Working in Partnership with

Hewlett Packard Enterprise

future facilities

Innovation in Colocation

Thésée DataCenter implements colocation's first truly interactive data center digital twin

CASE STUDY

Thésée DATACENTER

Challenge:

To provide a best-in-class innovative Tier IV colocation data center maximizing capacity usage, while ensuring cost-effective energy efficiency and an unparalleled customer experience.

Process:

Map out customer and colocation service provider needs and establish the best systems to offer a seamless customer experience.

Solution:

Fully integrate all systems within a ground-breaking DCMS, embed a 6Sigma Digital Twin to ensure informed decision making using CFD simulation both in design and operations.

Offering a Home-Away-From-Home Data Center Experience

French colocation data center provider, Thésée DataCenter, has knocked it out of the park when it comes to offering their customers a truly unique, interactive experience. In June 2021, the colocation provider opens its doors to offer 'Data Center as a Service': a virtual home-away-from-home experience for its customers. The idea is that customers should feel like it is their own IT room that they are managing, even though it is located in a colocation data center on the outskirts of Paris.

Thésée DataCenter's campus will eventually offer six data center buildings, each housing two identical data halls of 534m^2 commissioned in three phases of 1MW, 2MW and 3MW IT capacity build out. Specializing in offering mixed density, from legacy to cloud hyper-converged to HPC computing, the focus will be on high performance with minimal environmental impact and maximum energy efficiency. Thésée DataCenter is **Tier IV certified by the Uptime Institute** and is the first French colocation provider to offer this level of high availability for service level agreement up to 100%. Thésée DataCenter contracted **Hewlett Packard Enterprise** to lead the design, the construction PMO and the commissioning of its new data center.

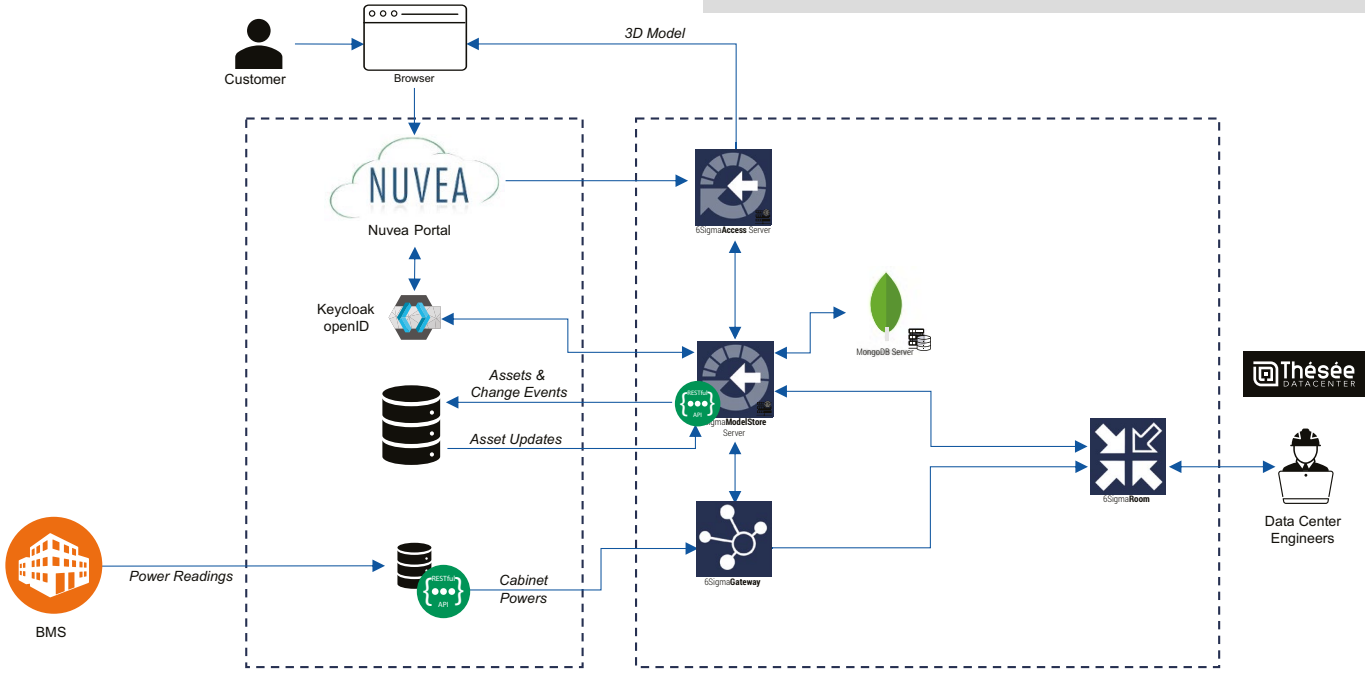
Eric Arbaretaz, CTO and Co-Founder, Thésée DataCenter comments: ***"Thésée DataCenter aims to offer the best combination of qualities currently sought by customers: a sovereign, eco-responsible data center offering the best level of security and availability at a competitive price."***

Counting some of the highest performing French and international companies amongst its clientele from automotive to telecoms, customers will benefit from complete, real-time visibility of exactly what is going on in their data center space through a web service portal. This will be powered by **New Generation**'s NUVEA Paas web service portal, fed with information from **Future Facilities**' 6Sigma Digital Twin as well as the Building Management System (BMS).

> The 6Sigma Digital Twin will allow us to know the real capacities of our infrastructures, to anticipate the arrival of new projects, to test and propose the best locations for pre-sales projects and finally to maximize the commercial potential of our campus.
>
> **Eric Arbaretaz, Co-Founder and CTO, Thésée DataCenter**

There is a reason why Thésée DataCenter is so named...

The colocation provider is named after Theseus, the renowned hero of Ancient Greek mythology, who used reason to defeat the Minotaur. Adopting a rational, collaborative approach, he navigated the confusing maze of the labyrinth that was used to contain the Minotaur and pulled out a hidden sword to defeat the beast. In so doing, he saved the lives of many Athenian children that were sent to its mercy each year with just a ball of string and a sword. Now this doesn't really seem like your average data center analogy, but when you use the labyrinth as a parody for technological progress and the whole myth as a reminder of the fragility of information systems in the age of cloud computing, then Thésée DataCenter as a name starts to resonate.



Agile by Modular Design

The data center has been designed with agility and availability in mind. As capacity requirements grow, the colocation provider will be able to upscale quickly without disruption. The whole data center is built on a modular design concept to facilitate this.

Pascal Lecoq, Worldwide Practice Director, Hewlett Packard Enterprise, who masterminded the design, working alongside Thésée DataCenter, comments: ***"We've got only IT infrastructure and network interconnect inside the Data Center shell – everything pertaining to facilities is outside; the design is modular in order to be incremented and upgraded really easily."***

The colocation provider needs to be able to react quickly to the demands of its customers. The data center modules are granular and can be upgraded in sufficiently small increments of 500kW modules that can be set up in a question of months. This means that it maintains energy efficiency as it grows but can still upscale quickly.

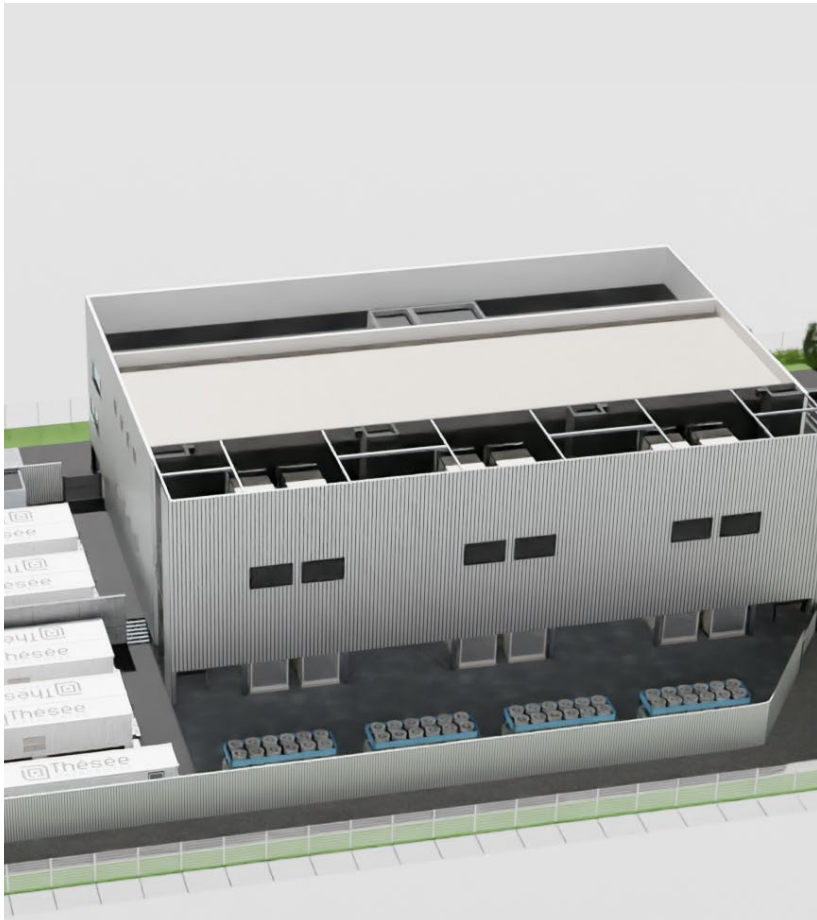
All mechanical and electrical equipment are based in container modules (all the electrical chains from the high voltage feed to the low voltage PDUs feeding the data halls are integrated into these container modules). If Thésée DataCenter wants 500kW more, they just need to order new containers which will arrive in three to four months. Similarly, for the cooling system, Thésée DataCenter currently has six Air Handling Units (AHUs) for indirect air free cooling in use, but has slots already built in for six more. This would enable them to double capacity in a matter of months. The containers and AHUs for power and cooling are located outside of the building, as well as the diesel generators.

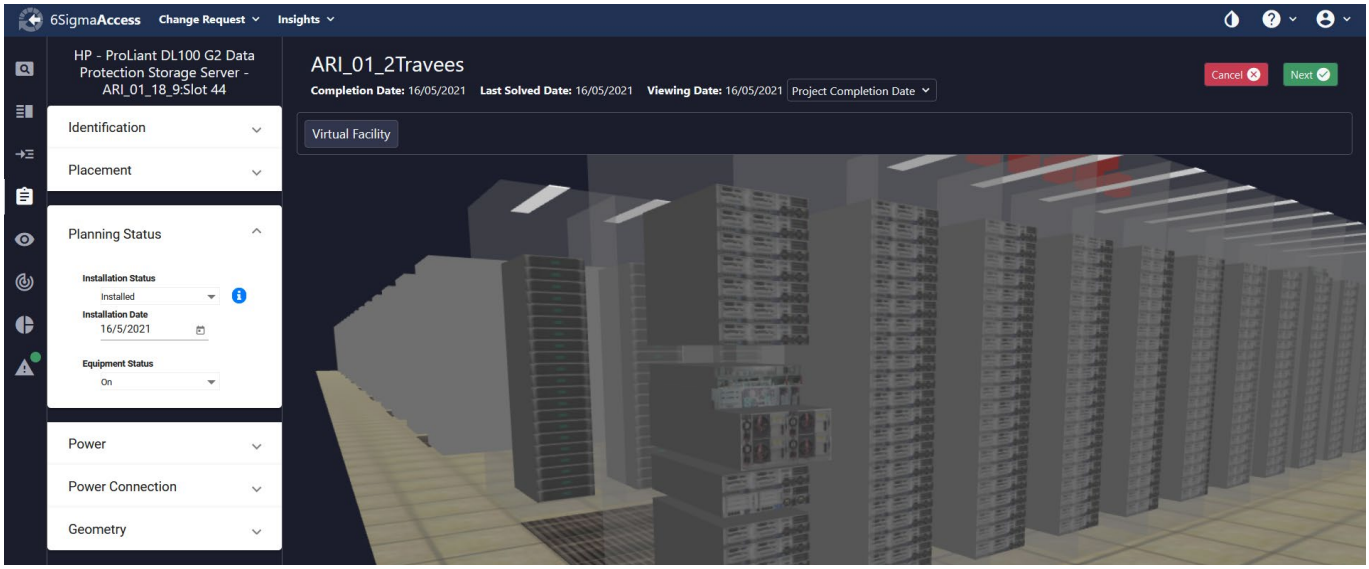
These important design elements have allowed the provider to maximize its use of real estate, at a premium in the Parisian suburbs. Lecoq continues: ***"At the moment we have sufficient space but at a certain point we will meet the capacity limit of the land. Then, if we need to upgrade the capacity of the data center further, we can just come with a crane, extract the container of 500kW and replace it with a new 1MW container. It is planned like that, so that at the end of the day we can play with all these Lego blocks. We can take off a block and install another block that is higher capacity."***

And the scalable data center design isn't the only thing that is ingenious in the Thésée DataCenter design. Arguably the most compelling Unique Selling Proposition (USP) will be the end-user customer experience. The secret to this: an end-to-end integrated Data Center Management System (DCMS) architecture designed by HPE, including solutions from Future Facilities and New Generation, with everything accessed via a single web portal.

Why did Thésée DataCenter implement a 6Sigma Digital Twin?

1. Offer clients a rich, innovative customer experience – an essential tool in the communication between the data center and its customers
2. Allow clients access to a 3D vision of their IT equipment, power and operating conditions – home-away-from-home data center experience
3. Provide complete transparency to customers in real-time on performance and service level indicators
4. Allow customers to develop precise knowledge of the evolutionary capacity of their infrastructures and plan future installations risk-free
5. Help Thésée DataCenter better optimize the filling of the data center and use full capacity - essential to the financial success of the data center
6. Anticipate changes to the cooling infrastructure to achieve ambitious energy performance objectives (PUE1.2)





Not Your Average Data Center Management System (DCMS)

Hewlett Packard Enterprise, New Generation and Future Facilities, via French reseller **WattDesign**, worked together on this project. Based on a design by HPE, New Generation took the lead to integrate all the systems to provide a seamless and interactive customer experience. The idea was that the customer could do whatever they needed to do concerning their data center space, all via one web portal interface.

As the customer logs in, a plethora of information will be available to them, shown on dashboards and in customizable reports. The event and alarm system will also be managed via this portal, through a close integration of the BMS (Building Management System). Customers can access a marketplace where they can request and order services from a predefined catalog, approve them for implementation and then visualize them in their very own 6Sigma Digital Twin – an exact 3D digital replica of their own data center space. Future Facilities' 6Sigma Digital Twin product suite will be used to power this functionality and is fully integrated into the overall Data Center Management System (DCMS). In addition, customers will benefit from CFD simulation to ensure that they maximize space usage, plan IT upgrades, manage power and more. It is unusual for colocation customers to be given this level of real-time visibility and functionality.

> The 6Sigma Digital Twin is an essential tool in the communication between the data center and its customers.
>
> **Eric Arbaretaz, Co-Founder and CTO, Thésée DataCenter**

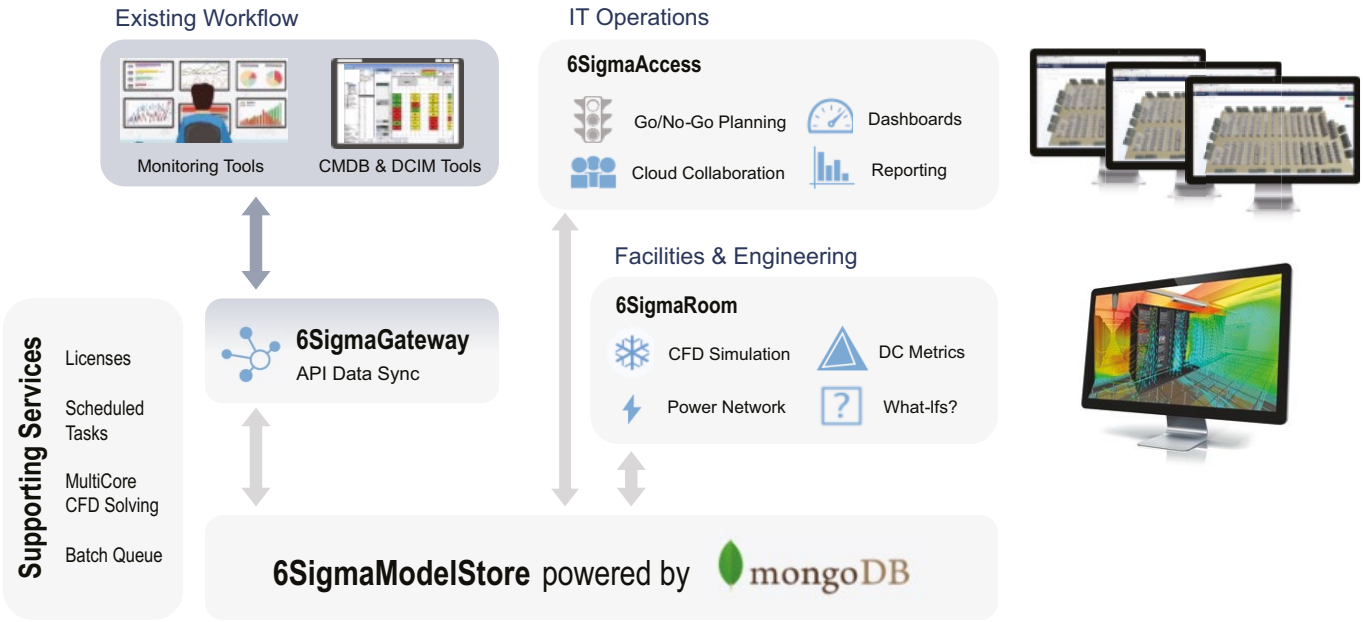
"Our solution made it possible to influence the design of the data center by allowing the integration of previously separate technical areas and to integrate them into a unified and efficient management system," comments Gilles Cieza, CEO of New Generation.

He continues: *"We started out together with the observation that the DCIM solutions on the market only covered part of the challenges that data center operators were facing and NewGen then had an integrated platform that allowed for the overall management of a data center by reconciling the DCIM and DCSO (Operations Optimization) components, which was a perfect match for the DCMS concept. The 6Sigma Digital Twin is an important component of the DCMS solution since it allows, through a very accurate model of the rooms, to manage equipment inventories, to plan and optimize the rooms, to simulate interventions by validating the feasibility a priori, etc."*

Arbaretaz concurs: *"We will encourage our customers to use this service portal to access the visibility of their infrastructure remotely, prepare their scheduling plan and if they agree, order the work to be carried out in the room to accommodate future racks and install the IT equipment. This service portal will be based on the 6Sigma Digital Twin and will allow each client to have a 3D vision of their IT racks, servers and all the operating conditions of the IT room. The implementation of the portal and the service catalog for data center users will make it possible to digitize all the processes linked to the purchase, implementation, monitoring and invoicing of services. Future Facilities has adapted its software for a multi-client environment and Thésée DataCenter will be the first hosting company to offer this service integrated into our service portal. We are particularly proud of this innovation."*

Future Facilities' 6SigmaAccess product was integrated into the NUVEA Paas web portal and adjusted to change viewing permissions to accommodate a multi-tenant data center environment.

Sylvie Boudoux, Director of WattDesign explains: *"A key point we raised and worked on is the introduction in 6SigmaAccess of the ownership for racks. It is essential to define an owner for each rack, but more than that, the client connected to the portal should visualize only their racks and obtain reporting considering only their IT equipment."* This is clearly critical from a security point of view.



Why use the 6Sigma Digital Twin?

Future Facilities' 6Sigma Digital Twin is a key part of the DCMS to enable such high functionality to Thésée DataCenter's customers. Not only that, but it is also key for the colocation operator themselves to operate with confidence. The idea is that the provider's digital twin will always be kept true to life. Any time a change is made in the data center, this will be automatically updated and reflected in the 6Sigma Digital Twin. This means that Thésée DataCenter can rely on its digital twin to have an overall view of how the data center is performing and to ensure it is squeezing the maximum capacity out of the space available, without any risks to customer services. This makes both operator and customer as cost-efficient as possible and allows Thésée DataCenter to deliver customer services quickly. The 6Sigma Digital Twin is such an effective tool because it takes account of precisely which IT equipment is in each IT rack, how the data center is laid out and how airflow, cooling, weight and power are affected using Computational Fluid Dynamics (CFD) to calculate the current state and the impact of any potential changes. It is useful for detecting issues such as hotspots, particularly problematic in multi-density environments. It has a two-way exchange of data to monitoring and asset management systems to utilize this information in the 6Sigma Digital Twin model.

Design Aims of the Data Center

1. Cater for a large range of client density needs from 5kW to 30kW racks and more
2. Offer high availability as a Tier IV data center certified by the Uptime Institute
3. Offer a modular, agile data center to quickly upscale to accommodate customer needs
4. Design for maximum energy performance and efficiency – to minimize PUE/CUE in the most cost-effective way

"We will use the 6Sigma Digital Twin for each change, both in pre-sales and in capacity planning. The tool will enable us to analyze, model and test future scenarios for the evolution of the IT room to offer a risk-free environment for our customers, make maximum use of the site's capacity, anticipate changes to the air conditioning infrastructure, which is modular, and achieve our very ambitious energy performance objectives (PUE 1.2). This is why, in my opinion, the 6Sigma Digital Twin is an essential tool in the communication between the data center and its customers," comments Arbaretaz.

He continues: *"The 6SigmaAccess solution makes the relationship between the hosting company and its customers more fluid and allows capacity planning decisions to be based on scientific analyses, thus reducing the risk of breakdowns, whilst simultaneously reducing the carbon footprint and energy consumption and keeping costs under control. And all this without the need for customers to travel to the site, which is a real asset for customers hosted by Thésée DataCenter."*

> The 6Sigma Digital Twin is at the heart of our service portal and Data Center Management System. This service is truly innovative and provides transparency that very few data centers currently offer.
>
> **Eric Arbaretaz, Co-Founder and CTO, Thésée DataCenter**

Energy Efficiency and Environmental Responsibility

There are concerns resonating around the industry about the impact of data centers on carbon footprint and global power consumption at worldwide level. As the population moves to a lifestyle that consumes more and more data and computing, so increases the importance of the data center industry to make the right choices to cater for that need in an environmentally responsible manner.

This concern was at the forefront of Thésée DataCenter's mind as Arbaretaz says: ***"The capacity to collect and accumulate data is causing the ecological and energy weight of the digital sector to explode. The ambition of Thésée DataCenter is to contribute to digital sovereignty and minimize the environmental impact of the digital sector."***

The data center project has kept this at the forefront throughout design and construction. Not only does it have an ambitious PUE target of 1.2 even at partial load, it has also measured the carbon impact of the data center construction and kept this to a minimum. The main technical challenge for Thésée DataCenter was to reconcile objectives that seemed to be contradictory:

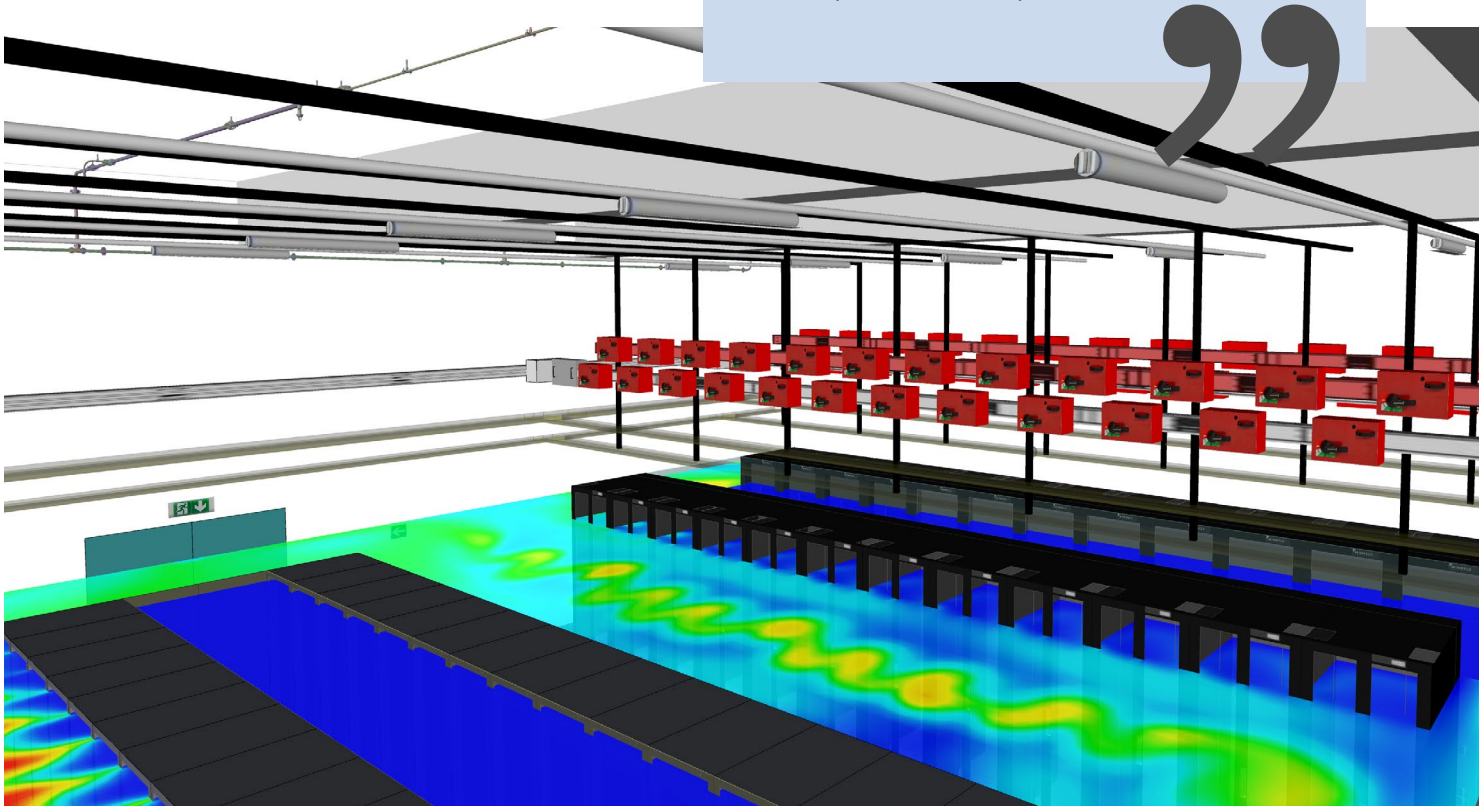
- Uptime Institute certified Tier IV high availability
- Minimal environmental impact with unprecedented energy performance
- Cater to the hosting needs of the 2020-2030 decade, characterized by much higher electrical densities, for new use cases such as artificial intelligence or data analytics.

This was enabled by using a scalable modular design coupled with ingenious cooling. Clearly the level of initial upfront investment needed for eco-responsible technologies is higher, however, it is important to remember that there are not only benefits to our planet involved.

Thésée DataCenter will make significant economic savings in terms of energy efficiency, savings which it intends to pass on to its customers to make its offering more attractive: ***"We guarantee an energy bill 30% lower than most current offers, bearing in mind that this consumption can represent more than half the cost of hosting in the case of high density (private cloud and/or HPC hosting for example). The environmental impact is also considerably improved, and carbon emissions are guaranteed to be reduced in the same proportions. The guarantee of this level of energy efficiency has been validated in the design phase in the 6Sigma Digital Twin and will be supported in the operational phase by an Artificial Intelligence (AI) system that will constantly adapt the operating conditions to the weather conditions and the behavior of the IT equipment."***

How will this work? To understand how AI and Machine Learning (ML) is used to adapt operating conditions, we need to look to the cooling system.

> The 6Sigma Digital Twin is an indispensable design and operating tool to achieve the level of performance and availability we have defined for ourselves.
>
> **Eric Arbaretaz, Co-Founder and CTO, Thésée DataCenter**



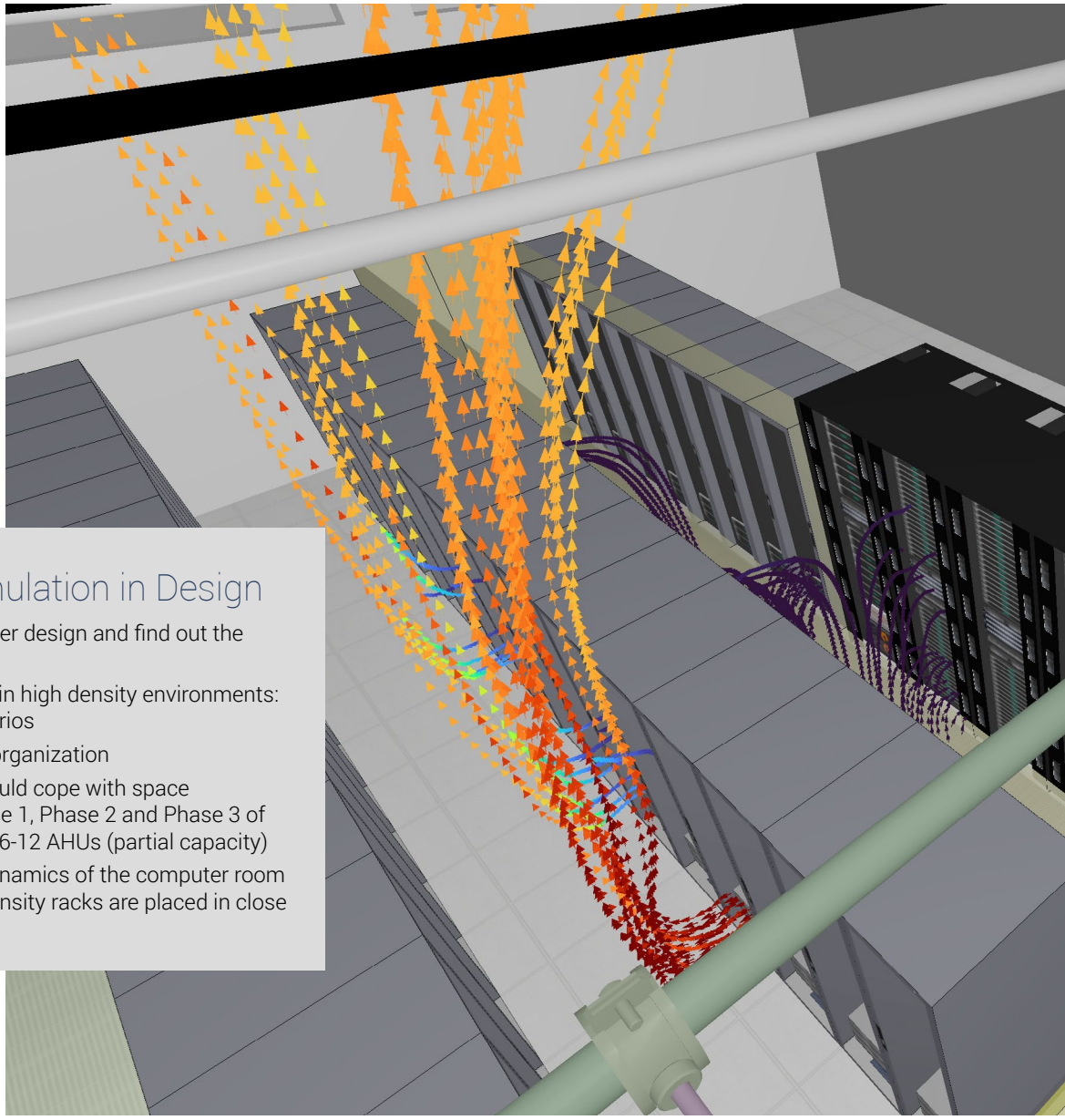
The Ultimate Cool – AI & ML

To cater for the various customer rack densities and the high availability of the Tier IV certification, the cooling system at Thésée DataCenter was key. To ensure the best performance, coupled with the most energy efficient solution, a three-level cooling solution was decided upon, incorporating:

1. Indirect air free cooling as main cooling source
2. Adiabatic system with osmosis plant to produce very pure water for the adiabatic system
3. Chilled water system as an ultimate source

The idea is that the different levels of cooling would kick in according to the data center needs and the external temperature conditions. The system will use six AHUs initially that are individually controlled, meaning that different areas of the data center can be operating with different cooling techniques in use simultaneously.

Lecoq explains: *"AI software and infrastructure designed by HPE and implemented by Siemens (Siemens Artificial Intelligence system for cooling regulation) takes input from all the sensors and all the parameters coming from the systems, computes it, analyses the behavior of the data hall, and makes a step-by-step customization of each AHU behavior to pilot and control each AHU individually to bring the right level of cooling to the right part of the data hall. This was quite tough. The engine is an Artificial Intelligence engine but also a Machine Learning engine that progressively, through time, will analyze behavior of the computer room to optimize the operating condition of the AHUs."*



Use of CFD Simulation in Design

1. Finetune the data center design and find out the design limits
2. Simulate failing AHUs in high density environments: N+2, N+1 and N scenarios
3. Optimize whitespace organization
4. Ensure that cooling could cope with space configurations at Phase 1, Phase 2 and Phase 3 of implementation using 6-12 AHUs (partial capacity)
5. Explore the thermal dynamics of the computer room when low- and high-density racks are placed in close proximity

Looking to the Future

When looking to the future of the data center industry, much change is expected and the ability to remain agile, accommodate high density and be able to satisfy stringent carbon efficiency goals will be crucial. Eric Arbaretaz, CTO, Thésée DataCenter comments: "The data center market is changing rapidly. On the one hand, the electrical density of computer racks is increasing rapidly and is reaching the limit of many data centers' capacity. And given the increase in the cost of electricity and the need to reduce the carbon footprint of IT activities, many data centers will quickly become obsolete because they will no longer be able to adapt to this market evolution. In addition, customer requirements are becoming increasingly stringent in terms of security and sovereignty for the most critical applications."

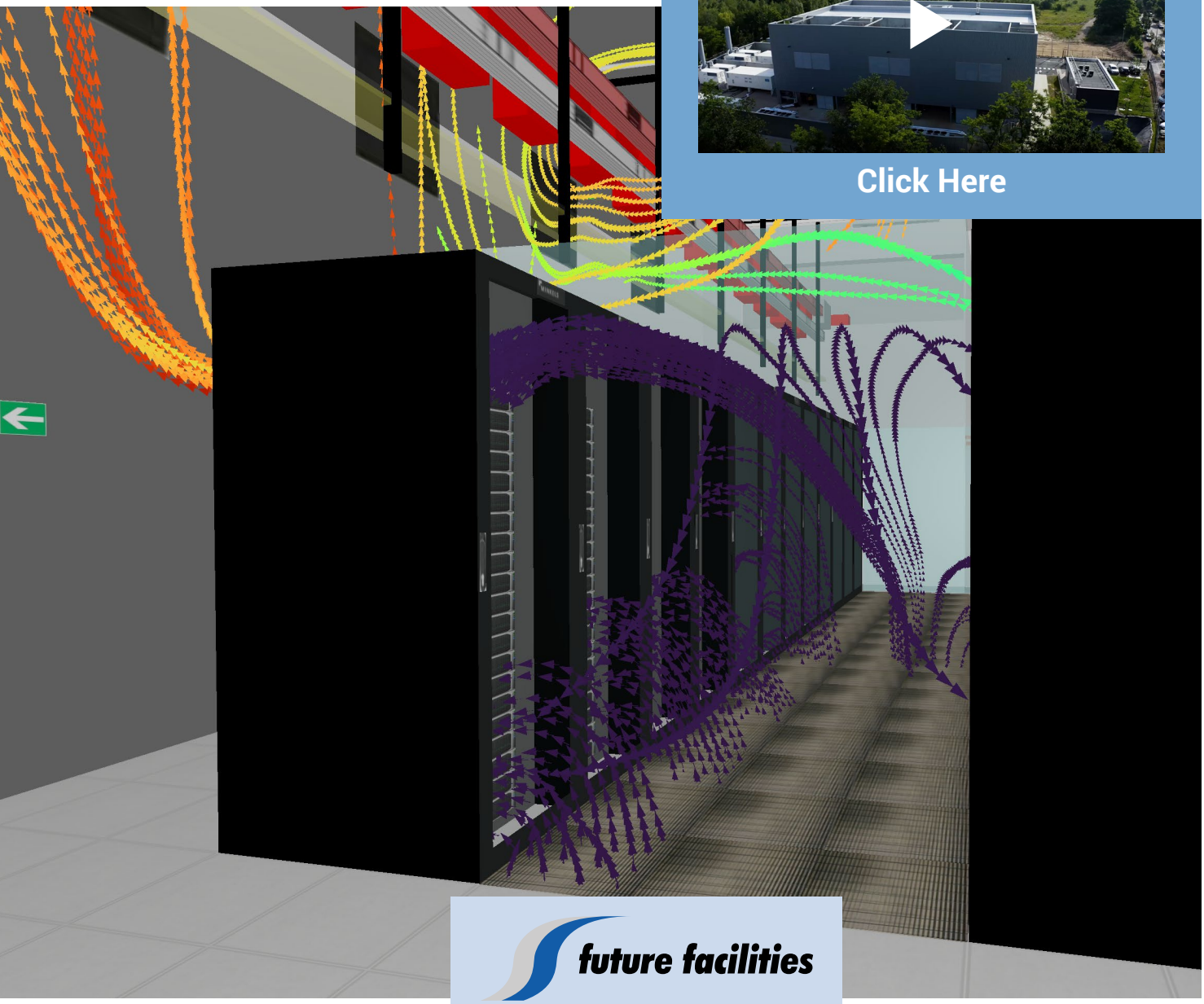
Thésée has designed its data center offering to be future-proofed, whilst offering its end customers the best experience in the present day.

Use of CFD Simulation in Operation

1. Check risk of any data center changes and maximize performance
2. Make informed scientific recommendations to clients on rack and equipment placement
3. Allow customers to test future scenarios and take full advantage of the data center capabilities with confidence
4. Simulate every data center change, both in pre-sales and capacity planning

To watch the full case study video

Click Here



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