

Smarter, More Reliable Data Centers with Core Infrastructure Components

Presenters:

Michael Schmelzle, Industry Sales Manager, TE Connectivity

Jason Roe, Heavy Duty Connectors, TE Connectivity

Claudia Lizeth Amador, Relays, TE Connectivity

Jason Gildea, Filters, TE Connectivity



KEY TAKEAWAYS

- Advances in compute-intensive applications are driving unprecedented data center growth.
- Data center growth presents new challenges in climate management systems.
- EMI filters ensure reliable operation of sensitive equipment and regulatory compliance.
- Standardized, robust interconnects enable reliable performance for critical HVAC systems.
- Power distribution blocks and relays ensure safety, compliance, and scalability.

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OVERVIEW

As demand for cloud services, AI, and high-performance computing becomes the norm, data centers need to be more efficient, scalable, and reliable than ever. Reliable climate-control infrastructure becomes mission-critical. Leading-edge component technologies, including power distribution, cooling, and control systems, create the foundation of modern data centers—high-quality, high-performance infrastructure that will enable value well into the future.

Industry leader TE Connectivity is a comprehensive partner—providing EMC protection, power distribution, high-performance interconnects, safety components, and deep engineering support—to ensure continuous operation, energy efficiency and future-ready scalability in the age of megascale computing. TE Connectivity's portfolio of solutions addresses many challenges for all the areas of the data center, such as server cabinets, network equipment, security monitoring, battery energy storage, uninterrupted power supplies, transfer switches, and medium- and even low-voltage power distribution.

TE Connectivity combines global engineering support with local customization, ensuring resilient supply chains and tailored solutions for customers; TE Connectivity's solutions can be customized to customer requirements for optimal performance.

CONTEXT

The presenters discussed the criticality of high-quality cooling system components for reliable data center operation and explained how TE Connectivity's industry-leading portfolio enables long-term value for critical infrastructure.

KEY TAKEAWAYS

Advances in compute-intensive applications are driving unprecedented data center growth.

Over the past decade, data center size, scale, and scope have reached exponential growth.

Traditional data centers, which have long supported basic business operations such as email and internal data storage, are typically sized at approximately five acres, with significant power needs equivalent to as much as a neighborhood comprising 5,000 homes.

In the past 10 years, as the industry has seen advancements in cloud, big data, and AI technologies, development has shifted to hyperscale AI data centers, which have footprints of up to 100 acres, equal to the power requirements of up to 100,000 homes.

Today, the trend of exponential growth continues, with megascale AI data centers already under construction (e.g., Stargate Abilene facility in Abilene, Texas) to support advanced digitalization and AI on a global scale. Occupying a space of a size equal to 800 football fields, with a 25x power increase over hyperscale AI data centers, megascale AI data centers have a power requirement equal to that of the city of Seattle.

Data center growth presents new challenges in climate management systems.

This explosive growth has driven an evolution in data center infrastructure. Ever-larger data centers translate to more racks, higher computing density, and skyrocketing heat generation. The significant increase in thermal load demands 10x more cooling equipment—air cooling chillers, fan wall units, computer room air conditioners, computer room handlers, and heat exchangers—than in a traditional data center.

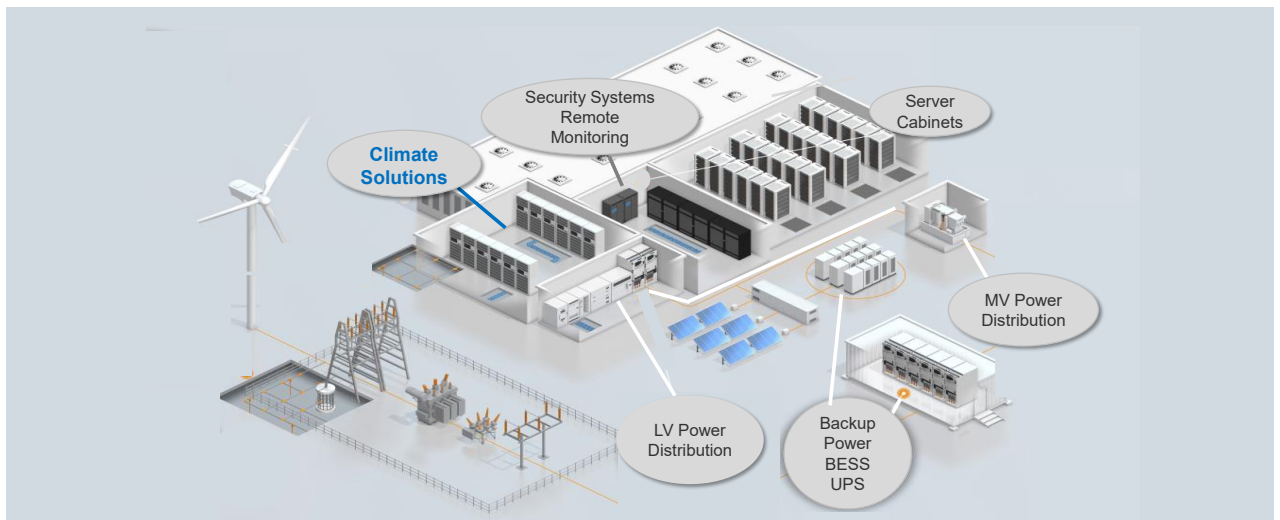
The new data center landscape has introduced several major challenges in developing effective, efficient cooling systems for modern data centers:

- **Sustainability and compliance.** New government regulations are driving adoption of environmentally friendly refrigerants; however, these new refrigerants are highly flammable, requiring components to meet higher UL safety standards for protecting data center workers—and the data itself.
- **Safety.** High-power, high-density environments such as AI data centers present new electromagnetic interference (EMI) and power quality (PQ) challenges. Dense AI electronics are sensitive to interference, and cooling systems can generate electromagnetic noise that threatens operation. EMI filters and robust components are essential to control interferences and ensure continuous, stable operation.
- **Scalability, modularity, and flexibility.** Data center growth is being realized through both new data center construction and retrofit of existing facilities. Retrofitting requires components that are flexible, scalable, and adaptable to changing requirements.
- **Uptime and business continuity.** Data center outages can have significant financial impact, costing from \$14,056 per minute to \$23,750 per minute for larger enterprises. To support continuous operations, reliable cooling systems using high-quality components are a priority.

“Every connection counts—for reliability of power management and power distribution. EMC and power quality are essential to protect the equipment from interference that could impact an outage.”

– Michael Schmelzle, Industry Sales Manager, TE Connectivity

Figure 1: Modern data center reliability depends on more sophisticated cooling system



EMI filters ensure reliable operation of sensitive equipment and regulatory compliance.

TE Connectivity delivers a comprehensive portfolio of EMC and power quality solutions for industrial and data center applications, including EMC filters, PQ filters, chokes, and accessories designed to address evolving market needs such as electrification, regulatory compliance, and sustainability. TE Connectivity’s EMC and power quality solutions:

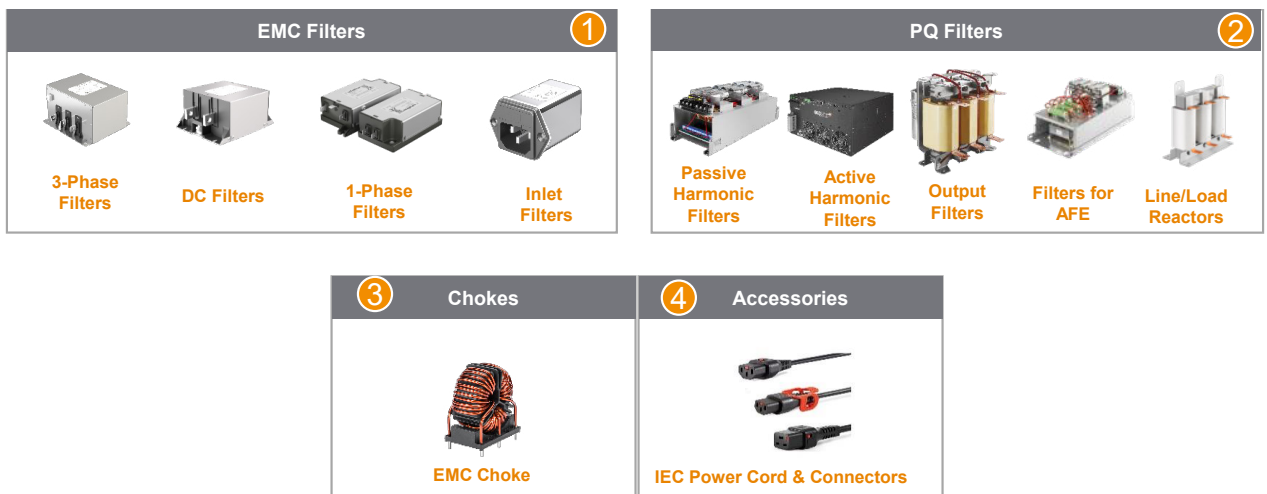
- **Protect sensitive equipment** by suppressing electrical interference to ensure reliable server and network performance.
- **Improve power quality** by reducing harmonics and overheating and supporting energy efficiency in line with industry standards.
- **Enhance system reliability** by minimizing electrical noise and transients to extend equipment life and reduce risk.
- **Assure compliance** with solutions that meet growing FCC, CE, and local utility requirements for critical infrastructure.
- **Enable operational advantages** such as lower noise, greater cooling efficiency, and reduced maintenance costs.

TE Connectivity’s 2023 acquisition of Schaffner, the world’s largest EMC and power-quality filter manufacturer, solidified the TE Connectivity brand for EMI/RFI filters as the industry market leader. Combined with TE Connectivity’s existing Corcom product portfolio, TE Connectivity offers the broadest product range in the industry, from single-phase 100A filters to three-phase 2300A filters, with a wide range of termination styles and performance levels to fit diverse infrastructure needs.

“Our solutions reduce downtime, protect critical assets, support compliance, and deliver the long-term value for data centers.”

– Jason Gildea, Filters, TE Connectivity

Figure 2: TE Connectivity’s EMC solutions portfolio



Standardized, robust interconnects enable reliable performance for critical HVAC systems.

Managing incoming power to roof-mounted air handling units that handle cooling for AI data centers is crucial to avoid overheating. Data center server racks are already surpassing 130 kW—with future designs reaching 250 kW—with cooling load increasing alongside this growth. Cooling systems alone account for up to 54% of total energy used in a data center (Forbes). Even modest improvement in cooling efficiency can provide significant savings in annual operations costs.

To enable this expansive scale of power delivery to HVAC systems for massive data centers, TE Connectivity offers standardized, robust, reliable interconnects for power transmission. The HDC rectangular connector series—standardized plug-and-play solutions for speed and ease of installation—offers contact sizes for up to 60A at 1000V, with flexibility to shift to smaller gage contacts for signal transmission in the same form factor. With an IP65 rating and a temperature range of -40°C to 120° C, HDC connectors are designed for use in even the harshest of environments. And for inside the HVAC enclosures, TE Connectivity offers a wide range of connectivity, including terminal blocks and headers.

“Features like quick latching and robust panel-mounted solutions can offer a plug-and-play option for the customer, reducing field installation time, and aid in troubleshooting.”

– Jason Roe, Heavy Duty Connectors, TE Connectivity

Figure 3: TE Connectivity offers standardized connectors for a wide range of applications



Power distribution blocks and relays ensure safety, compliance, and scalability.

Power distribution blocks are essential for managing high-current connections in data centers to support efficient and reliable climate solutions. TE Connectivity’s power distribution blocks are designed for easy installation, with three configurations—single pole splitter, multiple pole splitter, and grouping—in a single product, which enables the fast installation and flexible wiring layouts crucial to large-scale projects.

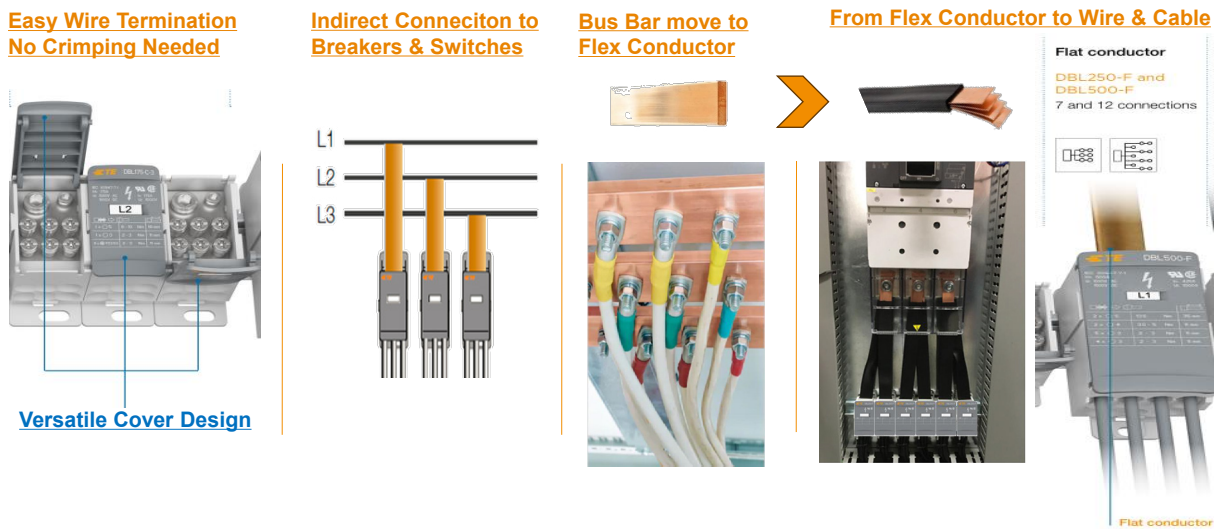
With robust certification to UL and IEC standards, these blocks streamline power management, helping to maintain uptime and operational efficiency.

“Our distribution blocks ensure safety and compliance even the most challenging applications.”

– Claudia Lizeth Amador, Relays, TE Connectivity

TE Connectivity also offers switching relays in a wide range of current and voltage capabilities, from signal-level switching to high-powered applications. Relays meet UL, CE, TUV, and CSA certifications necessary for safe, efficient, and scalable data center climate automation and control.

Figure 4: TE Connectivity’s power distribution blocks simplify busbar applications



ADDITIONAL INFORMATION

- **TE Connectivity.** To learn more, visit [TE Connectivity](https://www.teconnectivity.com).

BIOGRAPHIES



Michael Schmelzle

Industry Sales Manager,
TE Connectivity

Michael is located in Americas, and is an Industry Sales Manager at TE Connectivity. Michael is responsible for understanding market trends for key growth Industries, the challenges these industries face, and developing a strategy for TE Connectivity to provide product solutions. Understanding these challenges and offering product solutions enables TE Connectivity to be an innovator and partner to key customers supporting products for these challenging industries. Prior to this current role, Michael was covering the challenges of the Outdoor Lighting Industry for TE Connectivity. Today TE is the market share leader for Outdoor Lighting connectors and control components. Michael has a B.S. degree in Marketing from Judson College in Elgin Illinois and currently resides in Orlando Florida.



Jason Roe

Product Manager, Heavy Duty Connectors,
TE Connectivity

Jason is the Americas Regional Product Manager at TE Connectivity where he is responsible for board to board, wire to board, and wire to wire industrial connector solutions. For Jason, helping customers find solutions to their connectivity problems is the most rewarding part of his job. Prior to taking on his role at TE Connectivity, Jason gained experience in manufacturing and connectors as the Technical Director at ERNI Electronics, Inc. He has a B.S. degree in Electrical Engineering from Virginia Commonwealth University and currently resides in the Richmond, VA metropolitan area.



Claudia Lizeth Amador

Relays,
TE Connectivity



Jason Gildea

Filters,
TE Connectivity