DELL Technologies

Solution brief

# Smaller, faster and cooler: Innovations in Dell Precision mobile workstations surmount the latest thermal challenges

*Dell Precision 5550 mobile workstation*

**Dell Precision mobile workstations prioritize high performance while shrinking dimensions.**

**Smallest, lightest 17" workstation[1]**

*Dell Precision 5750*

**Peak performance, reduced size[2]**

*Dell Precision 7550 and 7750*

**Smallest, thinnest 15" workstation[3]**

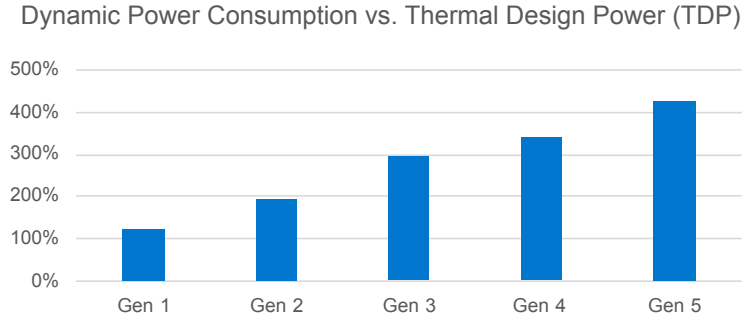
*Dell Precision 5550*

High-end application users want it all: workstations that deliver envelope-pushing performance via powerful CPUs and GPUs while simultaneously reducing size for maximum portability. For engineers, this introduces the challenge of how to mitigate growing thermal output—or heat—in increasingly dense spaces.

Why does thermal output matter? For users relying on high-end applications, improved thermal design can reduce the time it takes to complete rigorous tasks such video rendering, CAD, and more. An overheated system slows down performance or induces shutdowns until components cool—options that hurt productivity and cause understandable frustration. Plus, over time, high temperatures can cause permanent failures and shorten the life of the device. End users that rely on high performance benefit from powerful systems that mitigate heat-induced slowdowns and enable them to meet business deadlines faster.

The main driver of increased thermal output in modern computing is the concurrent usage of CPUs and GPUs, which together generate a level of heat that's difficult to dissipate in ever-shrinking chassis.

Some vendors sacrifice performance and prioritize "cool and quiet" modes as their default settings, which can leave users frustrated with sluggish performance that hurts productivity. The Dell engineering approach is different. By prioritizing high performance above all, Dell engineers have made breakthroughs in the thermal design of new Dell Precision models, using dual opposite outlet fans, vapor chambers, software-based thermal management solutions and other design strategies to deliver more performance in smaller spaces than ever.




*As processors continue to increase in performance generation over generation, the power requirements beyond TDP have increased significantly. Dell Precision workstations have been engineered to mitigate that heat and provide peak performance.*

## Dell thermal innovations in 2020 Precision workstations push the boundaries of what's possible

New challenges call for innovative solutions. Here are the top five technologies the latest Dell Precision models use to overcome the thermal challenges of balancing the high performance of CPU/GPU concurrency, higher wattage graphics power, and all within a thin-and-light form factor.

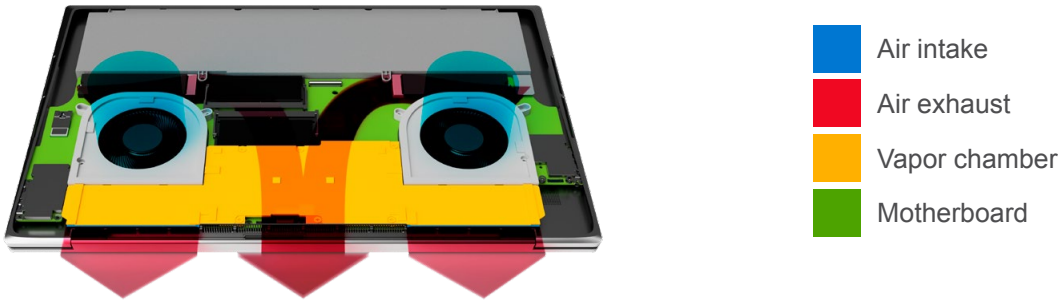
### Dual opposite outlet (DOO) fans

DOO fans, which are a Dell proprietary design (patent number: 10,584,717 with further patents pending), improve on traditional fans by increasing the performance of the airflow system. The DOO design increases the size of the fan blades relative to the fan body, improving efficiency. The blades are made of liquid crystal polymer (LCP), which allowed designers to reduce blade thickness and pack in more fan blades to increase air flow per rotation.

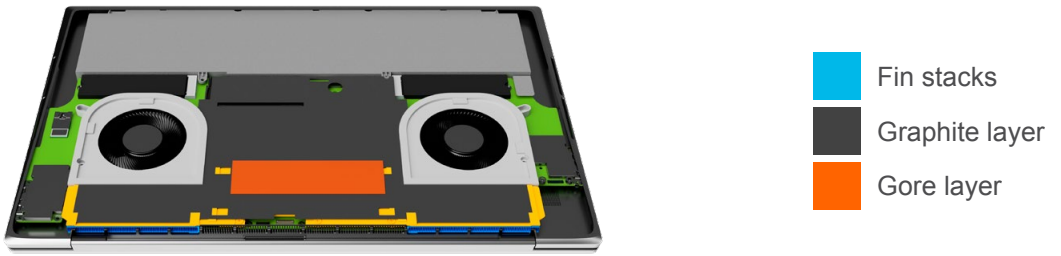
Traditional fans are optimized with an impeller that takes up only 60% of the fan housing because reduction in fan housing space traps air and makes the fan less efficient. The DOO fan adds a second airflow outlet, allowing for a much bigger fan impeller and thus more airflow than a traditional fan.

- A 30% larger DOO fan delivers more than twice the airflow of a traditional fan.
- Opposite outlets send pressurized air in two directions, flooding the center of the chassis while also pushing air out through the sides, vs. the single outlet of a traditional fan.

Because DOO fans blow air through the system, through the chassis, and over the CPU and other hotspots, using DOO in mobile workstations can reduce skin temperature (which refers to the feel of the system on the outside) by as much as 6 degrees Celsius. This not only makes for a more comfortable user experience, but also demonstrates the effectiveness of DOO fans to dissipate heat quickly to bolster hardware reliability.



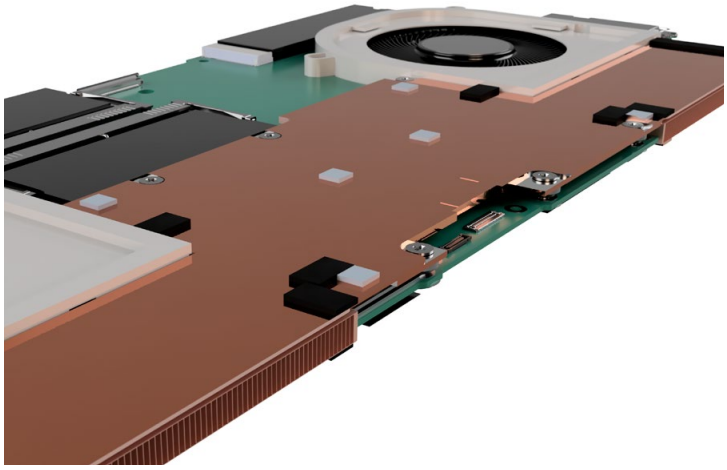

*Airflow diagram of Dell Precision 5750. The dual opposite outlet fans pressurize the inside of the chassis, moving hot air away from critical components and the user's hands.*




*A graphite layer between the hot components and the outside of the laptop allows heat to be efficiently transferred to thermal rejection materials, while gore layers placed strategically throughout the system prevent hot spots from affecting other components or the user.*

## Vapor chambers

Where cost-effective heat pipes once reigned supreme in thermal design for heat transportation, vapor chambers present a more effective way of spreading heat in a confined area/space and allow the CPU to stay in Turbo Mode for longer. Because vapor chambers are thinner than heat pipes and can spread heat in all directions, instead of just one, they allow for a larger heat rejection path reducing both the skin temperature and junction temperature of the CPU/GPU.



*Vapor chambers allow for a larger heat rejection path*

## BIOS-based user-selectable thermal tables (USTT)

Available in previous generation models, Dell Precision Optimizer automated performance tuning, utilization monitoring and system updates. Now, the new Dell Optimizer for Precision automatically prioritizes the highest performance possible over other concerns, and allows users and IT administrators to access four thermal tables directly from the BIOS with USTT. Users can choose from four presets—Balanced, Cool, Quiet and Performance modes—to ensure they get the experience they desire. Because these options are available from the BIOS, IT can choose to manage or hide these settings company-wide independently of the end user.

## Machine learning dynamic tuning technology (MLDTT)

Dell is first to market with machine learning dynamic tuning technology, a code-based solution from Intel® that automatically adjusts performance based on the applications a user runs. This anticipation of performance needs and thermal impacts improves the overall user experience by ensuring performance remains steady and slowdowns don't happen when workload demands increase.

*Precision workstations use the latest high-tech components to improve thermal design*

## High-tech components and innovative materials

New Dell Precision mobile workstations take advantage of innovative materials available to move heat smartly and efficiently to maximize performance and deliver an unparalleled user experience. With an intelligent balance of high-performance conductors and insulators, Precision workstations utilize high-tech Gore technology insulation layers, graphite spreaders and copper materials for maximum thermal performance.

## Looking under the hood of 2020 Dell Precision mobile workstations

What are your priorities for your device? From the world's smallest 15-inch and 17-inch mobile workstations to powerful workhorse models, Dell Precision mobile workstations offer the right combination of performance and portability to meet your needs.

> The 5750 features revolutionary DOO fans and top-of-the-line vapor chambers that move heat effectively.

## Introducing the world's smallest 17-inch mobile workstation, the Dell Precision 5750[1]

New to the Precision mobile workstation lineup is the ultra-thin and light 17-inch Dell Precision 5750. The 5750 model utilizes all the latest advances in thermal technology to ensure strong performance without sacrificing form factor.

Weighing in at just 4.7 pounds with a thin 13.5mm rear depth, the Precision 5750 uses two DOO fans that not only increase airflow throughout the chassis, but also direct heat away from vital components more efficiently to keep the system cool to the touch. The 5750 features top-of-the-line large vapor chambers that move heat effectively in a small area, dissipating heat in all directions rather than simply moving it along a heat pipe. A graphite spreader in the bottom cover enhances skin temperature to create a pleasant user experience unhampered by heat.


*Dell Precision 5750 mobile workstation*

## Peak performance in a new, smaller form factor with the Dell Precision 7550 and Dell Precision 7750

The workhorses of the Precision line, the 15-inch Precision 7540 and 17-inch 7740 get an update in 2020, packing more power into a slimmed-down chassis.[2] While not as small as the Precision 5000 Series mobile workstations, the 7550 and 7750 models are sleeker than their previous-gen counterparts. The Precision 7000 Series models lose the side vents of the previous gen, instead relying on a larger rear heat exchanger and slightly increased bottom air gap (between the bottom cover and table top) to remove heat.

In these models, peak performance is possible thanks to thermal solutions that include copper plate for SSDs to provide top-notch drive performance, as well as highly conductive graphite spreaders. Dual fans with metal blades, long-horn heat pipes for strong cooling capacity, multiple fin stacks, and an 80% open ratio on the outlet area all come together to provide users with a serious benefit: 25% power improvement when the CPU is at its max. The CPU/GPU thermal solution for the Precision 7550 offers higher concurrency power support (70% CPU + 100% GPU vs. 55% CPU + 100% GPU) compared to the previous generation. Both the Precision 7550 and 7750 utilize machine learning to enhance runtime system performance, and both utilize BIOS based user selectable thermal tables to allow users to prioritize their unique needs.

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## Industry-leading 92% display-to-body ratio for a 15-inch thin and light: Dell Precision 5550

*Dell Precision 7750 mobile workstation*

Those looking to maximize workstation screen size in a 15-inch form factor will delight in the new thin and light Dell Precision 5550. Decreasing rear and front height by 31% over previous generations, the Dell Precision 5550 utilizes two LCP fans that pack in the cooling blades for fast heat dissipation. Further thermal technologies in this model include a graphite cover and gore layer to efficiently reduce skin temperature. The Precision 5550 also gives users or IT the ability to choose their right balance of performance and thermal output through user-selectable thermal tables and dynamic tuning technology.

## Conclusion

With the latest Precision models, Dell continues to pioneer smarter thermals for mobile workstations that allow processor and GPU innovations to evolve so you can be more productive. To get the peak performance your demanding workloads require in easily portable sizes, visit DellTechnologies.com/Precision and find the Dell Precision mobile workstation that best meets your needs.

1 Based on Dell analysis using publicly available data, January 2020. The smallest refers total surface area of the mobile workstations.

2 When equipped with Intel® Xeon® W-10885M (2.40 GHz to 5.30 GHz), 128GB ECC/nECC RAM, NVIDIA Quadro RTX5000 (16G) graphics running at 80W. Based on Dell analysis of competitive products using publicly available data, March 2020.

3 Based on Dell analysis using publicly available data to compare 15” mobile workstations, January 2020. The smallest refers total surface area of the mobile workstations.

Learn more about Dell EMC Precision solutions.

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