A data center strategy for tackling the challenges of the future

– how to best prepare your data center for the road to digitalization

Thinking long-term sustainable data centre strategy

Budgeting and estimates

How data management can be optimised in the data centre

Key sustainability factors for "green data"

atnorth

The news that the volume of data organisations generate and manage is growing to the point of them becoming inundated comes as no surprise in this age of digitalisation.

The requirements to have the right data in the right place are imposing increased demands on how, where and when data is handled, processed and refined. Speed and delivery capacity have become an increasingly competitive advantage for digitalized internal processes and also when faced with impatient consumers. The pandemic has further accelerated the rate of digitalization. According to the Gartner Board of Directors Survey 2021[1], 69% of the board members surveyed have increased the rate of digitalization in their company's business, making it their top priority along with internally improved digital processes.

The volume of data is growing faster than ever, affecting the data center's design, volume and electricity consumption.

Data centres – an increasingly complex business

Nowadays, there's more to this sector than just finding the most cost-effective, secure and robust solution possible for your organization's data. It's also about understanding your data estate and how to optimize its use. Data-driven technologies and applications reliant on using AI algorithms are increasing demands on hardware capabilities; simultaneously customers are keen to reduce data center carbon footprint, proving to be a more complex data management challenge. According to Stefan Jofors-aTribe, Nordic Sales Director for atNorth, customer strategic decisions are increasingly turning to the output of what's needed from the data estate.

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While previously you had a strategy to use colocation from a general security or cost perspective, I think that nowadays you need to take the issue to another level and think about what solution the data needs. Technological progress now makes it possible to choose between different solutions to optimize both performance and costs in a smarter way. **"**

Stefan Jofors-aTribe
Nordic Sales Director for atNorth

[1] Gartner Top Priorities for IT: Leadership Vision for 2021

Since data-driven organizations have changing requirements for their IT infrastructure, customers are placing more emphasis on securing data center energy capacity rather than assessing physical footprint.

> **"** Whether you run the data center yourself or have all or part of this functionality outsourced, the question every organization needs to ask is whether the data center has the best possible infrastructure to support the organization's road to digitalization, and it is important, in this respect, to consider the sustainability aspects too, **"**

continues Stefan Jofors-aTribe

It is important to review what requirements exist for businesses to adapt their infrastructure taking into account the goals set as part of a long-term data center strategy. For example, whilst it's possible to maximize process times and minimize latency across your entire infrastructure portfolio, it would not always be necessary (and cost-effective) to do so, especially if the data that constitutes your data estate is not mission-critical.

> **"** In this instance, you very simply need to do the job to optimize both costs and functionality. This is what we mean when we say that the rapid progress of digitalization requires us to review our data center strategy rather than let it become something that is tackled at the very end of the chain. **"**

This whitepaper provides an overview of key focus areas to future-proof your organization's data and processes and devise a data center strategy to meet the challenges of the future.

Mapping and classifying the data

Not all of an organization's data can be classed as business-critical, therefore it's important to consider different strategies for how data should be processed to maximise cost-efficiency.

When examining business-critical data – consider how compute-intensive the processes are likely to be. For example, large compute clusters running simulations require more sophisticated infrastructure than equipment needed for storing customer data. High Performance Computing (HPC) can be part of the solution in an organization in driving efficient processing of your data estate. A dedicated HPC environment not only shortens compute time significantly, top-performing HPC racks can nowadays achieve an output of more than 40 kilowatts per rack, allowing both performance and output to be optimized in relation to energy and costs.

HPC adoption is on the rise as more organizations discover the benefits of simulation and technical calculations

HPC is a growing segment used to perform simulations in aerodynamics, weather forecasts, computational fluid dynamics, and many other compute-intensive workloads. An HPC rack has up to 6 times the output of a standard rack. According to Verified Market Research, global growth in HPC currently stands at 18% a year.

atNorth's HPC specialist Staffan Hansson believes that the increased need to carry out simulations for more applications is one of the reasons why the requirement for high-performance computing power is increasing.

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Simulations are currently used in a large number of applications, ranging from monitoring the effects of climate change to producing safer and more climate-friendly vehicles. But AI and machine learning also require advanced simulations, as no one can afford to put a product on the market that hasn't been properly tested, which is where HPC plays a crucial role in speeding up product development. **"**

Staffan Hansson
Nordic Sales Director for atNorth

Sustainability and costs drive the market

Companies have traditionally run their HPC infrastructure themselves, but the trend is for a growing number of companies to choose to look outside their own data center to gain access to both specialist expertise and flexible consumption models, with an increased awareness of reducing climate impact.

> **"**
> Sustainability, costs and flexibility may sound like a hackneyed mantra, but these are the factors driving the trend towards increased use of HPC services in our industry, **"**
>
> **Stefan Jofors-aTribe**

The increased energy consumption and need for cooling that HPC entails have led many to think about both the costs this incurs and the subsequent carbon footprint.

> **"**
> Most companies do not have the opportunity to recycle residual heat in the way colocation providers can by connecting to the district heating network, **"**
>
> **Stefan Jofors-aTribe**

Thanks to state-of-the-art software and interconnected high-performance computer servers, the simulation options available nowadays are almost endless.

> **Here are some examples:**
> flow simulation, acoustic simulation, thermal simulation, research on diseases, and strength and performance throughout a product's lifecycle.

What capacity is required?

The "how much capacity should we plan for" question has proven to be difficult to answer, often resulting in undersizing and building of unnecessarily large data center halls. Today, the challenge is not necessarily how much capacity we need but what kind of capacity we need, and when. Inaccurate capacity planning not only leads to potentially unnecessary costs and incorrectly sized data center premises but can also cause bottlenecks for your organization's growth. Analyzing your capacity requirements carefully and adapting infrastructure requirements and strategy whilst clearly beneficial, are also time-consuming and costly exercises. An alternative option is to look at a solution where it is possible to buy data center capacity with built-in flexibility to be consumed as a Service.

> **Every day, the world's population generates 2.5 trillion bytes of data. Throughout 2020, the digital universe's data volumes generated 44 zettabytes.[2]**

Planning and budget

Determining financial resources is of course critical to the effective management of your organization's data and opportunity costs should certainly be factored in.

When drafting the budget, you need to be thinking about the following questions: How much does it cost to operate with an outage? How much more can we increase profitability through a faster process? Are there processes which are so time-critical that we need to speed up data transfer? In a nutshell, costs which may arise from not optimising the processes need to be mapped and made visible when drafting the budget. Together the answers to the questions that formulate your data center strategy need to be prioritised to ensure the most effective financial allocations and robust budget management.

Your data center strategy, therefore, needs to be prioritized.

[2] https://techjury.net/blog/how-much-data-is-created-every-day/#gref

Latency – how fast is the response time needed?

Latency is a crucial factor to consider in measuring business-critical outputs. A millisecond's delay could be the difference between closing a deal or missing out. However, as vital as latency is to business-critical processes – it is an overly simplistic calculation to just factor in the distance between sender and recipient of the data. Layers of applications and networks involved in reaching the destination point are wider factors that affect latency. Therefore, it's more helpful to take a holistic view and consider optimizing efficiency through the lens of expected infrastructure output, and server capacity to get a measure of the factors that affect overall performance.

Geography

Proximity to users has a major contributing effect on latency. Many multinational organizations have chosen to centralize their infrastructure in major European cities, with clusters of data centers being located around, for example, Amsterdam and Frankfurt. Clusters also bring the advantage of increased connectivity when organizations colocate their resources. However, it's worth considering what matters in terms of latency and connectivity - with a more stable, cheaper and sustainable energy supply, colocation in the Nordic region is an attractive cost-effective and sustainable alternative.

Connectivity requirements

Connectivity factors are interlinked to latency. If you are looking to distribute digital content, along with needing a powerful internet hub with many distribution networks available, it may be relevant to look at how the distance of the fibre network affects delivery speed and quality. Stockholm Data Parks, for example, provides good opportunities for different options with high fibre density and good proximity to the nearest internet hub.

Stockholm Data Parks for the ideal data center infrastructure

Stockholm Data Parks is an initiative launched by the City of Stockholm, local energy firms and grid companies, Stockholm Exergi and Ellevio, together with the city network supplier Stokab. Jointly they have created a hub with an effective infrastructure for a growing data center industry with opportunities to connect to the district heating network. atNorth have recently opened a campus within the Kista data park giving customers an ideal opportunity to locate infrastructure that satisfies connectivity and latency requirements.

Expertise

As data centers have become increasingly more sophisticated, so too has the level of expertise required to ensure that they run smoothly 24/7.

Processes and procedures need to be well documented and firmly embedded to release the responsibility of data center maintenance from a few key individuals and to protect continuous operations. Organizations should be aware of how to best secure their data, and whether given expertise and resources considerations, it would make sense to locate some if not all data center infrastructure through a colocation solution.

Sweden leads the way in Europe in terms of expertise

Per Lähdet is Operations Manager for atNorth's new data center in Akalla.

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As the security requirements around operations have increased, so has the realisation that it may sometimes be necessary for an external party to ensure operational security," remarks Per. "It can be difficult to meet the requirements for operating 24/7 internally in an organization and to always have the right staffing levels. "

As Lähdet explains, Sweden is the top European country for expertise in data center operation. Swedish-based data center operators bring the advantage of a strong heritage working within the industry combined with a highly professional approach to data center management.

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I have worked in international environments for a long time and can see that we have a way of working which affects the quality of delivery. Flat organizations allow operating engineers much wider scope in their work, not to mention that we have a culture which means that you are not afraid to question whether something is wrong, which makes a big difference in a business where nothing can go wrong. "

Per Lähdet

Site Manager for atNorth's new data centre in Akalla

Lähdet also believes that it is important to create a work culture where employees thrive and are motivated by constantly wanting to maintain the highest possible delivery level.

> **"** Even if you outsource the data, it is important to get to know your operating staff and establish a trusted relationship. The usual human values also apply to those of us who are in the business of dealing with ones and zeros. **"**

Minimizing data center carbon footprint

The carbon impact of the data center industry is comparable to the aviation industry, it is of course becoming an ever-higher priority for business and IT leaders to think carefully about minimizing data center carbon footprint. Given the exponential growth of data annually, achieving the UN's climate goals is vital to reducing industry impact, whilst recognising that the solutions towards carbon reduction are complex.

How green is the electricity?

In Sweden as per the rest of the Nordic region, electricity is 100% sourced from renewable means. A data center in our region has a much smaller climate impact than a data center located in a country which relies on fossil fuels. Therefore, major efforts are being made by governments in all Nordic countries to attract more data centers to the region.

Heat recovery

Nordic data centers that are located near cities often take advantage of connecting to the district heating network. In Stockholm, for example, the Stockholm Data Parks capture excess heat from data centers to put back into the network, and heat local neighbourhoods.

Natural cooling

More than a third of a data center's electricity consumption is normally used to cool the facility. This gives our colder climate a big advantage. Modern data center campuses in the region are perfectly suited to provide natural cooling. This means reduced electricity costs and a lower climate impact.

What is the most resource-efficient solution?

Colocation is part of the sharing economy; this is where shared resources create better conditions for sustainable operations than running them yourself. In addition, a colocation data center is more likely to be equipped with the latest and most energy efficient technology.

Data centre's PUE value

The PUE value is equal to a facility's total energy consumption divided by the energy consumption of the IT equipment. This measurement still applies in the industry - in Sweden - the Swedish Civil Contingencies Agency recommends that data centers should not have a PUE value higher than 1.25. As equipment becomes more energy efficient, most state-of-the-art data centers have been able to significantly reduce their PUE values. However, from a climate perspective, it is better to have a slightly higher PUE value and full heat recovery, than a lower value with no heat recovery potential.

The big picture is important for a sustainable data center, according to Stockholm Exergi

Stockholm Exergi is one of Europe's largest suppliers of district heating. In 2020, the company supplied 7,224 GWh to its customers in Stockholm. Its ambition is to build a circular system where the heat sources comprise a variety of sources such as waste, biofuel and the growing number of data halls around Stockholm. The data halls and other operations which have surplus heat and are connected to Stockholm Exergi supply around 120 GWh of heat annually through the recycling of waste heat. Data halls are the largest segment. atNorth is the latest in a line of data centers to connect to a state-of-the-art facility capable of recycling all waste heat.

Peter Sivengård is a business developer at Stockholm Exergi. He sees a trend that has developed in recent years where data centers' customers are using heat recovery as an evaluation criterion when choosing which data center organization to work with.

> **"**
> From the beginning, this was completely cost-driven. Data centers were able to connect and bring down the costs involved in cooling data centers. Nowadays, we are finding an increased interest in sustainability as the primary consideration. **"**

Sivengård believes that it is important to take a holistic view when considering colocation solutions - asking questions of where excess heat goes in addition to where the electricity comes from.

> **"**
> Sweden provides excellent conditions for sustainable data center operations with the combination of free cooling and the possibility of heat recovery. It's important to think holistically about sustainability i.e., what equipment is inside the data center for obtaining a cost-effective solution with heat recovery **"**

Peter Sivengård

Business Developer at Stockholm Exergi

Data centers' energy consumption levels out

The data center industry is driving the development towards more energy-efficient solutions at a rapid pace and producing quick results. According to the International Energy Agency (IEA), energy consumption in the world's data centers is not increasing in step with the increase in data volumes. Between 2010 and 2019, a measurement was taken showing that data volumes had increased by 650%, while the energy consumption of data centers remained at the same level the whole time. The world's data centers are estimated to consume 1% of the world's electricity.

Global trends in internet traffic, data center workloads and data center energy use, 2010-2019

Source: **https://www.iea.org/reports/data-centres-and-data-transmission-networks**
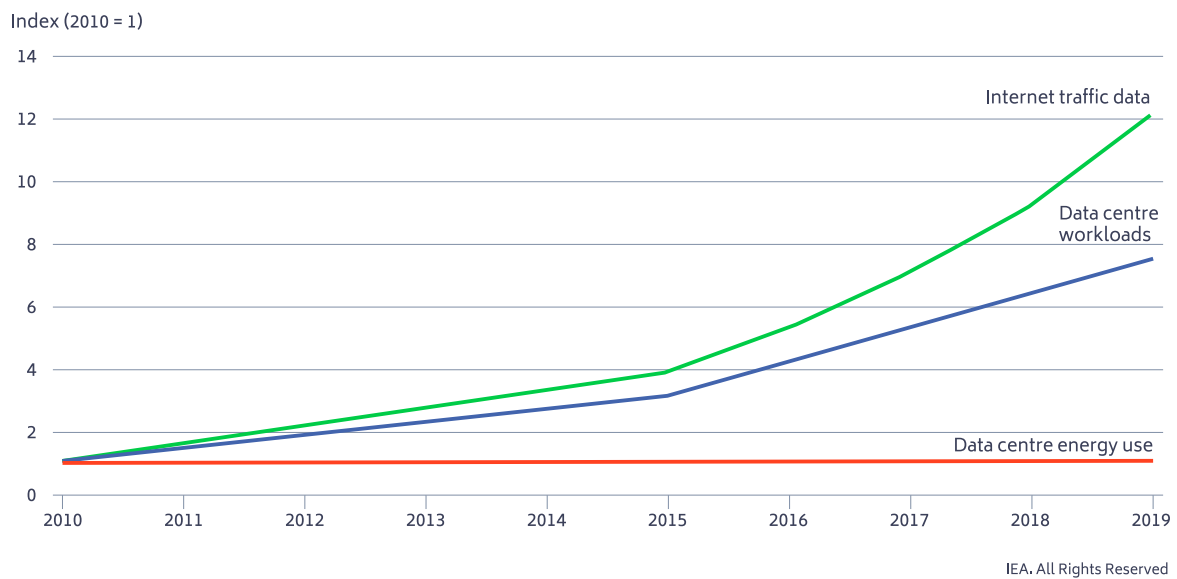
Cloudberry Datacenters – a research project investigating the path of data from ground to cloud

Cloudberry Datacenters is a research project initiated by Luleå University of Technology with financial support from the Swedish Energy Agency and Region Norrbotten, with the aim of mapping the ecosystems around data centers and how they can be integrated into the energy supply today and in the future. The idea is to adopt a holistic approach to the issue.

> **"**
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> We usually say that we work with data from the ground to the cloud from a resource perspective, **"**
>
> **says Michael Nilsson,** Project Manager, Cloudberry Datacenters

Cloudberry Datacenters has a number of research projects underway on how cooling and heat recovery can be optimized now and, in the future, how heat recovery can be used for different purposes, and how the infrastructure network can be built to achieve optimum operation. In terms of heat recovery, they look not only at the district heating network, but also at application areas such as indoor wastewater cultivation and treatment facilities, in addition to the option of using heat to dry biomass or wood.

Boden Business Park, for example, in collaboration with the municipality and the Swedish Energy Agency, has built a greenhouse heated using waste heat from an adjacent data center. The aim of this cooperation is to promote a universal approach to energy use and promote the future development of IT-related industries and food production.

30% of a data center's energy consumption (1MW) could be reused to heat a cultivation installation – a cost-effective beneficial solution.

Michael Nilsson

Project Manager Cloudberry Datacenters

> **"**
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> Heat recovery for cultivation, as shown in the Boden example, can be a good option in northern Sweden, but is not as ideal a use of resources in the south due to a lower demand for heating greenhouses. You have to look at other solutions there, **"**
>
> **says Mikael Risberg,** Assistant Professor of Energy Engineering

Data centers as part of urban planning

Anna Krook Riekkola, Assistant Professor of Energy Engineering, is leading one of the research projects on data center interaction with the national energy system.

> **"** For example, in places where there are no district heating networks, the possibility of year-round cultivation may be an option. The important thing is that data centers are now integrated into urban planning and their infrastructure is integrated with other infrastructures, such as district heating networks or other functionalities. **"**

So, what does the future look like according to some of the leading researchers in Sweden in this field?

On the recycling side, there is likely to be a combination of solutions for reusing heat. As far as the input of energy is concerned, Sweden is also likely to use a combination of fossil-free solutions, just like today, where wind, solar energy and hydrogen are useful as complementary resources.

> **"** The advantage that data offers, unlike other traditional industries, is that the data is flexible and can be added where the energy supply is best and cheapest right now. **"**

Anna Krook Riekkola

Assistant Professor of Energy Engineering

Security

As digitalization progresses, data becomes increasingly valuable, which places growing demands on the security procedures around the data center. Disruption to IT operations is becoming increasingly costly in revenue and brand reputation terms. A risk analysis of how data is stored and processed is a first important step towards identifying any security breaches.

Security protection
What level of physical security protection and perimeter security does your business require? Who will have access to the data center and its equipment and which access systems are therefore required?

How do we ensure redundancy?

Is the data center located in a sufficiently secure area with protection against external threats from the surrounding environment? This also includes the risk of flooding, explosions/fires or the risk of sabotage, but also if there are nearby shipments of dangerous goods or flammable material being stored in the vicinity.

Tier Classification and mechanical protection
The mechanical protection of the data center, i.e. the durability of the physical structures against external intrusion, is defined by different protection classifications. The highest protection tier 3 is recommended for future-proof IT operations.

Do we have enough back-up for this?

What are the resources available in terms of back-up and uninterruptible power supply in the event of a power outage?

Colocation trends 2021

According to Forrester, the pandemic has had a clear effect on the use of data since 2019, with increased digitalization of services, but also on all the services that remote working requires.

Data gravity
AI, IoT and Machine Learning provide new opportunities and applications and place new demands on the infrastructure, which in turn affects the entire data center strategy.

Energy savings
The industry strongly focuses on developing energy-saving solutions and alternative energy sources where, for instance, hydrogen is the latest in line to be used as a back-up.

Increased data volumes and HPC
According to a global survey, a third of all companies use public clouds to consume HPC or are planning to consume HPC in the future.

Source: Forrester

atNorth is a Nordic provider of high-capacity colocation for data-driven organizations. atNorth's services transform data into business-critical decisions without compromising performance, energy consumption or climate impact. Thanks to the strategic location of data centers in the Nordic region, the company can always offer a combination of cost efficiency and performance, regardless of data volume.

All of the company's services are delivered with the goal of contributing to increased circular economy principles for the data center industry, which include energy efficiency and using 100% renewable electricity. The company has been operating in Iceland since 2009 where it runs one of Europe's largest data center facilities near Reykjavik with an output of 80 Megawatts. In March 2022, the company's first data center will be deployed in Stockholm with a total capacity of 11.2 Megawatts.

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