The Power of Architecture & Design

MSI Mobile Workstation

ABOUT MSI MOBILE WORKSTATION

MSI is the leading brand in mobile workstations, with the new generation Intel® processor and NVIDIA® Quadro RTX™ graphics card, able to match workstation desktops in both performance and features. The mobile workstations are designed as light and compact as possible for better portability, while providing a long 8 hour battery life. Over 90% of our mobile workstation series are ISV-certified and compatible with most applications, while the built-in Creator Center software provides settings that optimize work processes with a single click. With high-quality design meeting US defense standards (MIL-STD) to provide the durability for you to swiftly and smoothly process complex designs and workflows. MSI Mobile Workstations are perfected for professionals in architecture, engineering, and construction (AEC) fields.

Content

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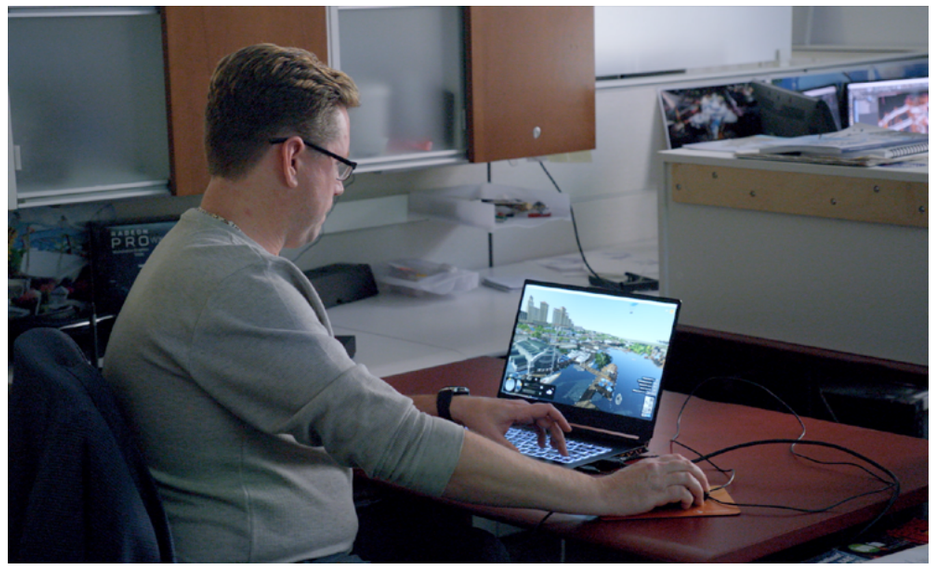
After School (Renai Yeh's House)



Design Trends

An overview of MSI Mobile Workstations within the scope of the architecture and landscape industry

Creative Group / HIYORI Design

Bringing designs stemming from the heart with personal use in mind and seeking to flourish together with nature.

Over the past decade, Creative Group has broken down and analyzed what people look for in spaces, and designed one living space after another filled with wonderful aspects that originate from the heart. They give meaning and breathe life into spaces by imbuing personal stories within the architecture, bringing warmth and in turn hoping to elicit emotions. Ultimately, Creative Group sets out with a vision where humans can coexist with nature.

www.creative-group.com.tw

Building Information Modeling (BIM) is a crucial delivery method for design information — ranging from architectural, civil engineering, structural, mechanical, construction, appraisals, and construction schedule planning — within the international architecture industry. To cooperate sufficiently, visualization of design information is essential and as a result, large projects require a workstation that is both powerful and stable. This is the reason that the workstation product series was born.

MSI Mobile Workstations expands from the basics of a workstation but with the addition of the "mobile" element; an ambitious attempt at innovation. In the past, workstations mainly consisted of designs centered on desktop systems to pursuit of performance and stability; ensuring that no errors would occur even under prolonged heavy computational workloads. Over the years, MSI has achieved unparalleled success in the gaming laptop industry with efforts put into the consistent quality of performance and system stability. The Mobile Workstation series are able to make its debut through the valuable expertise and experience that MSI has gained over the years. Now, more designers are able to create freely outside of traditional office workspace for creative flow and visual communication.

Many large architectural designs are completed through Autodesk® Revit®, one of the international BIM indexes. For instance, the project designs of BMW Welt in Munich, Germany; the Mercedes-Benz Museum in Stuttgart; and the Porsche Museum also in Stuttgart all were completed using Revit®. Within the Taiwanese architectural design environment, the government also actively promotes the usage of BIM, with many designers utilizing Revit® for their designs. The AEC community often also uses SketchUp in lieu of Revit® for their professional BIM software needs. SketchUp effectively speeds up the design modeling process. However, visual communication is still an important aspect of the design process, and that is where Lumion, a visual communication software used by over 60 of the top 100 international architectural designers comes in to play helping designers and proprietors communicate effectively. Next, we will showcase the benchmarks of the three mainstream design software tools on MSI Mobile Workstations!

We are honored to be able to invite Creative Group/HIYORI Design, renowned Taiwan architectural and interior design group, to participate in evaluations and testing of MSI Mobile Workstations. We wish to convey to the readers through actual projects how MSI Mobile Workstations can be beneficial to designers in practice.

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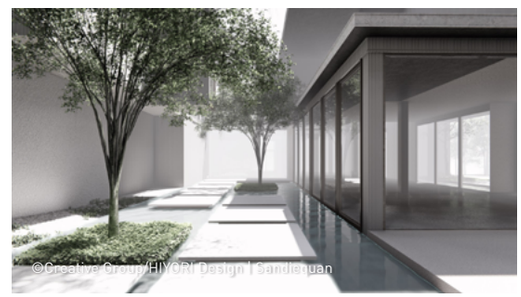

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Performance is the product of well-matched software and hardware

Can common home or work computers be used in design related work? The answer is a definitive yes, but luck would often be a factor. Take a home-built gaming desktop computer as an example: if the setup uses an i9-9980EX (TDP 165W) CPU, 64GB (16GB*4) RAM, 512GB M.2 SSD, GeForce RTX-2080 Ti (250W)(with a max power consumption of 500W), and a 650W 80 Plus Bronze PSU (with an actual efficiency of around 520W) initially things might run smoothly, but as time goes on, a high stress environment with extended periods of usage and high temperatures would deteriorate power supply related components that don't adhere to higher standards (cost considerations) and result in a drop in power output. A threshold (insufficient power supply) is usually reached after prolonged usage and the instability of the system results in various problems such as system crashes and more. The warranty for the components has typically just expired, and now you have nobody you can turn to. Your progress is stopped dead in its tracks, and you have clients breathing down your neck. It goes without saying that this is a worst-case scenario that professional designers hope that they never have to encounter.

By using a dedicated workstation, where all system hardware undergoes rigorous testing, one can prevent the aforementioned incidents from happening. For instance, the MSI WS75 9TL with a Xeon E-2286M (TDP 45W) CPU, 32GB (16GB*2) RAM, PCIe NVMe 512GB SSD, Quadro RTX 4000 Max-Q (TDP 80W), and a 4-Cell Li-Polymer+230W PSU that we will be testing this time has more than double the power supply backup capacity. The system has also passed MIL-STD 810G testing standards and is highly adaptive to extreme temperatures, pressure changes, vibrations, shock, and dust. The MSI WS75 9TL can effectively prevent various unforeseen circumstances from happening and still maintain stability while running at peak performance.

In addition to rigorous hardware quality testing, MSI workstations are also Independent Software Vendor (ISV) certified, including software such as Autodesk® Revit® 2019, SOLIDWORKS® 2019, ANSYS 18.2, Siemens NX11, SketchUp 2019, Autodesk® 3ds Max®, Autodesk® Maya®, KeyShot, and more. Not only does this lessen the probability of software operation errors, but also a safeguard towards meeting deadlines on time.

MSI Creator Center

With the MSI Creator Center, you can optimize commonly used software—including SolidWorks, CATIA, AutoCAD, ANSYS, and more1. Additionally, the four preset mode settings (customized, balanced, silent, power saver) can fulfill different performance needs.

ISV-Certified

Designers are guaranteed a responsive and stable working environment. All systems within the product series have been certified by software vendors from various AEC, mechanical engineering, automobile design, media & entertainment, and other industries.

Rigorous Environmental Testing

MSI workstations are sturdy, durable and suitable for any type of environments. The systems have passed a series of MIL-STD 810G tests that include dust, vibration, shock, extreme temperatures, and other various tests in harsh environments.

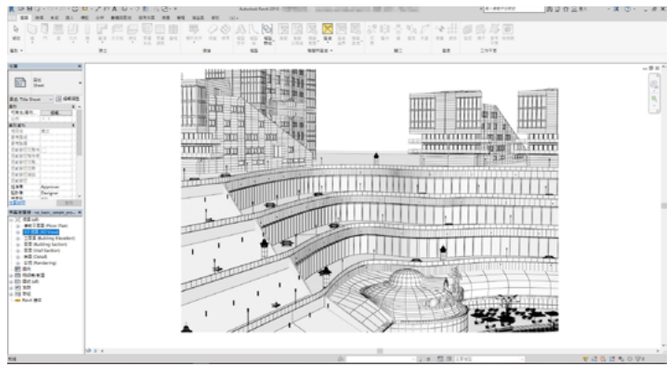
SolidWorks 2019	Maya 2019	Sketchup 2019
CATIA VR-6R2017	Revit 2019	PTC Creo 5.0
3ds Max 2019	Alias AutoStudio 2019	Siemens NX 11
AutoCAD 2019	VRED Pro 2018	Solid Edge 2019
Inventor 2019	Moldflow Insight 2018	ANSYS 18.2
Rhinoceros 6	Keyshot 7	

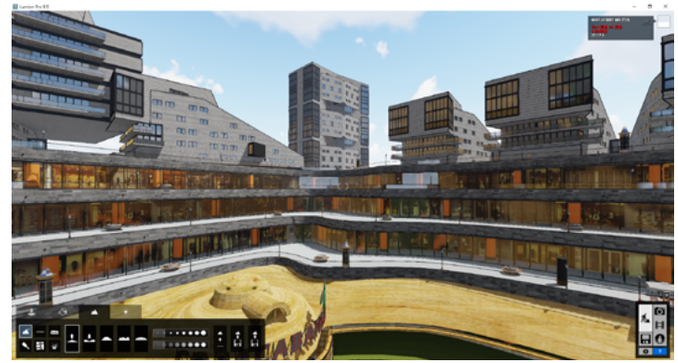
Note: A list of ISV-certified software available for optimization

Application in Design Projects and Reviews

MSI Mobile Workstation in the architectural landscape industry

Autodesk®Revit® is a software that is capable of supporting online collaboration. In order to be more align with the project design characteristics of BIM, the software encompass a wide range of content ranging from architectural design, civil engineering, electrical and mechanical engineering, plumbing, construction scheduling, and appraisals that can all be completed on the same platform. Due to the uniqueness of the software design, Autodesk®Revit® requires support from a massive library. Every element from beams, columns, bricks, doors, windows, and even plumbing will need to be read from the Autodesk®Revit® library. One floor of a design project could possibly encompass thousands of objects, so a stable internet connection and fast hard drive are important. For example, the size of the project file that is 163MB and simulates multiple large mixed-use buildings, the whole scene consists of more than 100 million 3D vertices and can be considered a complex project. After loading the file on the six systems that will be participating in the test, we changed the scene to 3D preview mode in Autodesk®Revit®. Display performance remained smooth during operations and there were no significant discrepancies between systems. It could be due to the performance requirements of a single floor plan not being as intensive. When 3D live syncing the model to a Lumion environment, performance differences became more noticeable. One floor of the scene consists of around 3.3 million 3D vertices, and the WS75 9TL with a Xeon E-2286M and RTX4000 came out on top in regards to display performance at 83 FPS (frames per second). A 60 FPS display performance is already quite remarkable.



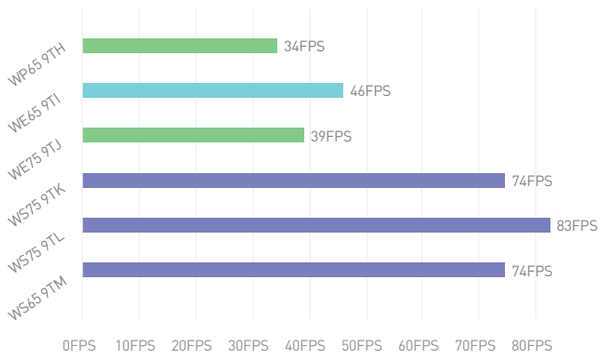


Rendered Simulation / Left Revit / Right Lumion

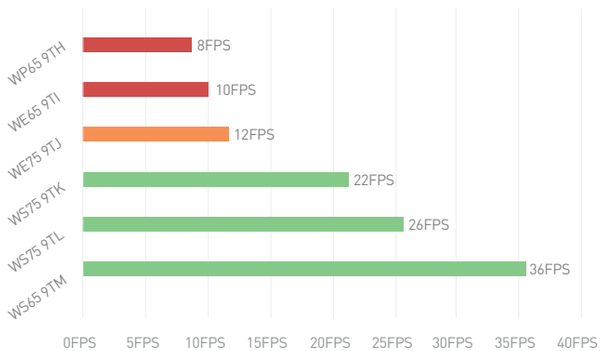
After coming up with a rough design of an architecture, SketchUp is required for further visual integration. This include building surrounding outdoor landscape, integrating building models, constructing an interior design point view, or rendering photorealistic visualizations. By using SketchUp, one could make sure that the project is heading in the direction originally intended and that the overall feeling and functionality of the project is up to par with design requirements. With around 100 million 3D vertices in the scene being used for testing, performance differences are significantly noticeable in SketchUp. All four models have an i7-9750 CPU, but the GPUs range from basic to advanced models with a 3.5 times difference in display performance. The other two models may have a stronger CPU, but there is no evident contribution in improving display performance. That is because the main function of the CPU is to load the data of a file to memory. This is a sequential job, so when your budget is limited, choosing a high frequency CPU with fewer cores would be more beneficial to everyday work.

Rendered Simulation / Left SketchUp / Right Lumion

Revit + Lumion Real-time Display / Scene Vertices: 3.3M



SketchUp + Lumion Real-time Display / Scene Vertices: 108M



Refresh Rate Description

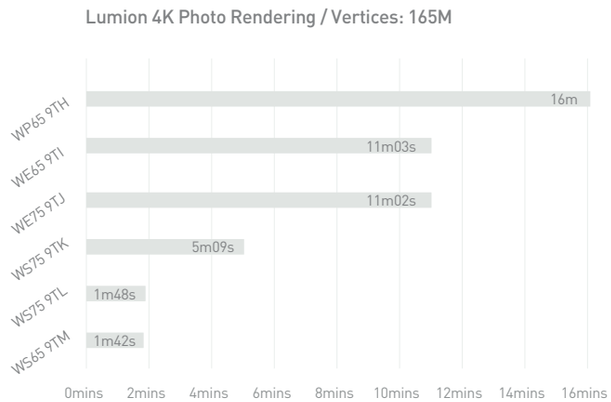
- Delayed: 1-10 FPS
- Normal: 11-20 FPS
- Smooth: 21-40 FPS
- Outstanding: 41-60 FPS
- Exceptional: 60 FPS and above

> **The MSI Mobile Workstation series provide a stable, smooth, and highly portable editing environment for Revit® projects.**

SketchUp is a software commonly used in the interior design industry. It is without doubt that the professionalism and value of architects lie in creating a relaxed and comfortable space for the people living inside and in striking a balance between personal spaces and interpersonal interactions. The medium-sized test scene is comprised of 33 million 3D vertices. While the number of vertices is not overly large, the indoor lights in the scene consume a large amount of hardware resources during instant rendering when syncing to Lumion. With a resolution of 1920*1080, the best performance measured was with the WS75 9TL at 11 FPS, which was quite a surprising result. The results of our tests indicate that a powerful CPU with a GPU that is one tier below provides the best real-time display performance. This proves that it is important to find matching CPUs and GPUs to achieve the best overall performance.

Rendered Simulation / Left SketchUp / Right Lumion

After the design process is completed, usually a photorealistic 3D simulation with shaders is rendered using software to create an authentic demonstration of the overall atmosphere. GPU rendering has been gaining popularity in the industry in recent years, and many conventional enterprises as well as startups have delved into its research and development. In addition to real-time display, Lumion also provides photo rendering and animation output functions. In this review, we measured performances of real-time display and 4K photo rendering in a large architecture scene with 165 million vertices as well as 4K photo rendering and animation output for a 90-second (2706 frames) Full HD video in an indoor scene with 33 million vertices. The performances are compared based on the time required to complete rendering. In the large architecture scene, sunlight was the only light source and rendering shaders was therefore relatively simpler. The WS75 9TL and WS65 9TM tied for first place in the real-time display category, and WS65 9TL outperformed other competitors in 4K photo rendering by one minute and forty-two seconds. However, it is a different story regarding the indoor scene. As the sources of light increased, WS75 9TL achieved best performances in both photo rendering and animation output. It can be seen that a better CPU performance is required when rendering scenes with complicated shader settings.



The RTX 5000 graphics card in WS65 9TM has an exceptional real-time performance in processing large-scale scenes, the one and only choice among all high performance and thin mobile workstations for designers working with SketchUp and Lumion.

Review Project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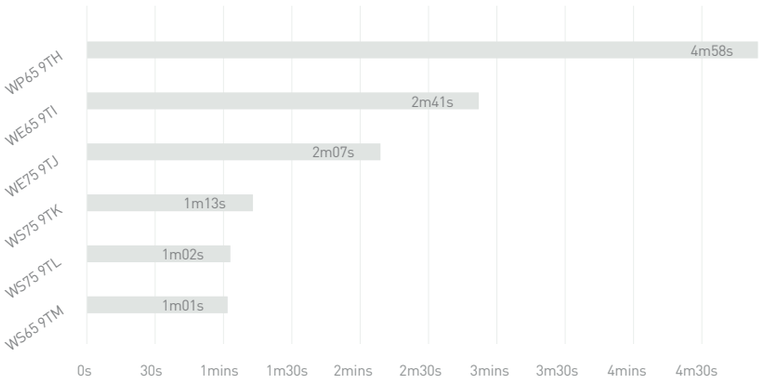
4K Photo Rendering / Vertices: 33.8M



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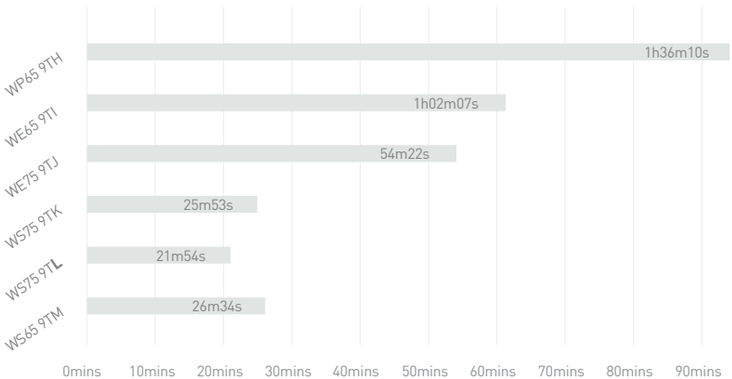
FHD Animation (2706 Frames) / Vertices: 33.8M



A couple conclusions can be made from the above review results and designer feedback. First of all, our designers compared desktops currently available in the market with WS75 9TL (refer to the next page for detailed specifications). **The results indicate that WS75 9TL outperforms desktops by 20% to 30% in terms of smoothness of operation in real-time display for large architecture scenes.** As graphics cards in both computers are based on TU106 GPU and have almost the same specifications, the possible reason is that the Quadro RTX 4000 boasts a superior performance in vector graphics rendering and provides better rendering and data accuracy (equipped with ECC memory) than an RTX 2070 does. For large-scale projects, choosing a professional graphics card is definitely the right decision to make. Secondly, although a high-performance graphics card results in a better display quality in scenes with simple light sources, it takes a better CPU to fully utilize the potential of the GPU when processing scenes with complicated light settings. Finally, all of the six MSI Mobile Workstation products ran smoothly during the test. No programs crashed (unexpected shutdown) or system errors (blue screens) were observed during operations and the rendering processes. This proves that the products have been specifically designed and fine-tuned to ensure system stability. Even if equipped with Core i7 CPUs, the MSI Mobile Workstation will still put up a decent performance, but it is still recommended to use Xeon CPUs and Quadro RTX graphics cards to achieve optimal overall performance.

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Creative Group/HIYORI Design
Model: WS65 9TM

- GPU: Quadro RTX 5000 16GB GDR6
- CPU: i7-9750H
- Memory: 32GB (16GB x 2)

Johnny Lu

Creative Group / Deputy Director

> With MSI Mobile Workstations,
> we seldom encounter lag or delays.
> It is definitely a great choice.

What is most attractive to you in interior design?

Interior design integrates several elements that I personally like. Interior design is closely connected to people, and you can let your creativity flow. Whether it is about designing a residential space, a commercial space, or an office, I hope to create a space where people are connected with each other and able to enjoy life.

The core value of your brand HIYORI Design is "Creating a space of happiness." How do you convey this value through your creations?

In design, we must consider whether the arrangement of a space is able to foster interactions between people. The advancement in technology undoubtedly has made life more convenient, but it also has led to a gap among people. We hope to turn over this indifference stemming from technology through designs and create a harmonious atmosphere. For example, when I design rooms for children, I prefer not to place a desk in the room because I want children to study in an open space such as at a dining table or a work table. Even if family members are not talking to each other, they are connected together in this open space.

Can you share with us how you communicate with your clients?

The first step is to let our clients get to know us and gain their trust. Next, we take our clients' needs and incorporate them as the cornerstones of our designs. Throughout the communication process, we try to find out what a client values, and these values will be the core of the whole design service. Some clients value cost efficiency, while others look for luxurious building materials. Only when we understand what our clients value can we proceed to the design process and begin subsequent works.

This is your first time using an MSI Mobile Workstation. What features are most appealing to you?

First of all, I would like to specifically recognize the graphics card for its exceptional performance. I seldom encounter lags or delays in either the operating or the rendering process. In addition, the workstation has an elegant design in line with contemporary aesthetics. While taking the workstation out at work, it looks both fashionable while still being professional. Another advantage of the product is that it is thin, light, and easy to carry. It is definitely a great option among all mobile workstation products.

WP65 9TH

WE65 9TI

WE75 9TJ

	WP65 9TH	WE65 9TI	WE75 9TJ
Best for	Junior architects/interior designers	Junior architects/interior designers	Junior and senior architects/interior designers
Revit + Lumion Scene Vertice: 13,700	Refresh rate maintained at around 34 FPS. Suitable for regular projects and team collaboration.	Refresh rate maintained at around 46 FPS. Suitable for regular projects and team collaboration	Refresh rate maintained at around 39 FPS. Suitable for regular projects and team collaboration.
SketchUp + Lumion Scene Vertice: 108 million	Suitable for regular projects and team collaboration.	Suitable for regular projects and team collaboration.	Suitable for regular projects and team collaboration.
Lumion Render Scene Vertice:165 million	4K photo rendering managed at 16'02". Suitable for rendering regular projects.	4K photo rendering managed at 11'03". Suitable for rendering regular projects.	4K photo rendering managed at 11'02". Suitable for rendering regular projects.
Specification	• GPU: Quadro P620 4GB GDDR5 • CPU: i7 -9750H • Memory: 16GB (16GB x 1) • Panel: FHD • Storage: PCIe NVMe 256GB SSD x1 + 1TB HDD	• GPU: Quadro T1000 4GB GDDR5 • CPU: i7 -9750H • Memory: 16GB (16GB x 1) • Panel: FHD • Storage: PCIe NVMe 256GB SSD x1 + 1TB HDD	• GPU: Quadro T2000 4GB GDDR5 • CPU: i7 -9750H • Memory: 16GB (16GB x 1) • Panel: FHD • Storage: PCIe NVMe 256GB SSD x1 + 1TB HDD

Refresh Rate Description ● Delayed: 1-10 FPS ● Normal: 11-20 FPS ● Smooth: 21-40 FPS ● Outstanding: 41-60 FPS ● Exceptional: 60 FPS and above

Why Quadro Professional Graphics Cards?

This is a question many designers have asked. Why do they need a professional graphics card (Quadro)? The main reason is that architecture and interior design projects often involve simulations such as light, wind, heat, or structural capacity. In this context, floating point accuracy is especially crucial. It is worth noting that gaming graphics cards have a floating accuracy far lower than that of professional graphics cards. Furthermore, gaming graphics cards usually do not feature ECC memory, and this leads to a higher probability of rendering error. Simulations involve continuous rendering, and a tiny deviation in each process can lead to a catastrophic result in the end.

In addition, professional graphics cards are optimized for vector graphics rendering. During this review, our designers indicated that when comparing the real-time display performance between RTX 2070 and RTX 4000 in the same large architecture scene (with 165 million vertices), RTX 4000 outperformed RTX 2070 by 20%. It is suggested that we save gaming graphics cards for gaming, and select professional graphics cards for design projects.

	 WS75 9TK	 WS75 9TL	 WS65 9TM
Best for	Junior and senior architects/interior designers	Expert architects/interior designers	Expert architects/interior designers
Revit + Lumion Scene Vertice: 13,700	● Refresh rate maintained at around 74 FPS. Suitable for large projects, team collaboration, and overview of a project.	● Refresh rate maintained at around 83 FPS. Suitable for large projects, team collaboration, and overview of a project.	● Refresh rate maintained at around 74 FPS. Suitable for large projects, team collaboration, and overview of a project.
SketchUp + Lumion Scene Vertice: 108 million	● Refresh rate maintained at around 22 FPS. Suitable for large projects, team collaboration, and overview of a project.	● Refresh rate maintained at around 26 FPS. Suitable for large projects, team collaboration, and overview of a project.	● Refresh rate maintained at around 36 FPS. Suitable for large projects, team collaboration, and overview of a project.
Lumion Render Scene Vertice:165 million	4K photo rendering managed at 5'09". Suitable for rendering large projects.	4K photo rendering managed at 1'48". Suitable for rendering large projects.	4K photo rendering managed at 1'42". Suitable for rendering regular projects.
Specification	• GPU: Quadro RTX 3000 6GB GDDR6 • CPU: i9-9880H • Memory: 32GB (16GB x 2) • Panel: FHD • Storage: PCIe NVMe 512GB SSD (256GB x 2)	• GPU: Quadro RTX 4000 8GB GDDR6 • CPU: Xeon E-2276M • Memory: ECC 32GB (16GB x 2) • Panel: FHD • Storage: PCIe NVMe 512GB SSD (256GB x 2)	• GPU: Quadro RTX 5000 16GB GDDR6 • CPU: i7 -9750H • Memory: 32GB (16GB x 2) • Panel: 4K • Storage: PCIe NVMe 1TB SSD (1TB x1)

Refresh Rate Description ● Delayed: 1-10 FPS ● Normal: 11-20 FPS ● Smooth: 21-40 FPS ● Outstanding: 41-60 FPS ● Exceptional: 60 FPS and above

In displaying the same large architecture scene (with 165 mn vertices),

Quadro RTX 4000 outperforms GeForce RTX 2070 by 20%.

WS75

BEYOND REALITY

More than real

| UP TO 9TH GEN INTEL® CORE™ i9 PROCESSOR | WINDOWS 10 PRO |
| UP TO NVIDIA® QUADRO RTX™ 4000 | 17.3" IPS THIN BEZEL |

WS65

BEYOND REALITY

More than real

| UP TO INTEL® CORE™ i9 PROCESSOR | WINDOWS 10 PRO |
| UP TO NVIDIA® QUADRO RTX™ 5000 | 15.6" IPS THIN BEZEL |

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