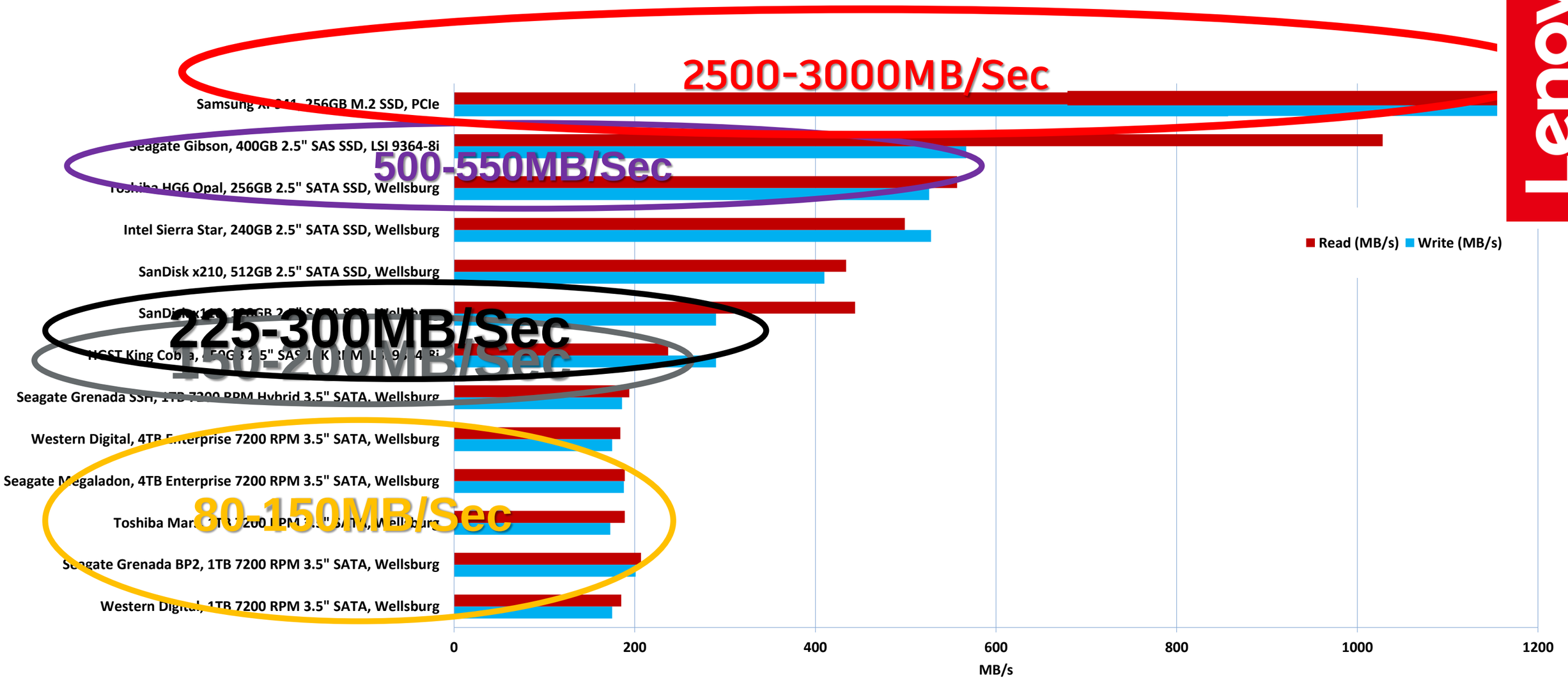
  SAS HDD (Spin) – 15K ~ Aging Standard, Good Performance & Full Duplex

  SATA SSD (Solid State) – Standard Workstation Technology

  PCI-E SSD (AHCI) – Cutting Edge Technology

  PCI-E SSD (NVMe) – ***Bleeding Edge Technology***

Optimised Storage

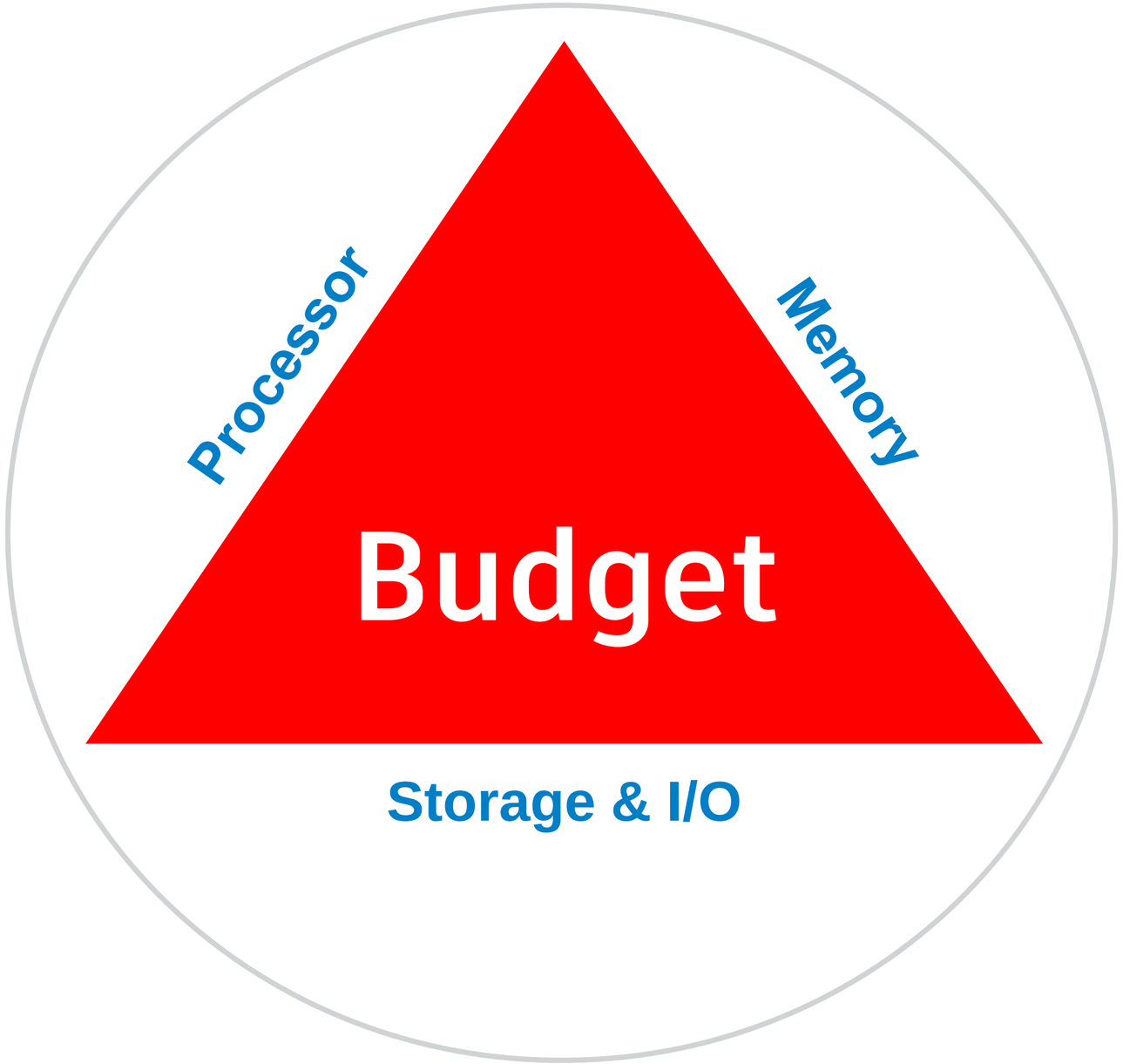


Optimised Storage

- System Base - Operating System
  - *Solid State – SATA or PCI-E*
- Application - Cache/Scratch Disk
  - *PCI-E/SATA SSD – RAID 0*
- RAW Data - Project Archive/Storage
  - *7.2K HDD (SATA)*
  - *RAID 1 or 5*

The Results

The Results



Graphics

Project Size/Complexity

Lenovo Desktop Workstations

NVIDIA VRREADY

Platform:	ENTRY (1S)	MAINSTREAM (1S)	HIGH-END (2S)
Processor:	Intel® Xeon® E3	Intel® Xeon® E5 16xx / 26xx v4	
Socket:	Socket H	Socket R3	
Chipset:	Kabylake	Broadwell	

ThinkStation

Lenovo Laptop Workstations

	P40 Yoga	P51s	P51	P71
		 Ultrabook		
Size/Weight:	14” IPS – 1.76kg	15.6” IPS – 2.16kg	15.6” IPS – 2.56kg	17.3” IPS – 3.46kg
Resolution:	1920 x 1080	1920 x 1080 (FHD) w or w/o Touch / 3840 x 2160 (4K/UHD) >100% sRGB		
Processor:	Intel Core i7 2C - Skylake	Intel Core i7 2C - Kabylake	7th Gen. Intel Core i7 HQ / Intel Xeon E3 15xx v6	
Graphics:	NVIDIA Quadro M500 2GB	NVIDIA Quadro M520 2GB	NVIDIA Quadro M12/2200	NVIDIA Quadro P3/4/5000
Spec:	16GB + 2.5” SSD	32GB + 2.5” or NVMe SSD	64GB + 2.5” + 2x NVMe	64GB + 2x 2.5” + 2x NVMe

ThinkPad

NVIDIA VRREADY

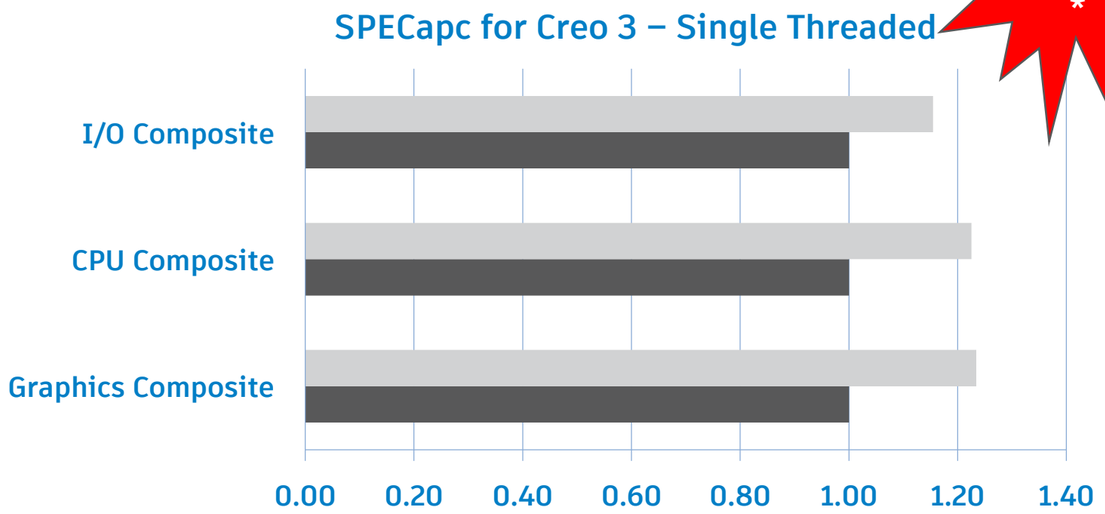
Lenovo Performance Tuner

Improve your Performance Experience

- Customize Resources Affinity by SW Application
- Customize Graphical Settings
- Manage your Power Settings

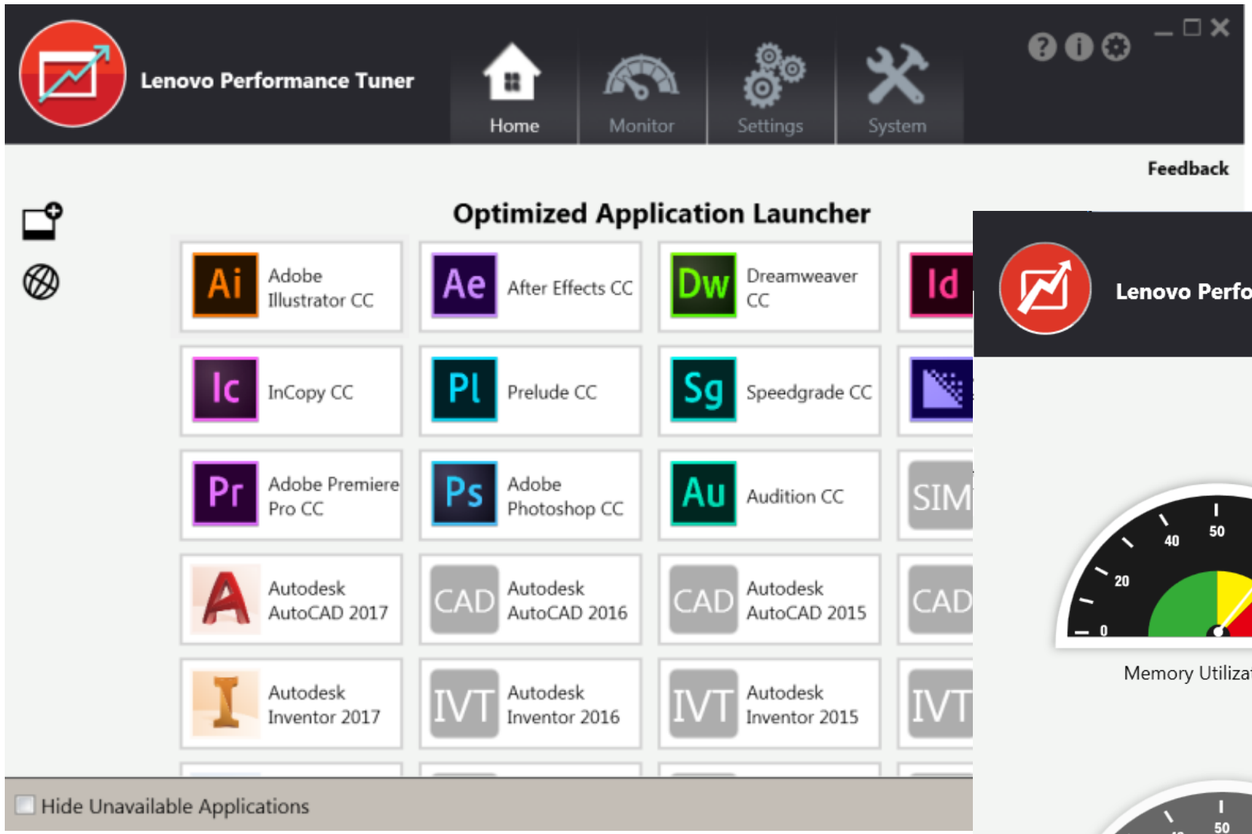
Monitor your Resources

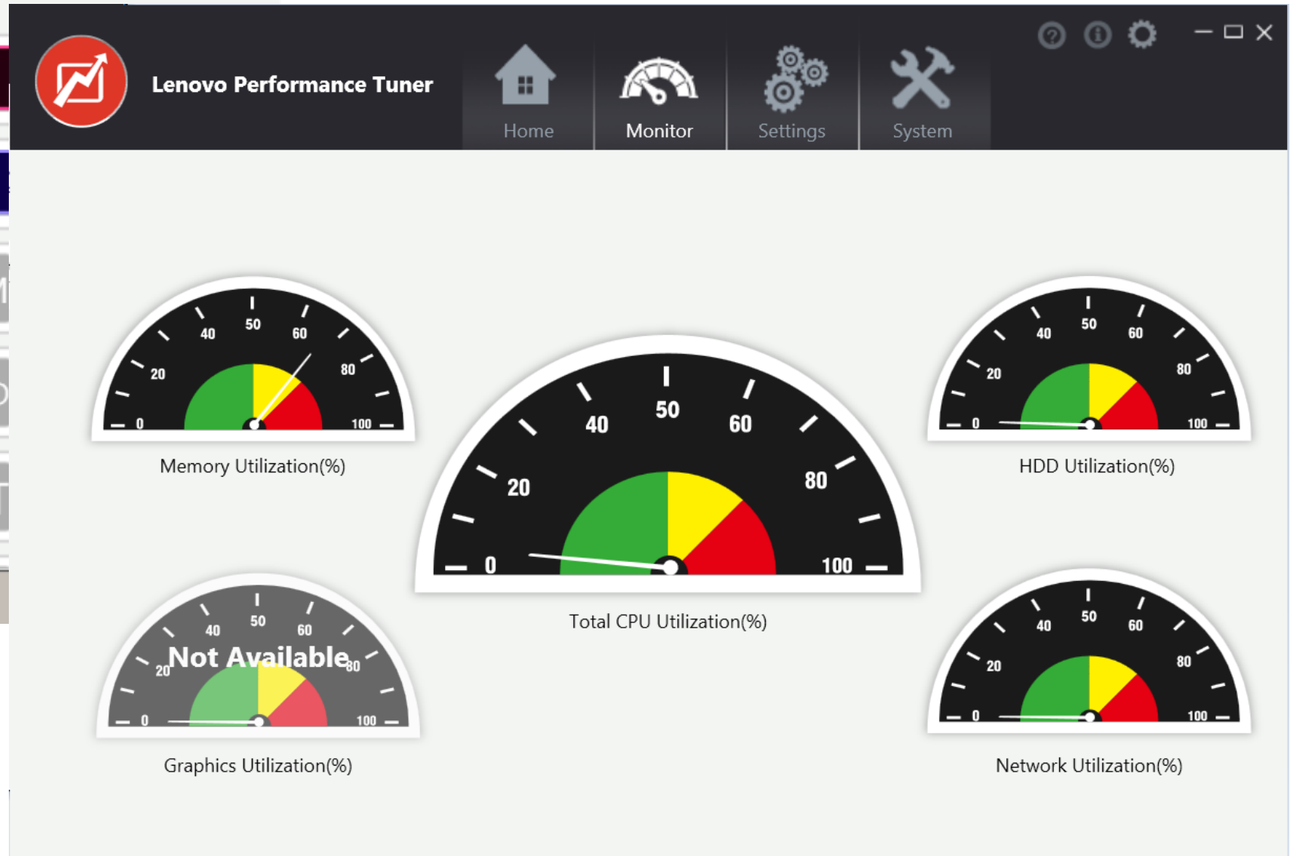
- No more bottlenecks holding you back!



20% better *

Lenovo Performance Tuner





http://support.lenovo.com/gb/en/downloads/ds105193

ThinkStation P320 Tiny

NEW

World's Smallest Professional Workstation!

- Tiny 1L Workstation
- NVIDIA Quadro® P600 2GB Professional Graphics
- 6x Display Port Outputs (4x mDP + 2x DP)
- Intel Core i7 Quad-Core Processor
- Up to 32GB DDR4 Memory
- 2x M.2 NVMe SDDs
- Full VESA Mount for AIO ThinkVision Solution

Awesome Inventor 3D CAD & Fusion Hub!

NVIDIA

AUTODESK® INVENTOR®

AUTODESK® FUSION 360™

ThinkStation

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ThinkPad P71

VR Ready Mobile Workstation!

- Intel Xeon E3 Quad-Core Kabylake CPU
- Up to 4.2GHz Clock Speed!
- Up to 64GB of DDR4- ECC Memory
- NVIDIA Quadro® Pascal GPUs
- NVIDIA ProVR Ready
- 17” 4K Display 100% sRGB Accurate
- Built-In Colour Calibration
- High-Performance NVMe SSDs

Powerful, Portable Performance

NVIDIA VRREADY

ThinkPad

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Lenovo

ThinkStation P320 TWR

Our Fastest Professional Workstation!

- Up to 4.5GHz Quad-Core Processor
- Up to 64GB DDR4 Memory
- *Up to* NVIDIA Quadro® P4000 Graphics
- High-Performance NVMe SSDs
- Flex Bay Storage for Scalability
- Low Noise 25L Desktop Chassis

Awesome Revit 3D AEC Workstation!

NVIDIA VRREADY

AUTODESK REVIT

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ThinkStation P910

Our Most Powerful Workstation!

- 2x Intel Xeon E5 26xx v4 CPUs
- Up to 44x Cores (88x Threads)
- Up to 2TB of DDR4- ECC Memory
- NVIDIA Quadro® P6000 GPUs
- Supports up to 4x GPUs
- High-Performance NVMe SSDs
- Modular & Tool-Less Chassis Design
- Desktop or Rackmount Design

Amazingly Powerful Rendering Workstation!

NVIDIA VRREADY

AUTODESK MAYA®

AUTODESK® 3DS MAX®

AUTODESK®

Make anything.