INTRODUCTION OF COMPUTING DATA CENTER

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INTRODUCTION OF TRADITIONAL DATA CENTER

- A data center is a specialized facility designed to house, manage, and process vast amounts of data, applications, and digital resources.
- Data centers come in various sizes and configurations, ranging from small, localized server rooms to massive, state-of-the-art facilities that span acres.
- Key components of data center
  - Center operation building
  - Power infrastructure
  - Cooling system
  - Network equipment
  - Server racks and cabinets
  - Environmental control system
  - Security and Safety system
  - Operation management system
  - Redundancy system

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DATA CENTER CLASSFICATION

Data center is classified based on their reliability, availability, and redundancy.

- Tier I: Basic infrastructure components, including power and cooling systems, but they lack redundancy.
  - Uptime: 99.671%, allowing for up to 28.8 hours of downtime per year.
  - For small businesses or organizations with non-critical IT operations.
- Tier II: Redundant components for power and cooling, providing increased reliability compared to Tier I.
  - Uptime: 99.741%, allowing for up to 22 hours of downtime per year.
  - For small to medium-sized businesses with slightly higher availability requirements.
- Tier III: Multiple independent distribution paths for power and cooling, allowing for maintenance without disrupting operations.
  - Uptime: 99.982%, allowing for up to 1.6 hours of downtime per year.
  - For enterprise-level businesses with critical IT operations that require high availability and uptime.
- Tier IV: Have redundant components and systems to eliminate single points of failure, providing the highest level of reliability and availability.
  - Uptime: 99.995%, allowing for up to 26.3 minutes of downtime per year.
  - For mission-critical applications, such as financial services, healthcare, and telecommunications, where even minimal downtime can have significant consequences.

INTRODUCTION OF COMPUTING DATA CENTER

- A computing center, also known as a computational center or high-performance computing (HPC) center, is a specialized facility or organization dedicated to providing advanced computational resources and services for tasks that demand significant computational power and speed.
- Purpose and Focus:
  - Scientific research:
    - Scientific simulations: Modeling of physical phenomena, climate studies, and molecular dynamics,
    - Computational in various scientific disciplines: chemistry, biology, and physics.
  - Data analysis: Processing and analyzing vast datasets for insights and decision-making
  - Artificial Intelligence (AI) and Machine Learning (ML): Training deep learning models, natural language processing, and computer vision tasks.
  - Engineering simulations: Testing and designing complex systems, structures, and prototypes.
  - Financial modeling: Risk analysis, market forecasting, and algorithmic trading.

COMPUTING DATA CENTER VS CONVENTIONA DATA CENTER

	Traditional Data Center	Computing Data Center
Objectives	Versatile and suitable for a wide range of applications and workloads	Specialized facilities optimized for high-performance computing tasks that require massive computational power and acceleration
Infrastructure and Design	Typically large, physical facilities that house servers, networking equipment, storage devices, and other hardware. Require significant space, cooling systems, and power distribution infrastructure.	More specialized facility designed specifically for high-performance computing (HPC) and data-intensive tasks. Optimized for maximum computational throughput.
Workloads	Used for a broad spectrum of workloads, including web hosting, email services, database management, and general-purpose computing.	Primarily focused on compute-intensive tasks, including generative AI, machine Learning (ML), scientific research, weather modeling, financial simulation.
Hardware and Acceleration	Use standard servers with CPUs and a mix of storage solutions. While they can incorporate accelerators like GPUs for specific tasks, they are not typically optimized for high-density, accelerated computing.	Equipped with specialized hardware configurations that emphasize accelerators like GPUs or TPUs. These accelerators greatly enhance the performance of parallel processing tasks and are a critical component of high-performance computing
Cooling and Power Efficiency	Require extensive cooling and power distribution systems to maintain the temperature and power requirements of their diverse hardware. They may use air cooling or liquid cooling solutions	Designed with an emphasis on cooling and power efficiency, as the specialized hardware can generate substantial heat. These centers often employ advanced cooling techniques like liquid cooling and are designed to maximize energy efficiency
Cost and Scalability	Built to accommodate a wide range of workloads and may be less cost-efficient for specialized computing tasks. Scaling up or down can be challenging due to the diversity of hardware and applications.	More cost-efficient for specific high-performance computing tasks but may not be as versatile for general-purpose computing needs. They are often designed with scalability in mind for HPC workloads

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INTRODUCTION OF BLOCKCHAIN COMPUTING CENTER

- A blockchain computing center is a facility specifically designed to support the operations of blockchain networks, applications, and services. These centers provide the necessary infrastructure and resources for blockchain-related activities, including mining, transaction processing, node hosting, and development.
- Key components and features of a blockchain computing center:
  - Mining Hardware: specialized hardware, such as ASIC (Application-Specific Integrated Circuit) miners or GPU (Graphics Processing Unit) rigs, for cryptocurrency mining. These mining rigs perform the computational work required to validate transactions and secure the blockchain network.
  - Power Infrastructure: Mining cryptocurrencies like Bitcoin requires significant computational power, which in turn requires a substantial amount of electricity.
  - Cooling Systems: The intensive computational work involved in cryptocurrency mining generates a considerable amount of heat. To prevent overheating and maintain optimal operating conditions for mining hardware, blockchain computing centers typically employ advanced cooling systems, such as liquid cooling or industrial-grade air conditioning.
  - Networking Equipment: Blockchain computing centers require high-speed networking infrastructure to facilitate communication between mining rigs, nodes, and external blockchain networks. This includes switches, routers, and fiber-optic cables capable of handling large volumes of data traffic.
  - Security Measures: Given the value of cryptocurrencies and the potential risks of cyberattacks, blockchain computing centers implement robust security measures to protect against unauthorized access, theft, and hacking attempts. This may include physical security features like access controls, surveillance cameras, and security guards, as well as cybersecurity measures like firewalls, intrusion detection systems, and encryption protocols.
  - Node Hosting: In addition to mining operations, blockchain computing centers may offer services for hosting blockchain nodes. Running a node helps support the decentralization and security of blockchain networks by verifying and relaying transactions and participating in network consensus mechanisms.

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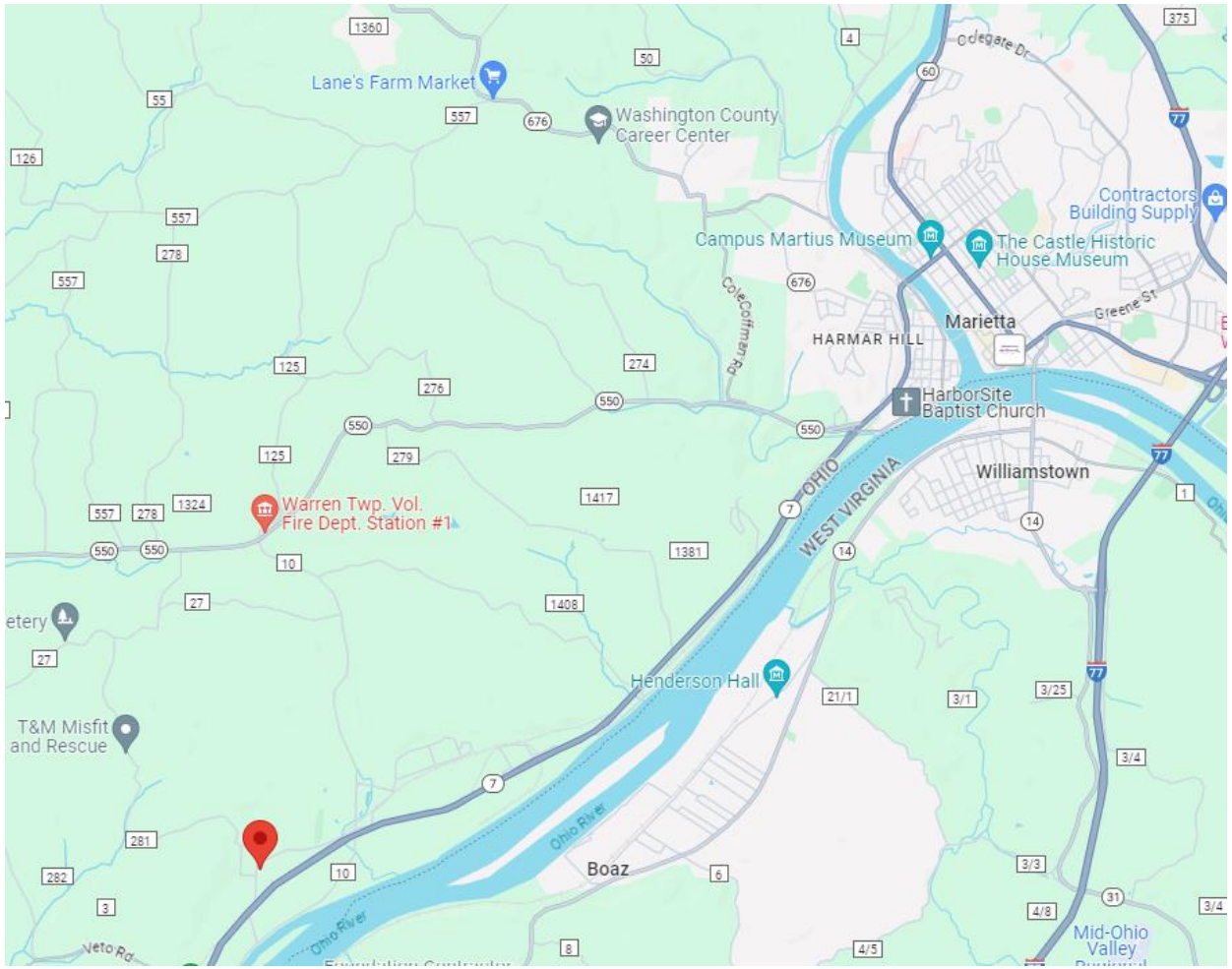
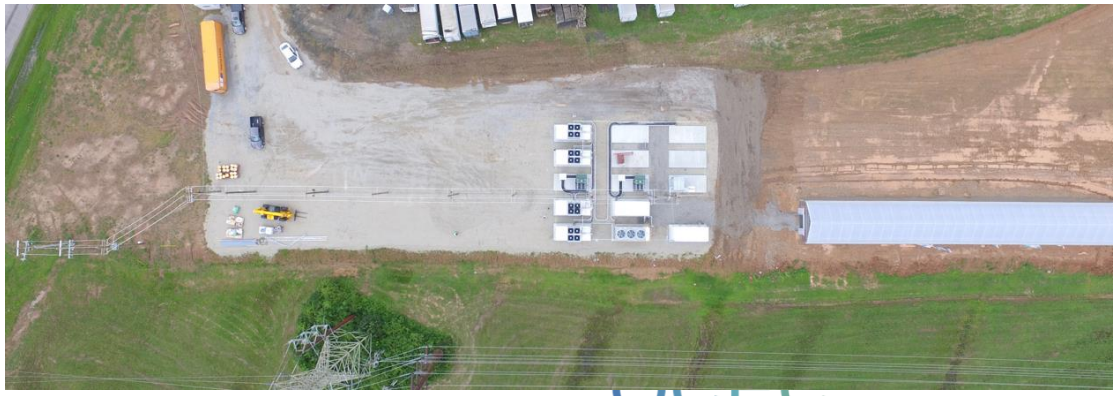
SAIHEAT R&D CENTER AND OCEC CENTER IN MARIETTA, OH

550 Gravel Bank Rd, Marietta, OH 45750
SAI US R&D Center + OCEC Heat Recycling Center

SAIHEAT Marietta Site Videos:

- SAI NODE Marietta
- SAI NODE Marietta Site Bird View





SAIHEAT R&D CENTER DEVELOPMENT PLAN

OCEC Center Missions and Goals

Our Missions:

- Develop technologies and systems to demonstrate how residential, commercial and industrial can recycle the computing heat waste as a replacement of traditional heating.
- Provide accessible information, engage in advocacy, and collaborate with stakeholders to educate individuals and communities about the urgent realities of climate change and inspire computing heat recycle for a sustainable future.

Our Goals:

- Build the center in a way to benefit local community.
- As the first of this kind of R&D center, continue to be the leader of this field in the world and bring the best computing heat recycle solution to the world.
- Be one of key contributors in achieving carbon neutral efforts.

ACKNOWLEDGMENT

OCEC appreciates support from our sponsors and partners.

Marietta Community FOUNDATION

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