cadence®

Reimagine Enterprise Data Center Design and Operations

Discover How Global Enterprise Organizations Maximize Performance and Future-Proof their Data Centers

Who should read:

- Financial Services, Automotive, Aerospace, and Healthcare Senior Management in IT & Operations
- Data Center Designers and Consultants
- Engineers working in Enterprise in IT and Facilities Management

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Introduction

Ever feel like the only constant in the data center industry is that things are always changing? You're not alone. From rising densities and new cooling technologies to shrinking budgets and shifting environmental policies, there's never a shortage of change in our field.

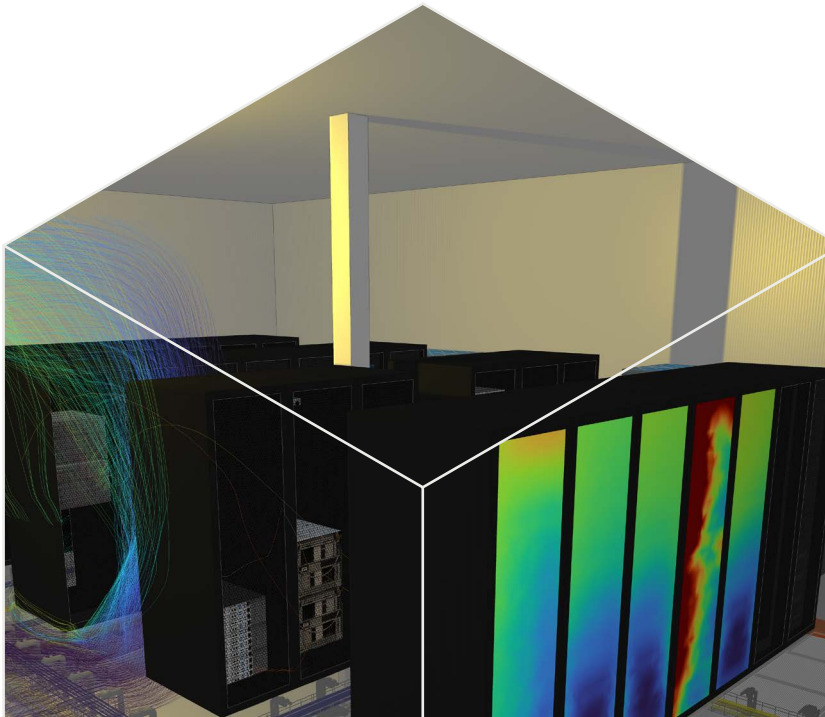
For large enterprises with legacy infrastructures, adapting to change is easier said than done and the specific challenges likely look different for each individual team.

Maybe your business needs the data center to power new instantaneous transactions. Maybe several data halls must support HPC and AI training and require high-density servers you've never housed before. Or maybe new sustainability commitments require a change in how your team manages energy consumption. Maybe your business needs are a combination of the above.

Despite this changing landscape and the complexities that come with it, data centers must always adapt to the new normal. If the digital world goes down, so does the "real" world. The two have become inextricably linked. There isn't room for error.

This is why digital twin technology is so pivotal to the data center industry today. In fact, we believe that every data center should have its own digital twin. Now, more than ever, data center professionals must do more than just firefight issues to survive: they must be ready to adapt to rapid change to succeed. This technology enables that.

From healthcare to aerospace, digital twin technology provides a holistic view of data center performance, empowering data center design and operations. With the right calibrated CFD simulation model, teams can observe, understand, and fine-tune the overall data center ecosystem without risk.

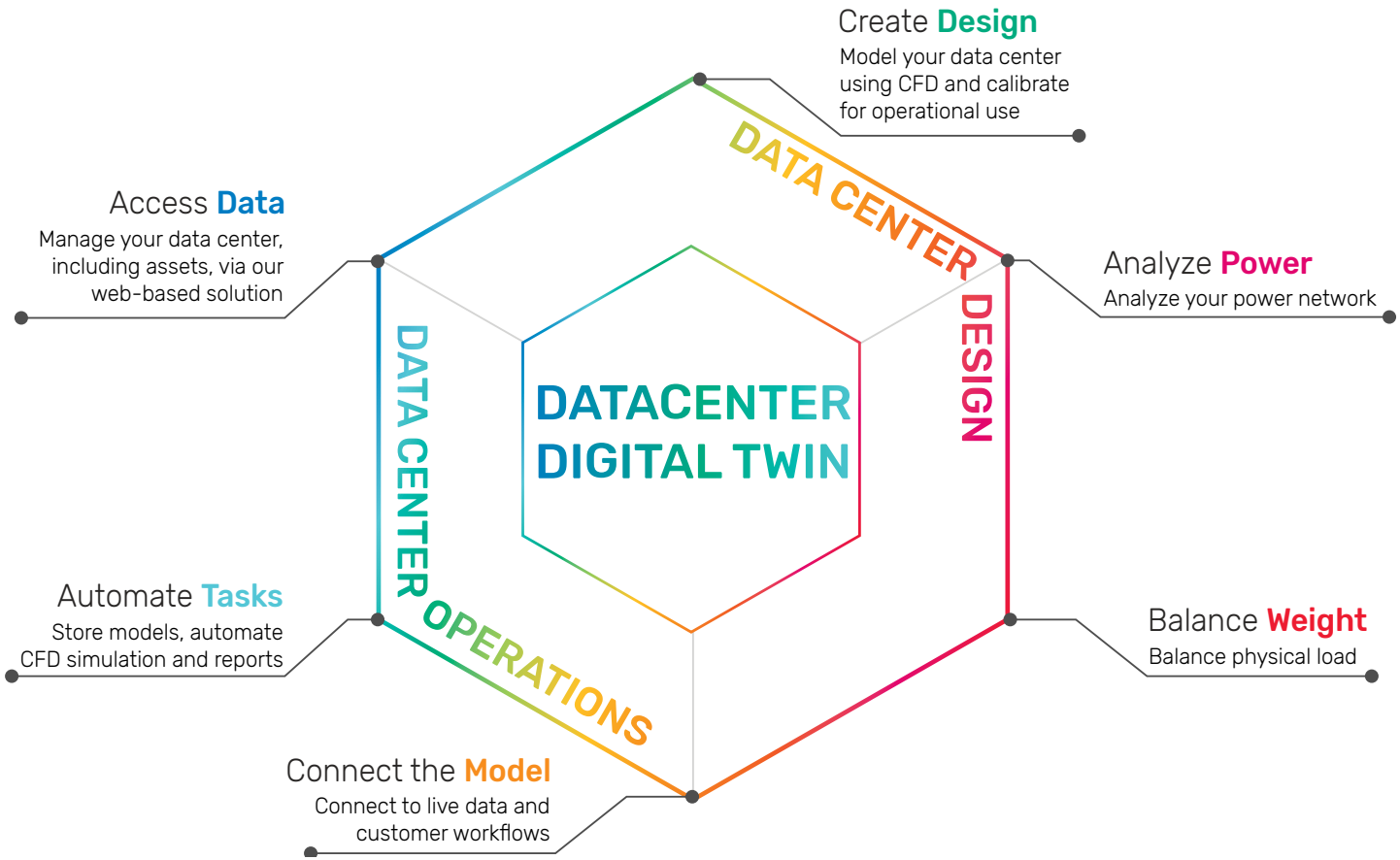


Introduction

Most importantly, data center teams gain actionable insights to enact meaningful changes to the real environment. Let us show you.

This eBook details several case studies from large enterprises in various industries with different pain points and needs.

All have found incredible success adapting to challenging circumstances using Cadence® DataCenter Insight Platform™: Digital Twin Module (DataCenter Digital Twin, formerly Future Facilities 6SigmaDCX product line).



Aerospace

How has DataCenter Digital Twin helped an aerospace enterprise?

Answer: 30-40% reduction in data center power consumption and an increase in data center efficiency.

One of the world's largest aerospace companies uses DataCenter Digital Twin for data center performance efficiency modeling and asset management. Initially, they needed this solution to address performance issues in the data center when implementing new IT equipment. These issues included loss of cooling, compliance, and low operating efficiency. In addition, the data center management team was using a manual, trial-and-error approach to IT installation planning that was time consuming and risky, ultimately resulting in a loss of some IT equipment and an outage to IT operations.

This large aerospace enterprise began using DataCenter Digital Twin to perform engineering simulations. They built and calibrated models to form a digital twin of their data centers, enabling them to see what would happen in different scenarios by testing them in a virtual model.

Using the solution's built-in libraries of cabinets and IT devices, the company simulated what would happen if they started to bring new IT into the data center environment. In short, the company could simulate the impact of new IT equipment deployment. They could also examine all the capacities of cooling and power currently adopted and began to experiment in their DataCenter Digital Twin models to search for greater efficiency gains and understand the impact of adding more capacity. DataCenter Digital Twin enabled the company to be very proactive and make decisions using science rather than rules of thumb or guesswork. As a result, there was a reduction in power usage and an increase in data center efficiency.

Changes in IT equipment drove the variances in data center performance in terms of compliance and efficiency. With help from Cadence tools and services, the company was able to simulate the changes in IT equipment in a virtual environment to understand the performance impact. This simulation-based methodology for IT installation planning enabled the data center management team to adjust environments for optimal performance before installation.

30-40%

Increase in data center performance and reduced power consumption

Aerospace

The company has quantified that it has been able to reduce power consumption and increase performance by 30-40% (depending on the data center). This large enterprise now operates its data centers more reliably and sustainably, reducing power consumption without increasing environmental compliance risk.

Cadence's DataCenter Digital Twin solution helped this aerospace enterprise overcome the challenge of fulfilling the competing objectives of compliance and efficiency at the same time. Initially, compliance was good, but efficiency was missing. DataCenter Digital Twin allowed them to simulate the impact of physical changes on compliance and efficiency and understand how they are interdependent. This insight into performance enabled the management team to drop PUE at one of their data centers from PUE 4 to 1.6.

This large aerospace enterprise is a long-time user of the Cadence DataCenter Digital Twin modeling suite. They use DataCenter Design Software for simulation modeling, as well as the DataCenter Insight Platform: Asset Twin for IT asset management, linking their Facilities Management and IT Planning Teams together under one software suite. Specifically, they use the software to efficiently perform monthly IT asset audits.
This saves their engineering department a significant amount of time.

One of the world's largest aerospace enterprises uses DataCenter Digital Twin to:

- Model impact of new IT equipment in a virtual environment, adjusting to reduce risk
- Experiment in a virtual environment to maximize efficiency without impacting compliance
- Manage IT assets and perform monthly IT audits more efficiently

Results:

- Reduction in power consumption and increase in performance of 30-40%
- Increased efficiency in cooling without impacting compliance
- Decreased one data center's PUE from 4 to 1.6

Healthcare

How has DataCenter Digital Twin helped a healthcare enterprise?

Answer: Resist internal pressure to migrate IT to cloud or other hosted services and increase the potential lifespan of its data centers whilst satisfying high-density demands.

One of the world's largest healthcare enterprises has implemented digital twins of its data centers for ongoing use in day-to-day operations. With multiple data center sites comprised of hundreds of thousands of square feet, optimizing operations across all sites can be a challenge. This required a strategic leadership approach, coupled with concerted cross-departmental collaboration, to facilitate systems integration and introduce business processes to achieve greater efficiency across the board.

The data center operations department set out to revolutionize a legacy data center system. The aim was to provide its business with faster delivery timeframes of upgraded IT services and offer cost savings, whilst still ensuring resilience. They did this with the implementation of DataCenter Digital Twin, including computational fluid dynamics (CFD) simulation and 3D modeling. DataCenter Digital Twin is considered a crucial tool in enabling their data center to satisfy the ongoing demands of their business.

The data center operations department was seeing increasing requests for high-density IT platforms that deviated significantly from their facilities' standard physical operating specifications around space, power, cooling, airflow, and weight. Desired cabinet-scale IT units broke the norms in terms of air and power consumption, as well as weight and size, and concerns arose around optimal cooling set-up for such high-spec equipment. They needed to plan for the effective cooling of the new units whilst avoiding any knock-on cooling issues that might affect existing IT.

They realized the need to invest in tools that could help them gain in-depth knowledge and understanding of the complex physical behavior of the data center cooling system, and the interdependencies between other capacity resources, such as space, power, and airflow. They also needed to increase their ability to cope with out-of-specification power loads with precision. CFD and DCIM products were evaluated, with quick realization that effective system integration would be key: this would ensure they could process IT requests fast enough to avoid damage to the business, and also protect against the threat of justifying IT service migration to the cloud or other hosted services.

Gain In-Depth Knowledge

Understand the complex physical behavior of your data center cooling ability

Healthcare

Implementing DataCenter Digital Twin and integrating it with current operational systems has enabled this large healthcare provider to streamline data center processes and provide a cost-effective solution by maximizing the performance of their legacy system. They regularly make decisions on complex issues by running CFD simulations within their digital twin models on a weekly and monthly basis. The team actively models power failure analysis on newly installed IT and performs cooling analysis on large IT deployments to optimize placement. They use DataCenter Digital Twin to implement data analysis to understand their data center progression. In placing larger deployments in more optimized locations, they believe that they will extend the life of their data centers and keep operations in house. CFD modeling and DataCenter Digital Twin are deeply beneficial to their business and embedded into their day-to-day operational business processes.

One of the world's largest healthcare enterprises uses DataCenter Digital Twin to:

- Ensure resilience whilst offering faster delivery and cost savings
- Accommodate increasingly large IT units without risk
- Optimize cooling for power-hungry IT — performing analysis on large deployments to optimize placement
- Plan for out-of-spec power requests with confidence and simulate power failure analysis
- Integrate their data center model with existing tools and systems via the DataCenter Insight Gateway tool and analyze performance information through the web-based browser tool

Results:

- Avoid pressure to migrate IT to cloud or other hosted services by instead keeping this in house
- Gain a true in-depth understanding of their facilities, and increase their lifespan

Automotive

How has DataCenter Digital Twin helped an automotive enterprise?

Answer: In looking to improve cooling, this automotive enterprise also found a solution for asset management and placement, as well as a platform to foster collaboration across IT and Facilities teams, resulting in a significant data center transformation project.

One of Europe's largest automobile manufacturers has developed six digital twins of its data center rooms using DataCenter Digital Twin. The original purpose of the implementation was to improve cooling across all halls to minimize risk and maximize energy efficiency. Digital twins of each data center hall were built and calibrated to ensure that they mirrored the exact behavior of their physical counterpart. Engineering simulation powered by CFD was then used to explore current cooling issues and run different scenarios to improve the energy efficiency of the data center, without any risk to IT equipment.

This automobile manufacturer then adopted DataCenter Digital Twin to manage the installation and decommissioning of servers in their multiple data halls. The digital twin models are kept up-to-date and accessed via a web browser. The team uses this to view the data halls, search for a particular server, interact with their digital twin model to assess where best to install a new piece of equipment, and check that there is adequate power for deployment. They also use the powerful dashboard and reporting functionality to create reports about their available resources. This tool is particularly useful to answer the many questions that the data center team receives from IT around available capacity and existing deployments.

As the company approaches a big shift in data center organization, DataCenter Digital Twin will be used to refine future data hall layouts to maximize efficiency. They will consolidate existing IT into fewer rooms to free up new space, using the digital twin technology to safely maximize capacity utilization without risk to compliance. DataCenter Digital Twin has enabled the Facilities and IT teams to work together in this modernization project, using the software platform to plan implementation, troubleshoot, share ideas, run iterations of potential future layouts of data halls, and ensure that capacity utilization will be maximized while ensuring adequate cooling across the data halls.

DataCenter Digital Twin

Interact with your data center digital twin in a virtual world and optimize deployment strategy

Automotive

This company has benefitted greatly from using DataCenter Digital Twin in planning this reorganization, particularly while physical access to the site was limited during the coronavirus pandemic. It has enabled them to work remotely with access to intricate detail on the current data center set-up and progress in line with initial project timelines, which would not have been otherwise possible. Without this technology, the data center operations team would have seen large delays to an important transformation project.

One of Europe's largest automotive enterprises uses DataCenter Digital Twin to:

- View all data center rooms through calibrated virtual replica digital twins
- Search for IT assets
- Decide where to place new equipment to maximize capacity utilization
- Verify power provision for new equipment and determine how best to connect it to the power network
- Edit reports about available resources
- Answer IT's questions about the data center

Results:

- Delivery of data center transformation project on time and to budget with improved use of data center space

Finance

How has DataCenter Digital Twin helped a financial services enterprise?

Answer: Removed guesswork, improved risk mitigation, and given oversight on the three key data center elements of power, space, and cooling.

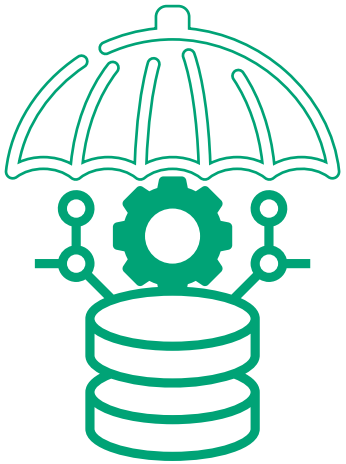
One of the top five global financial services organizations with over 200,000 employees worldwide uses DataCenter Digital Twin across its multiple US data center sites, many containing high-density racks of around 14kW. Using the Cadence CFD simulation solution, the company can identify areas where they can make improvements to data center operations — making both big and small adjustments to how each data center is run. This enables them to make dollar savings by fine-tuning efficiency.

With large scale company operations and multiple data center sites, small adjustments and tweaks in efficiency mirrored across sites can mean a big difference to the overall company bottom line. Coupled with larger improvements that can be identified by a data center digital twin, this financial customer is very happy with the business benefits offered by the Cadence solution.

Capacity decisions are a common use of DataCenter Digital Twin in this company. They are working across multiple sites in a high-density environment, squeezing maximum capacity out of their space without risk. Because the product gives them an overall view of cooling, space, control, electrical, and reporting, they have gained confidence through a full understanding of each of their data center environments with a fully updated digital twin for each one.

The company has integrated DataCenter Digital Twin with information from their existing DCIM and BMS systems to ensure that their data center digital twin is seamlessly and automatically updated. This ability to integrate easily with existing systems was a deciding factor in adopting this solution, as it allowed the company to maintain its CFD models in an operational environment without an impractical commitment of resource.

This financial services provider also uses the product to protect against future risks, simulating what-if scenarios to educate and direct risk mitigation strategies. This can be on short-term projects, such as simulating maintenance developments before they are underway.



Plan Safely

Inform risk mitigation strategies and gain confidence in decision making

Finance

Understanding the potential problems that maintenance could cause before they happen is a key benefit. For example, they can determine whether they can rely on one side of the power chain to carry twice the load whilst they do maintenance on the other side.

Similarly, DataCenter Digital Twin is also used on a longer-term basis to future-proof data center operations, simulating potential equipment failure on a much larger scale and helping their data center management teams to understand and mitigate those risks before they happen.

We selected Cadence DataCenter Digital Twin based on its ease of use, integration capabilities, and excellent customer support. It is competitively priced, and we found that it was a product that offers significant value and benefits to the business both from a cost-saving and risk mitigation standpoint.

One of the top five global financial services organizations uses DataCenter Digital Twin to:

- Make decisions on capacity
- Understand the capabilities of each data center
- Perform extensive failure analysis
- Inform risk mitigation strategies and give confidence in decision making

Results:

- Reduce OPEX costs through precision fine-tuning across its data centers
- Educate staff on data center impact through reporting

Finance

How has DataCenter Digital Twin helped a financial services enterprise?

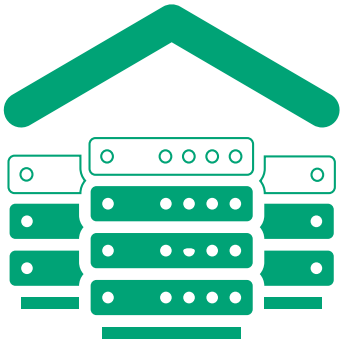
Answer: Offering savings of $10 million with increases in availability, capacity, and energy efficiency.

One of the world's largest commercial real estate and services businesses used Cadence DataCenter Digital Twin to deliver savings of over $10 million for a financial services business' 2 MW Tier IV data center without increasing the risk of downtime.

The financial services customer needed to improve the energy efficiency of one of its data centers without impacting availability or sacrificing capacity. This required an accurate data center digital model and insightful data to assess the facility's current efficiency. To achieve this, DataCenter Digital Twin was chosen.

DataCenter Digital Twin was used to measure the data center's availability, capacity, and efficiency to understand its current operational performance. The company ran a series of what-if scenarios and various designs within DataCenter Digital Twin to simulate and understand how to improve performance. The results demonstrated that the data center was currently running at only 97% availability (3% IT at risk of thermal shutdown), 86% capacity (14% stranded capacity), and 74% energy efficiency. By using DataCenter Digital Twin, the company identified the precise, yet simple, actions necessary to achieve target performance.

Using the insights revealed by DataCenter Digital Twin, the financial services business implemented the necessary changes to deliver statistically significant improvements. These changes resulted in 100% availability (3% improvement), 96% capacity (10% improvement), and 81% energy efficiency (7% improvement). Combined, these improvements saved the financial services business an estimated $10 million in energy costs and reclaimed stranded capacity.



Data Center Digital Twin Enabled:

100% Availability

96% Capacity

81% Energy Efficiency

$10m In cost savings

Finance

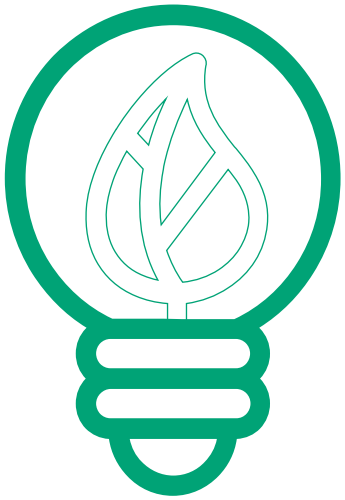
The company quoted a projected energy saving of $1.15 million over a 24-month period. It took them just 8.5 months to recoup the investment in this data center improvement project. The financial services business continue to use DataCenter Digital Twin for ongoing capacity management to track metrics and keep costs low. The solution has been integrated with existing monitoring and DCIM tools to ensure it is seamlessly and automatically updated. This has allowed its use to be integrated into the process for new deployments, maintenance schedules, and larger capacity planning projects. This means that cost savings are ongoing and cumulative over time.

A financial services organization uses DataCenter Digital Twin to:

- Save $10 million in capacity and energy costs, with $1.15 million in projected energy savings over a 24-month period
- Increase energy efficiency of one data center without impacting availability or sacrificing capacity

Operational performance improvements:

- Data center was originally running at 97% availability, 86% capacity, and 74% energy efficiency
- This was improved to 100% availability, 96% capacity, and 81% energy efficiency
- Increased understanding of data center operations and ability to push the limits without risk
- Return on Investment period for this project was 8.5 months



$1.15 Million

Projected energy savings over a 24-month period

Finance

How has DataCenter Digital Twin helped a financial services enterprise?

Answer: Extend existing data center legacy assets for many years, maximize capacity and space utilization, and avoid migrating to colocation services.

When one company thought they faced limited power availability, they thought colocation was the only answer. It was not until Black & Veatch assessed their data centers that they learned they could extend their existing assets for several more years, saving millions while keeping them online and buying them time to secure their long-term digital future. With this newfound capacity, the client needed to understand how best to use the space and capacity to accommodate its high-performing, high-density equipment. Black & Veatch enlisted Cadence to model the data center environment to optimize space and critical infrastructure systems and maximize performance.

When a BV client was upgrading and adding more data center equipment, the company convinced themselves that they were running out of power, basing their conclusion on stated equipment specifications, and applying a safety factor. Assessing and verifying what equipment was being used and how it was configured revealed they did not have a problem with capacity or space, but distribution. The distribution between mechanical, electrical, and IT systems needed to be reassessed to allow the stranded power to be distributed. By making some upgrades at a fraction of the cost of moving to colocation, the client would be able to meet near-term growth projections within their existing data center footprint.

Once the client realized they had more capacity and space than they originally thought, Black & Veatch turned to Cadence CFD modeling software, DataCenter Digital Twin, to determine the best use of existing capacity and space. By running multiple modeling scenarios, the team could determine the best configuration to yield optimal mechanical systems performance and PUE. Additional testing within DataCenter Digital Twin, including calculating transient times and failure rates, helped BV understand what the best and worst future cases would be, so they could help the client take the right actions now to mitigate any future operational disruptions.

Extend the Lifespan

of existing legacy data center assets, saving millions of dollars

Finance

The financial services client was able to integrate their data center digital twin model with existing DCIM and information systems, enabling them to visualize and gain a greater understanding of their data center, including the power network and existing IT deployment. Their digital twin model is automatically and seamlessly updated, without interruption to existing internal workflows and processes, to always give an accurate view of their data center. With this 360-degree view into their operation, the client can analyze and make day-to-day operational decisions more quickly and easily.

A financial services organization uses DataCenter Digital Twin to:

- Model the data center environment and run multiple simulation scenarios to optimize space and critical infrastructure systems, yielding optimal mechanical system performance and PUE
- Visualize and gain a greater understanding of power networks
- Integrate the twin model with DCIM and information systems to ensure it is seamlessly and automatically updated, meaning that the twin model will always provide an accurate view of their data center

Results:

- Avoid migrating to colocation services, meeting near-term growth projections within their existing data center footprint
- Extend the lifespan of existing legacy data center assets, saving millions of dollars

Conclusion

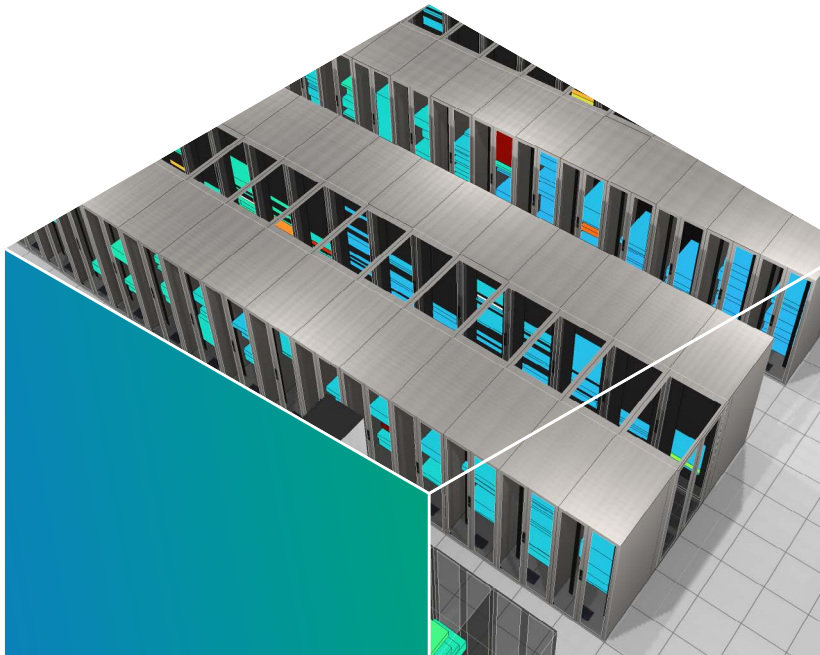
Cadence is determined to propel the data center industry into a new age – helping companies to stay leaner, greener, and more informed. We are passionate about developing software that provides a holistic view of data center performance and supports decision making in both the design and operational stages of a data center's life.

By consolidating big data within one platform—as well as integrating our software with DCIM, BI tools, monitoring systems, ticketing software, and more—we can create a seamlessly updated virtual data center model. This model visualizes airflow, cooling, and power using scientifically accurate CFD simulation across the data center environment to quickly identify any issues and prepare for future ones.

This model does more than just tell you the current state of your data center. As described in the case studies above, DataCenter Digital Twin provides actionable insights and a path towards a successful future.

DataCenter Design Software and Insight Platform 30-Day Free Trial

FIND OUT MORE



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 J13193 11/22 DG/RC/PDF