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# Cool Kid on the Block

- The Original Leader in Data Center Cooling Systems
- Custom Thermal Management for NVIDIA's Chips

A perspective view of a long, dimly lit data center aisle. On both sides are rows of server racks. The racks are filled with components, some of which are glowing. Overlaid on the scene is a complex network of glowing white lines and dots, representing a data network or cooling system. The floor is dark and reflective, showing the racks and the glowing lines. The overall atmosphere is high-tech and futuristic.

FROM THE DESK OF PORTER STANSBERRY

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## Cool Kid on the Block

### The Original Leader in Data Center Cooling Systems

#### Custom Thermal Management for NVIDIA's Chips

Based in Westerville, Ohio, **Vertiv Holdings (NYSE: VRT)** is a global supplier of industrial power and thermal management systems. The company generated \$6.9 billion in revenue in 2023, up 21% from \$5.7 billion in 2022.

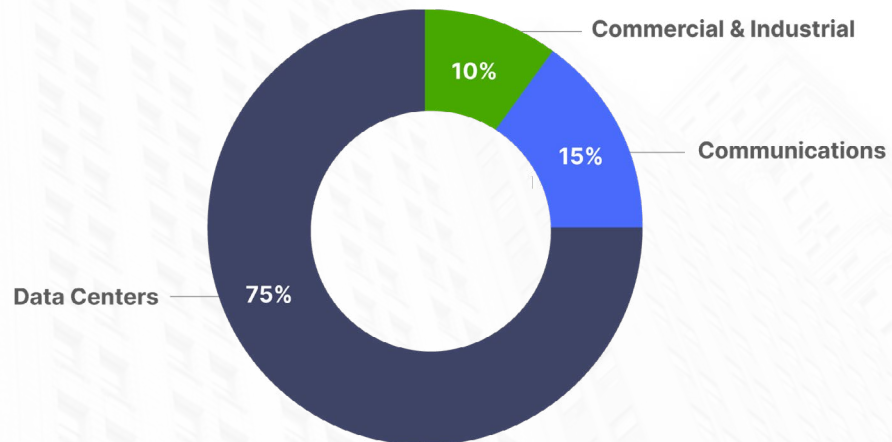
Vertiv was originally part of the Liebert Corporation, which was founded in 1965 as a supplier of industrial-scale air conditioners used for cooling mainframe computer rooms (the precursors to today's CPU- and GPU-based data centers). The company developed the world's first self-contained cooling systems capable of maintaining the strict levels of temperature, humidity, and air quality required in computer rooms.

Since then, the company has expanded into more advanced cooling systems, as well as power management devices used to control the flow of power through electrical systems in a variety of industrial applications, with a primary focus on the data center (discussed in greater detail below).

In 1987, the Missouri-based conglomerate Emerson Electric acquired Liebert, and in 2016 spun off the power and thermal management business into a standalone entity that became Vertiv. In February 2020, Vertiv became a publicly traded company through a special purpose acquisition corporation, known as a SPAC.

Today, Vertiv's core focus is on supplying data center infrastructure, which makes up 75% of its revenue. The remaining 25% of its business is split between the telecommunications market (15% of revenue) and commercial & industrial applications (10% of revenue).

Vertiv Sales by Segment (2023)



Today, Vertiv's largest product category is in power management systems, which makes up 33% of revenue. This segment provides the full spectrum of equipment needed to transmit power from the grid to the individual devices of industrial-scale electrical systems, like data center server chips:

Some of Vertiv's product offerings include transformers, which convert high-voltage power from utility connections to the lower-voltage electricity consumed by individual devices, like server chips.



The company also sells equipment used to ensure the safety of this power transmission process. One example is a product category known as switchgear equipment, which includes circuit breakers and electrical relays to regulate the incoming power source to a given device. If the voltage of the incoming current exceeds a pre-set threshold, these electrical switches will cut off the flow of electricity to prevent voltage surges from damaging the device. Switch components are integrated with other power management systems, like control panels, which together act like an electricity traffic cop – monitoring and ensuring the safe distribution of power throughout an electrical system.

Another one of Vertiv's key power-management products are backup power systems, like Uninterruptible Power Supply ("UPS") devices. These products contain battery packs that are programmed to instantly deploy power if the primary electricity source fails, ensuring continuous operations even if there is a power outage. These are mission critical components in data centers, telecommunications networks, and certain industrial applications where a system shutting down even for a few moments can result in catastrophic business loss.

The final key product in Vertiv's power management portfolio is electrical transmission equipment known as a "busbar." These are metallic bars or tubes that replace traditional copper wiring for transmitting electricity. Busbars offer several advantages over copper wiring, including:

1. Lower resistance to electrical current, reducing energy loss and minimizing heat generation
2. More compact than cable wires, enabling significant space savings
3. Modular designs that make it easier to add or remove connections, providing a more scalable electrical system
4. Larger surface area, which enables more efficient cooling and lowers the risk of overheating

The image below shows the Vertiv Powerbar, an overhead mounted busbar designed for data centers, which connects a power source to a series of server racks. Note the modular configuration, containing a number of switchable connections from the Powerbar to each server rack. This allows data center operators to seamlessly add, remove, or swap out individual server racks without disrupting the flow of electricity and operations of the remaining racks connected to the Powerbar:



Vertiv is the number-one global provider in the advanced UPS, busbar, and switchgear systems used in data centers. The company has achieved this dominant market-share position by investing heavily into its own manufacturing capabilities, as well as making strategic acquisitions of other industry leaders. For example, in 2021, Vertiv purchased for \$1.7 billion Ireland-based E&I Engineering, doubling Vertiv's manufacturing capacity in switchgear and other power systems.

Next, let's dive into Vertiv's second largest product category, thermal management systems.

### Leading the Transition to Liquid Cooling in the Data Center

Vertiv is a leading provider of thermal management systems used in the data center, which help dissipate the immense amounts of heat generated during massive amounts of computing. This category makes up 30% of its revenue.

Vertiv has been at the forefront of thermal management systems ever since developing industry-leading air conditioning systems for mainframe computer rooms in the 1960s. These early thermal management systems operated on the same principles as the air conditioning units found in a typical home. The main drawback was that they consumed massive amounts of electricity.

Since then, Vertiv has developed energy-efficient forms of heat management, like evaporative cooling systems. This method taps into the natural cooling effects of water evaporation, by passing warm air through a water evaporation system. This transfers the air's heat to the water, which evaporates and leaves behind cooler air in its place.

Evaporative cooling systems are roughly 90% more energy efficient than traditional air conditioning. For many years, this has been the standard for industrial cooling systems, including those used in data center applications. However, even the most state-of-the-art evaporative cooling systems have struggled to keep pace with the requirements of the parallel-computing revolution.

The rise of parallel processing has boosted data center computing power 10-fold, which has also created a 10-fold increase in the amount of heat generated in today's cutting edge data centers.

Vertiv is leading the industry's efforts to solve this issue, by bringing into the data centers a new class of liquid-cooling systems known as "direct-to-chip liquid cooling." These systems send super-chilled water to cooling plates attached to the individual chips inside of each server rack. Given that water is nearly 1,000 times more dense than air, this method offers a substantial increase in cooling efficiency over traditional air-based systems.

In 2020, Vertiv began partnering with one of the leading global suppliers of industrial-scale liquid cooling systems – a company called CoolTera, based in the UK – to develop direct-to-chip cooling systems. In 2023, Vertiv acquired CoolTera and has since developed some of the industry's most advanced liquid cooling systems. These

innovations set the stage for a breakthrough partnership in March 2024, when Vertiv was selected to join Nvidia's Partner Network ("NPN"), a program created to build long-term relationships with key suppliers.

We've previously written about one specific component of the NPN – the 4.5 million software developers that help advance **Nvidia's CUDA software program**. Notably, Vertiv is the only large-scale data center infrastructure supplier that's joined the NPN. And in the same month that Vertiv joined the NPN, Nvidia CEO Jensen Huang announced that Vertiv's liquid cooling technology would be used in the company's next generation of supercomputing architectures.

At Nvidia's annual GPU Technology Conference ("GTC") held in March, the company introduced its latest series of chip innovations. These included its Blackwell GPU and the DGX SuperPOD – which combines 36 Blackwell GPUs and 72 Grace Hopper CPUs into a supercomputer inside a server rack. The energy requirements of each DGX SuperPod are massive, at 120 kw per server rack, or enough to power 30 average U.S. homes.

And Vertiv is the key supplier of the liquid cooling systems that will keep Nvidia's chips from overheating. During a question-and-answer session with analysts at the GTC conference in March, Nvidia CEO Huang highlighted its relationship with Vertiv in helping it address the massive cooling needs of this latest class of data center chips:

*"And cooling 120 kilowatts is not an issue... none of this is a physics problem. None of this requires invention. All of it is supply chain planning... And so Vertiv is very important in the supply chain of designing liquid-cooled and other data center [cooling systems]."*

Nvidia plans to begin shipping its Blackwell chips in late 2024, which should provide a boost to Vertiv's thermal management systems. And as Nvidia continues leading the industry in developing newer, higher-powered data center GPUs, Vertiv will become an integral part of designing and building the liquid cooling systems required for these chips.

But liquid cooling is just one aspect of the relationship. As a key supplier in the NPN network, Vertiv is now working with Nvidia to develop a full suite of thermal and power management systems designed around Nvidia's chip architectures.

## An Nvidia Partnership Has Many Advantages

The benefits from Vertiv's strategic partnership with Nvidia go well beyond just a near-term sales boost. First, it allows Vertiv to stay at the leading edge of innovation, by developing next-generation infrastructure alongside the world's most advanced data center architect. Second, it cements Vertiv as a key strategic partner that Nvidia (and others) will increasingly lean on to build the supporting infrastructure for data centers.

This concept of a data center supplier like Vertiv working hand-in-hand with chip makers reflects an important shift in how the industry operates. The growing

complexity of today's super-computing data architectures means key suppliers like Vertiv have become an integral part of the research, development, and engineering of data center ecosystems. As a result, Vertiv is no longer selling commoditized components that customers can plug and play into the data center. Vertiv is becoming a key part of the chip design process, transforming itself into a highly-specialized component maker. Vertiv CEO Giordano Albertazzi explained this at a recent Bank of America tech-industry conference:

*"Ten years ago, there was no such thing as a relationship with the chip manufacturers... We knew the characteristics of what came out of the box, a server, and probably a characteristic of what comes out of a rack and that was it... things have changed dramatically. If you do not have a relationship with the chip manufacturers, you do not know where the technology is going... It's good to have a strong partnership in place."*

Vertiv's technological leadership developed over the last five decades will now become an even bigger competitive advantage, as it embeds itself directly into the design and engineering of today's cutting-edge chip architectures, further separating itself from its competitors.

But superior technology is only part of Vertiv's competitive advantage. The other key factor is its unmatched scale. Vertiv has taken a page out of the Danaher Business System ("DBS") playbook (which we wrote about in our [March 22 issue](#)) in developing its corporate strategy, known as the Vertiv Operating System. Like DBS, a key component of this strategy involves horizontal integration – acquiring the leading companies in its industry to achieve economies of scale and offer an unmatched scope of product offerings.

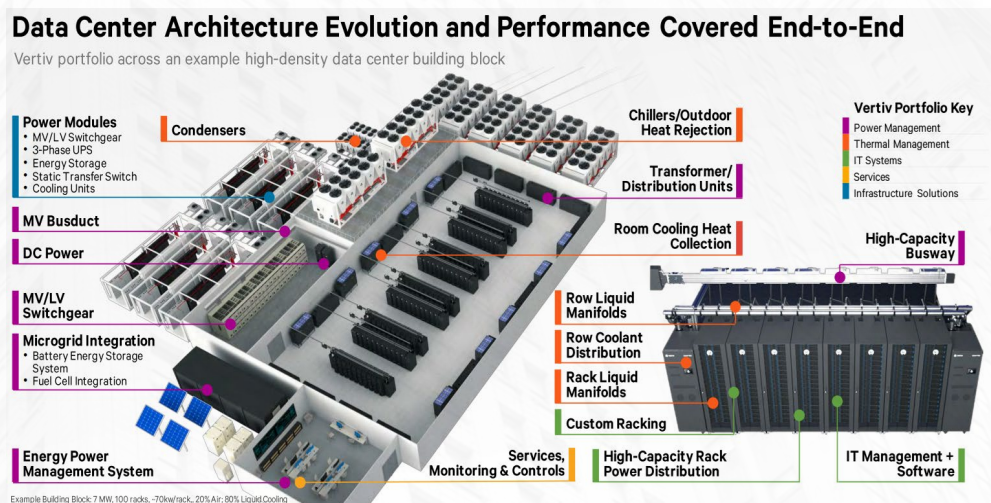
Through key acquisitions like E&I Engineering in 2020 and CoolTera in 2023, Vertiv has become the largest global supplier of both power and thermal management systems for data centers. This gives it the broadest portfolio of leading technologies and products in these two core segments, which together make up 63% of Vertiv's total revenue.

Vertiv has also invested in adjacent business lines that support these two core product segments. This includes Vertiv's IT Systems offerings, which make up 10% of revenue. Products in this segment include customized racks and enclosures. It also includes devices like Power Distribution Units, which distribute and monitor the power supply to the individual components in a server rack to ensure optimal energy efficiency within its operations.

Vertiv's final product segment is Infrastructure Solutions, which makes up 5% of revenue. This equipment includes scalable systems that can be added in modular formats, like aisles and rows for server racks – allowing data center operators to seamlessly add new server racks. Other key products include Vertiv's Power Modules, which offer the advantage of on-demand scaling, so data center

operators can easily add incremental server racks and power capacity as their operations expand, instead of making large upfront capital investments all at once.

Through these four key product segments, Vertiv covers the whole range of power and heat management needs for data center architects. This portfolio of product offerings makes Vertiv the ultimate source for data center infrastructure needs:



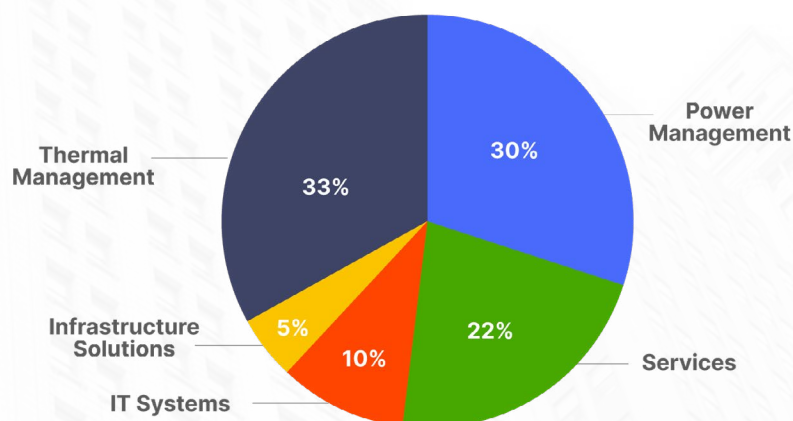
## Tying It All Together

The final component of Vertiv's business model that supports its hardware and software sales is the service it offers to keep its customers' operations running smoothly and efficiently. This segment makes up the remaining 22% of revenue. Vertiv's services segment plays a critical role in establishing long-term customer relationships. It starts with consultation services provided during the upfront planning stage of configuring data center infrastructure, and continues through the installation process. Once Vertiv's equipment is up and running, the company provides further service support for both routine maintenance and real-time troubleshooting when problems arise.

Given the growing complexity of power and heat management systems in modern data centers, this troubleshooting aspect is critical. As one example, Vertiv CEO Albertazzi explains how the company's liquid cooling systems require much faster troubleshooting than traditional air-cooled systems – since critical data center equipment can fail within seconds of a malfunction:

*"Think instead about the heat density inside a rack, and think something goes wrong with a CDU [liquid coolant distribution unit]. At that stage, you really have a brain. And the blood vessels that go through the brain, an interruption of 15 seconds... is 15 seconds too many."*

Vertiv Segments by Revenue



Source: Vertiv Filings

Here again, Vertiv's scale is a major competitive advantage. The company has 240 service centers and over 3,500 field service engineers to support customers in 40 countries around the world. Vertiv has spent five decades developing this network, and this is arguably its single greatest competitive advantage that would take new entrants decades to replicate.

The highly trained field engineers using the company's cutting-edge service tools – like remote monitoring systems and predictive maintenance software – identify problems before they arise. That's how Vertiv can ensure smooth operations for its data center customers, avoiding critical damage to things like Nvidia GPU supercomputers that can cost tens of millions of dollars per server rack.

This critical service element is what enables Vertiv to establish long-term relationships with its customers, averaging more than 20 years. And as the complexity of data center infrastructure continues growing with the rising demands of the parallel-processing revolution, Vertiv's quality products and service will further cement its place as a strategic partner of the companies leading this revolution.

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