



Innovative Carrier Design

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SUMMARY

This document outlines the process and benefits of our redesigned hard drive carriers for our 14th Generation of PowerEdge Servers.

The result was a new industrial design, consistent usability, and robust solution derived from direct customer feedback.

This unique approach resulted in:

- 4 new patents
- An automated manufacturing process
- Increased air flow
- Extensive server configurations
- 2017 Industry Red Dot Award for product design



As customers scale their monolithic server deployments for high performance workloads there is a trend to have more internal hard drives for enhanced performance. Drive choices abound with SAS / SATA / NVMe, in 2.5" or 3.5" form factors. Customer support for these types of drives places internal server real estate at a premium while keeping the same rack U footprint.

Dell EMC have invested energy into a unique hard drive carrier design that reduces the airflow bottleneck of traditional carrier designs, enabling richer configurations in our PowerEdge 14th Generation of servers, while still maintaining Best in Class performance robustness. This unique design has been awarded a 2017 Red Dot Product Design Award.

Thoughtful Design

Our team developed a list of tenets to satisfy both internal and external customers, with thermal design and server configurations at the forefront of priorities. We did not limit ourselves with a requirement of backward compatibility to our previous generation of carriers as this would hinder forward progress. We did, however, maintain the same expectations for quality, serviceability, material selection, and performance that our customers expect and deserve.

During development, our team used analytical simulation tools as well as empirical data collection to ensure continued performance excellence in areas such as rotational vibration, structural dynamics, thermals, and ergonomics. We ran extensive focus group studies with more than seventy tenured IT professionals, garnering feedback such as:



Word Cloud : IT Pros Choice of Descriptors for 14G HDD Carrier



Automation in Manufacturing

In our never ending drive for quality, we took inspiration from the automotive industry and designed this carrier for 100% automation. After conducting structural dynamics utilizing Finite Element Analysis (FEA) and Computational Fluid Dynamics (CFD) it was determined that a metal uni-body frame would provide a strong, sleek structure for this process. Manufacturing consistency leads to performance consistency. This exacting standard for the redesigned carrier and chassis bay ensures optimal density while enabling consistent airflow.

System Impact

A smaller carrier footprint offers internal server density, leading to an enhanced feature set in our 14G servers. Having a large quantity of hard drives in the front of any server could be a physical bottleneck to the airflow inlet and drastically reduce cooling efficiency. But with this innovative redesign and construction, coupled with strategic layout resulted in improved airflow by 15-30% cubic feet per minute (CFM) for our most common mainstream servers.

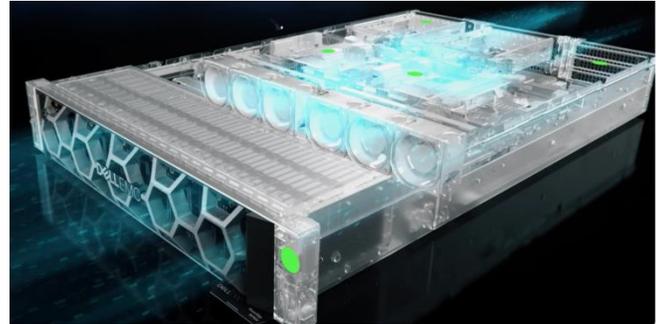


Figure 1: Innovative carrier design enhances airflow and cooling in PowerEdge 14G servers

Less impedance leads to a reduction in Total Cost of Ownership (TCO) by decreasing fan power requirements. This reduction in operating expenses offers customers significant cost savings over the full lifetime of the server while increasing capacity and performance.

Customer feedback drove our innovation however we were careful to retain key features and learnings from over decades of product development. Hot plug, color coding, robust materials and LED icon notifications are standard, and ensure less complexity and consistent experience across platforms within the 14th Generation PowerEdge portfolio.



"I like this carrier. It looks easy to manufacture but it is sturdy. The rail is thicker than I thought and solid on examination. It also incorporates better ventilation in this smaller compact form."

-PowerEdge 14G Focus Group Feedback

Conclusion

Our efforts have not gone unnoticed. In addition to four U.S. patents, our 14G hard drive carrier earned the prestigious Red Dot Award for Product Design. Our vigorous development, testing & automated manufacturing process significantly enhance our customers' ability to adapt and scale. All while ensuring the highest level of quality, functionality, and durability. This award winning feature is another example of how PowerEdge 14G servers provide a scalable platform for the modern data center.