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Investing in the Data Center Ecosystem: Opportunities and Insights

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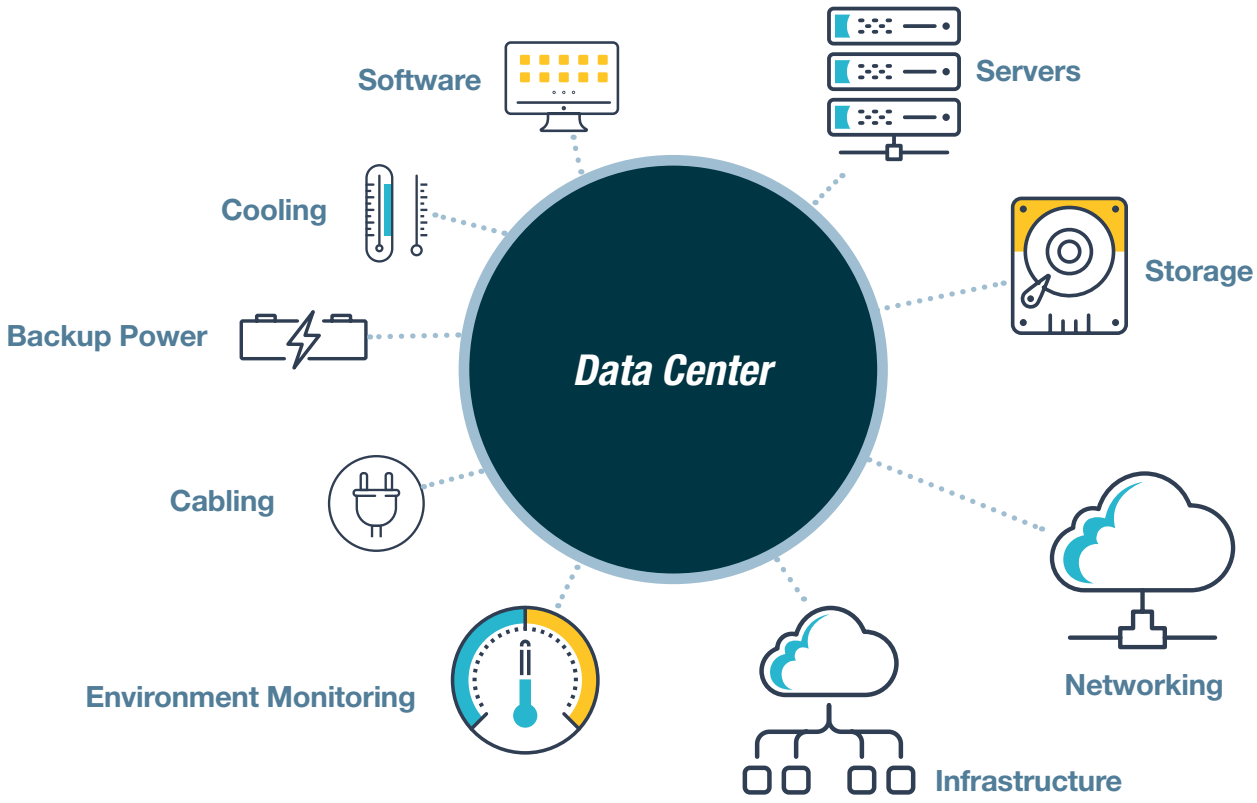
The digital revolution, powered by advances in technology like computing and communication, has reshaped society, changing how people and businesses interact and work. With technology advancing rapidly, the amount of data created has skyrocketed.

In 2010, a mere two zettabytes of data were generated. However, over just 13 years, this figure has skyrocketed by an estimated 60 times, reaching a staggering 120 zettabytes. Looking ahead to 2025, data generation is expected to surge by over 150%, surpassing 181 zettabytes[1]. Such exponential growth vividly illustrates the profound impact of digital transformation on global and societal industries.

In the ongoing digital revolution, data centers play a central role, serving as the backbone of the modern computing infrastructure. ***Data centers rely heavily on a diverse array of components, technologies, and stakeholders to support the delivery of digital services and applications.*** These key components include semiconductors, communication equipment, storage, software, and HVAC (heating, ventilation, and air conditioning) systems.

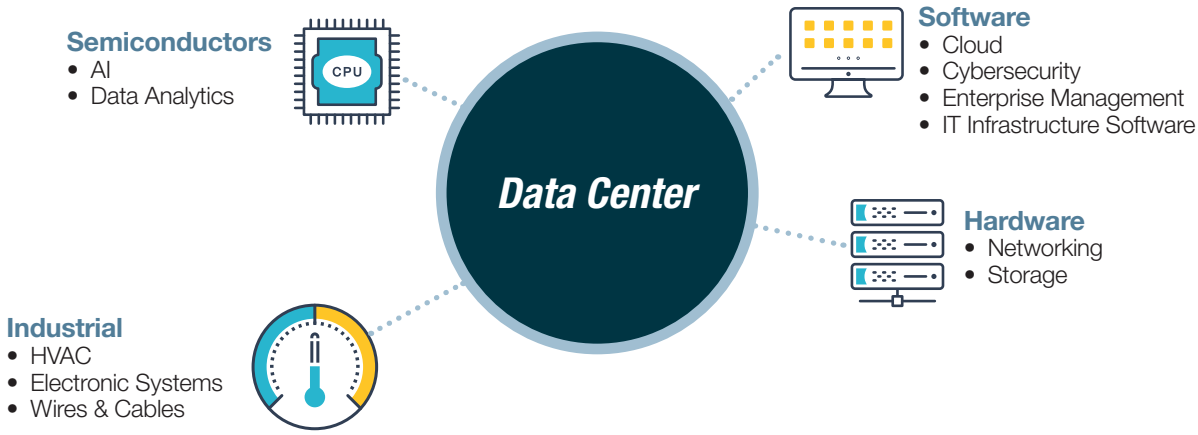


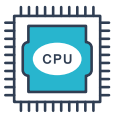
[1]Source: Statista. https://www.statista.com/statistics/871513/worldwide-data-created/

Investing in the entire data center ecosystem may be an attractive opportunity for investors seeking diversified exposure to the digital economy, technological innovation, and long-term growth trends in data consumption and digitalization.

The Pacer Data and Digital Revolution ETF (TRFK), which seeks to track the Pacer Data Transmission and Communication Revolution Index (TRFK Index), includes companies that generate a large portion of their revenue from the use, processing, transmission, or storage of data, particularly with involvement in data center operations.

This paper reviews four key areas that TRFK invests in, providing insights into the opportunities for investors.





Semiconductors

As the fundamental building blocks of modern electronic devices and systems, semiconductors are at the forefront of the digital revolution.

The chips, which power CPUs, GPUs, and various processing units, are the driving force behind rapid data processing and the exponential growth in computing power. Beyond their role in computing, semiconductors are essential for connectivity technologies like Wi-Fi, Bluetooth, and cellular networks, facilitating seamless data exchange and communication.

Moreover, semiconductor-based memory technologies have revolutionized digital data storage, offering faster access speeds, higher reliability, and lower power consumption. Additionally, semiconductors also play a vital role in sensors for data collection, condition monitoring, and process automation across diverse applications.

The recent rise of artificial intelligence (AI) heavily relies on semiconductor technology to accelerate AI algorithms, which enable tasks like machine learning, computer vision, and natural language processing. NVIDIA, one of the key players in AI, is renowned for its development of specialized semiconductor technology optimized for AI workloads. Their chips are instrumental in AI language models used by tech giants like OpenAI, Apple, and Meta.

In the context of data center operations, semiconductors provide processing power in various aspects such as computing unit, memory and storage, networking infrastructure, and power management. The integration of semiconductor chips within data centers enables AI technology to leverage the computing power of these facilities for intensive computing tasks and large dataset analysis.

In the earnings call of NVIDIA in 2023, the company highlighted their significant increase of supply in data center chips to meet surging demand resulting from investments in AI. According to the February 2024 reporting, the record quarterly results from NVIDA were driven by strong data center growth, where revenue grew more than 400% from a year ago, mostly stemming from NVIDIA Hopper GPU computing platform and InfiniBand networking.[2]

[2]Source: NVIDIA F4Q24 Quarterly Presentation

Hardware: Communication and Storage

The digital revolution has transformed communication technology, fostering collaboration and innovation in an increasingly interconnected world. Specifically, the growth of high-speed communication networks, such as 4G and 5G, enables faster and more reliable data transmission.

In data centers, various communication equipment such as switches, routers, and fiber optic cables provide connectivity between servers, networking devices, and external networks.

One notable example is data center fabric, which represents a network of switches designed to connect hardware and servers within data centers. This system is meticulously engineered to optimize the path for data delivery. Nokia Data Center Fabric offers a centralized and automated framework, providing agile networking capabilities to support the efficient and reliable operation of IT infrastructure. The company was recognized by GigaOm analysts as an innovation leader and outperformer in 2022 and 2023 for its data center fabric solution.

Besides data transmission, data storage solutions are equally important given the immense volume of digital data generated.

To address the need to optimize storage space and improve proficiency, data centers leverage various storage solutions and systems. Hard disk drives are ideal for archived data, solid-state drives are well-suited for frequently accessed data, while storage arrays consolidate multiple devices into a flexible, centralized system. They offer different capacities, performance levels, and cost considerations, allowing data center operators to tailor storage solutions to their specific requirements.

Western Digital provides data storage solutions and technologies to store, reform, and analyze data used in data centers worldwide. Their Ultrastar Series provides scalability, flexibility, and cost-effectiveness, empowering the development and usage of digital applications and services.

Software

Within data centers, the integration of various software solutions plays a crucial role in the delivery of digital services and applications.

Among these solutions, cloud software stands out as a cornerstone, offering clients flexible ways to access computing resources on-demand and deploy software applications without extensive physical infrastructure investments. Cloud-based data services and platforms enable organizations to transform their operations, improve efficiency, and stay competitive in the digital age.

Despite the term "cloud" suggesting a virtualized environment, the physical infrastructure supporting cloud services is still housed in data centers. Cloud software relies on data centers to host the servers, storage systems, networking equipment, and other hardware components.

A notable example of cloud-based platforms is Snowflake's Data Cloud, which empowers organizations with a scalable and efficient solution for storing, managing, and analyzing data. Since its founding in 2012, Snowflake has rapidly expanded its customer base and market presence. The company finished fiscal 2024 with a 38% year-over-year product revenue growth, totaling $2.67 billion. Driven by a robust product roadmap in the data cloud software space, promising a 30% plus growth rate in revenue annually into 2029, Snowflake has demonstrated signs of enduring growth.[3]

In addition to the software and services utilizing data centers, specialized software is built to ensure the efficient and reliable operation of data center infrastructure, maximizing uptime, and minimizing downtime.

Data center management software helps administrators monitor, manage, and optimize data center resources and operations. For example, Datadog uses a comprehensive monitoring and analytics platform to gain insights into system performance, application behavior, and infrastructure health. By collecting and analyzing data in real-time, Datadog empowers data center operators to identify and troubleshoot issues.

[(3)]Source: Snowflake Q4 FY2024 Investor Presentation

Furthermore, with the increasing frequency and sophistication of cyber threats, cybersecurity software has become paramount in safeguarding sensitive data and maintaining the integrity of systems. Given vast amounts of data stored, data centers are a cybersecurity focal point. Breaches in these facilities may result in significant ramifications, including financial losses, reputation damage, and legal consequences.

Fortinet is a leading provider of cybersecurity solutions, offering a comprehensive suite of products, including firewalls, intrusion prevention systems, and threat intelligence. Their flagship product, FortiGate, integrates advanced measurement, detection, and prevention systems, alongside secure communication protocols to safeguard data centers from malicious activities. With more than 730,000 clients served, the company has delivered an annualized revenue growth rate of 24.3% from 2009 to 2023 and maintained profitable and positive free cash flow every year.[4]

Industrial: Heating, Ventilation, and Air Conditioning

The operational environment of data centers encompasses various factors and conditions that are critical for ensuring the reliable and efficient functioning of IT infrastructure.

Data Center equipment generates a considerable amount of heat in a small area. Ineffective temperature management may lead to overheating and equipment failure. Meanwhile, maintaining the ideal humidity level is essential for preventing moisture-related issues such as corrosion and condensation, which can damage sensitive electronic components. Furthermore, airborne contaminants, such as dust, dirt, and particulate matter, pose a risk to the performance of data center equipment.

Therefore, data centers require accurate control of temperature, humidity level, and air circulation within specified ranges or conditions to ensure optimal performance and reliability of the infrastructure, and to reduce operation risk. This is typically achieved through heating, ventilation, and air conditioning (HVAC) systems.

AAON and SPX are companies that offer products and solutions relevant to data center operations, particularly in the areas of HVAC, cooling, power management, and environmental control. For example, SPX's Marley Cooling Towers are widely used in the cooling systems of some of the largest data center operators in the world, while AAON's BasX division specializes in the design, engineering, and manufacture of customized, energy-efficient cooling solutions for the rapidly growing hyperscale data center market.

(4)Source: Fortinet Investor Presentation March 2024

TRFK

Pacer Data and Digital Revolution ETF

In essence, as society continues to navigate the complexities of the digital age, a lot of investment opportunities emerge beyond just a handful of concentrated mega-cap stocks that dominate the sector indexes. Investments in the data center ecosystem enable investors to take a broader and more diversified approach to capitalize on the technological advancements that underpin the increasingly connected and digitized world. The Pacer Data and Digital Revolution ETF (TRFK), which seeks to track the Pacer Data Transmission and Communication Revolution Index (TRFK Index), offers an investment vehicle to capture this potential, tracking companies deeply entrenched in data-related activities.

TRFK Index Exposures, based on GICS Classification

as of 3/31/24

Sector	Sub Sector	Weight
Semiconductors & Semiconductor Equipment	Semiconductors	37.78
Software & Services	Systems Software	15.56
	Application Software	6.65
	Internet Services & Infrastructure	6.04
	IT Consulting & Other Services	0.62
Technology Hardware & Equipment	Communications Equipment	17.81
	Technology Hardware Storage & Peripherals	8.40
	Electronic Components	0.20
Industrials (Capital Goods)	Building Products	3.64
	Electrical Components & Equipment	3.00
	Industrial Machinery & Supplies & Components	0.30

TRFK Index Top 10 Holdings

as of 3/31/24

Ticker		Port. Weight	GICS Industry	GICS Subindustry
NVDA	NVIDIA Corporation	12.43	Semiconductors & Semiconductor Equipment	Semiconductors
AVGO	Broadcom Inc.	10.24	Semiconductors & Semiconductor Equipment	Semiconductors
AMD	Advanced Micro Devices, Inc.	8.93	Semiconductors & Semiconductor Equipment	Semiconductors
CSCO	Cisco Systems, Inc.	6.21	Communications Equipment	Communications Equipment
INTC	Intel Corporation	5.72	Semiconductors & Semiconductor Equipment	Semiconductors
ANET	Arista Networks, Inc.	4.54	Communications Equipment	Communications Equipment
CRWD	CrowdStrike Holdings, Inc. Class A	3.85	Software	Systems Software
MSI	Motorola Solutions, Inc.	3.11	Communications Equipment	Communications Equipment
SMCI	Super Micro Computer, Inc.	2.98	Technology Hardware Storage & Peripherals	Technology Hardware Storage & Peripherals
PANW	Palo Alto Networks, Inc.	2.88	Software	Systems Software

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