

HIGH-AVAILABILITY DATA CENTRES

Addressing a strategic and economic challenge on a global scale



The global data sphere doubles every three years, driven by the increasing number of people interacting over networks, purchasing online, and searching the internet. The advent of 5G, to support the rollout of the cloud, IoT, and AI, will turbocharge the quantity of data circulating over the web. By 2025, the total amount of data that will require processing could represent more than an eight-fold increase, to reach 163 zettabytes (i.e. 1,000 billion gigabytes).

Key figures of a data heavyweight: Google



40
data centers
around the
world, with
20 in the USA
and 20 across
Asia & Europe



900 000
servers

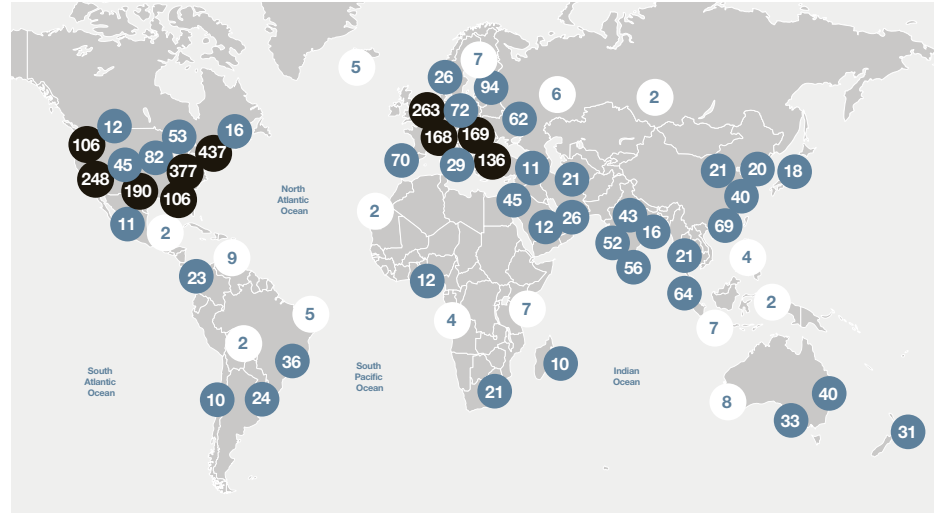


130 000
billion pages
indexed
20 sites
crawled



80 000
queries
every second,
15%
of which are
new queries

Data centres: exponential growth



The explosion in Internet use has spawned an increasing number of data centres around the world.

In 2020, there were 4,500 data centres in 122 countries, with 1,800 in the USA and 200 in France.

Four challenges for a fast-growing market



Competition is intense in the data centre market, where growth is exponential.

Each site needs to guarantee high availability, ensuring flawless **service continuity** for its customers as a means of safeguarding its reputation.

To boost productivity, each site aims to use **space-saving equipment** and reduce **energy consumption**. When combining the four elements of this winning formula, the **quality of the components** used within the data centre plays a key role.

Did you know?

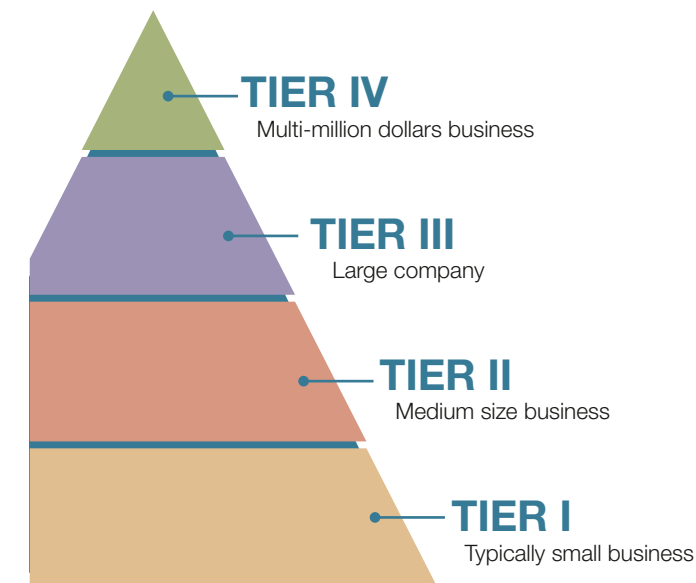
The financial losses from a data centre outage equates to €11,000 a minute.

Equipment Reliability

Whether the size of a living room or sprawling across tens of thousands of square metres, data centres need to operate around-the-clock. High quality and continuity of service are vitally important for facilities providing access to the digital economy. The security of the data centre and the data hosted there are key factors in allowing the entire web ecosystem to run smoothly.

How do you guarantee service continuity?

Data centre providers guarantee their facility's availability by ensuring an uninterrupted electrical and digital power supply and cooling their servers to prevent overheating. A data centre's "TIER" is defined by its service continuity level over a defined period.



Each tier corresponds to different levels of equipment and availability.

- **TIER 1** designates data centers with only one lane for the power supply and cooling, without element redundancy. These centers have an availability of **99,671%**, corresponding to an average cumulative downtime of 28.8 hours per year.
- **TIER 2** brings together data centers that also have a single channel for power supply and cooling, but with redundant elements to achieve availability from **99,749**, or 22 hours off.
- **TIER 3** has several supply and cooling channels, only one of which is active. Elements are doubled and maintenance can be frequent without stopping the machines. Uptime is **99,982%**, or 1.6 hours of downtime per year.
- The **TIER 4** is the most demanding: it has several active channels in parallel for the power supplies and cooling. Many infrastructure elements are doubled and "tolerant failures". Uptime is **99,995%**, or 25 minutes of downtime per year.

The key to high uptime

Preventive maintenance

within a data centre involves systematically seeking to identify any potential failures before they actually occur. Service providers have to replace parts and components at regular intervals, fine-tune the equipment settings, clean the filters, and update the software. Several pre-defined and ongoing maintenance routines are actioned. A continuous monitoring strategy protects the uninterruptible power supply and generators, the electric power distribution and wiring, the cooling installations, and the monitoring and security systems. In the event of a failure, corrective action must be fast and safe for operators.

Hot-swappable in the event of a failure

When performing upgrades or maintenance on mission-critical components, such parts must be hot-swappable, to allow them to be replaced without disrupting the service. Stäubli's quick-release couplings make it

possible for circuits to be safely disconnected and reconnected, even when pressurised. This feature eliminates the costs that would be incurred if part of the system had to be shut down.

Redundancy

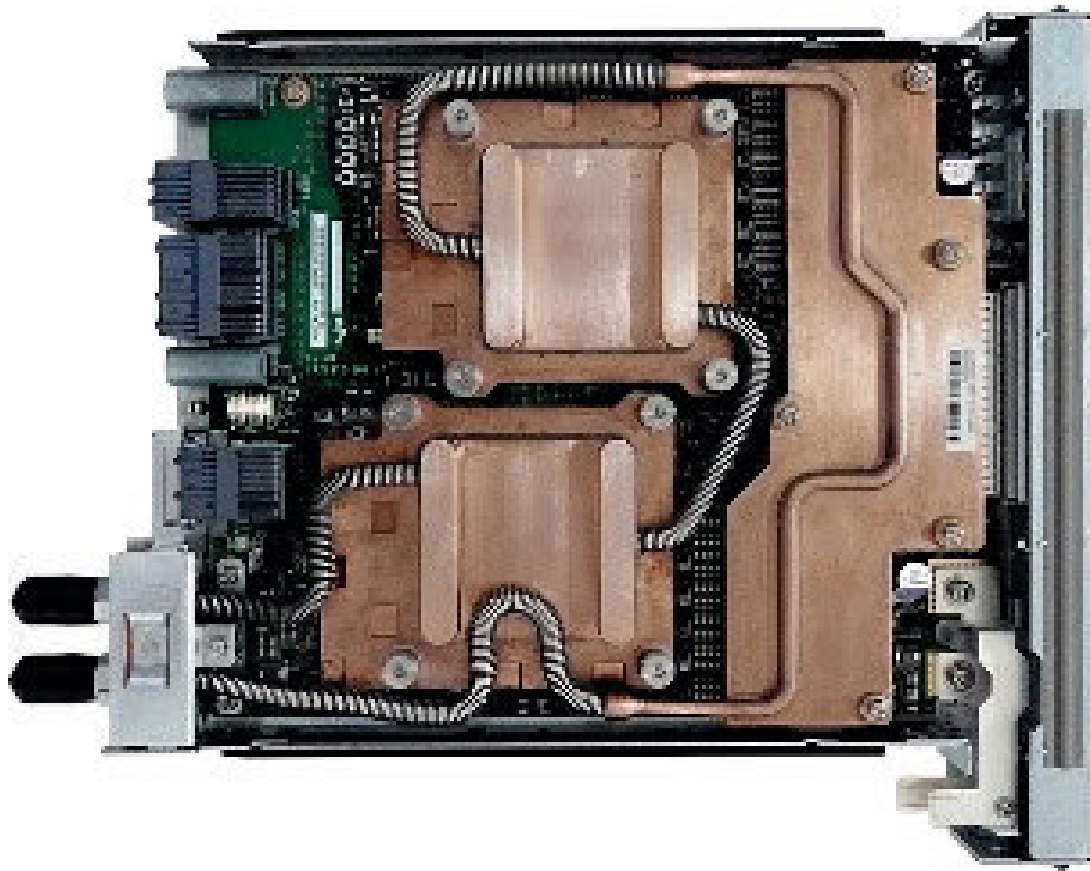
Duplicating specific devices ensures that the system can function continuously and prevents any partial shutdowns during maintenance or repair procedures. These redundant devices tend to be modular, so that any defective elements can be hot-swapped (such as a rack-mountable drawer) without disrupting its operation or losing pressure within the system. Building redundancy into the system improves reliability, since a duplicate component can take over when the primary component fails. The quality and reliability of the couplings used in these instances play an extremely important role, as inferior or faulty connections would not only jeopardise the hot-swap process, but could also prove to be dangerous to operators.

Quick and reliable couplings

With several different seal grades and materials available, coupling solutions from Stäubli can be tailored to the type of coolant and a wide range of temperatures. Stäubli's misalignment compensation technology is essential for blind rack connections. The technology is compatible with guiding systems and can accommodate misalignments up to several millimetres.

Simplified maintenance with Stäubli quick-release couplings

Thanks to Stäubli's quick-release couplings, circuits can easily be disconnected in complete safety during maintenance and repairs.



Maximising data storage

The key to optimum space usage

Embrace liquid cooling

The space available within server rooms can be further optimised by installing liquid cooling systems as close as possible to the heat sources. Liquid cooling can be used to enhance existing and sometimes cumbersome air cooling systems, which is why a combination of different cooling systems can be found in many data centres that have been upgraded.

Space-saving elements

Each component plays a role in the quest for optimisation, and thanks to their compact design, Stäubli couplings can be seamlessly incorporated into installations in confined areas, whilst ensuring excellent flow rate performance.

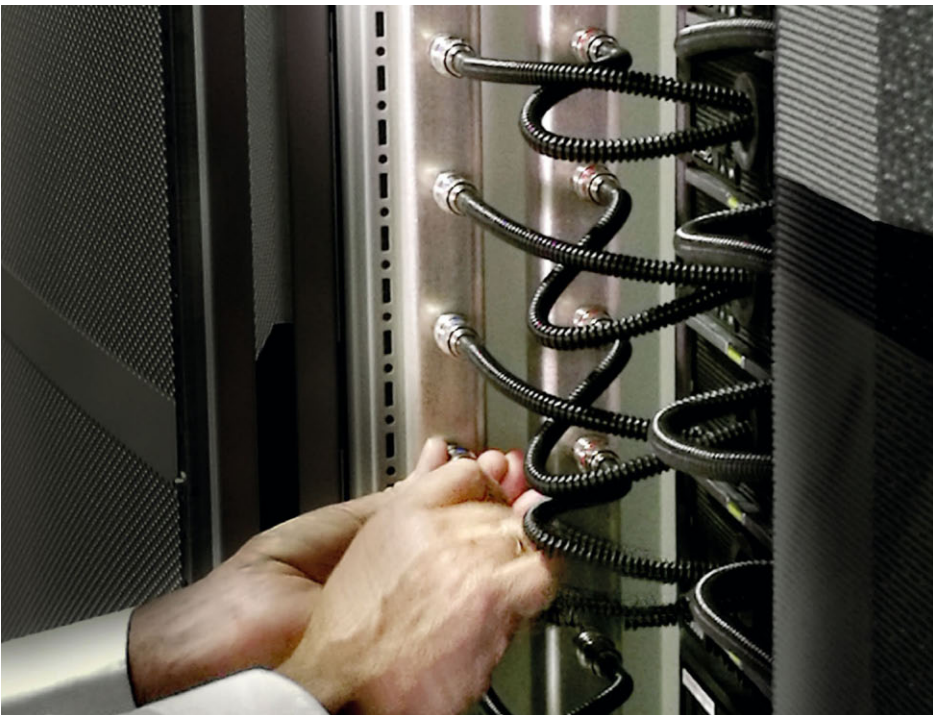
Fuelled by the soaring volume of data interchanges, data storage requirements continue to rise unabated. As data centres grapple with the task of housing increasing numbers of cabinets within confined spaces, the installation of high-density server racks can ramp up the centre's computing power without taking up additional floor space. These racks, however, must be capable of accommodating all types of hardware, whilst offering scalability and allowing different cooling solutions to be used.

Did you know?

In 2017, data centres around the world covered a combined surface area of approximately 167 million square metres.

"Every 18 months, the electronic components in data centres become obsolete. That is why it is so important to be able to work on the system using couplings that can easily be connected and reconnected."

G. Lyon

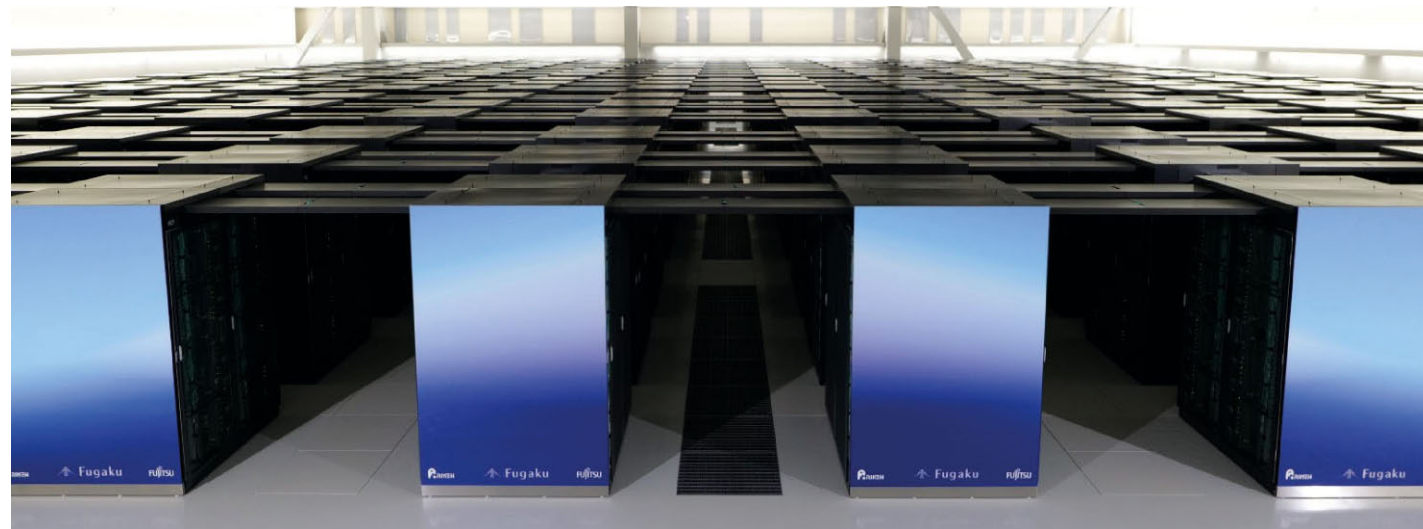


Guaranteeing equipment and data security

Data availability can only be guaranteed if the cooling system, power supply, and server connectivity continue to operate flawlessly. When it comes to protecting the infrastructure, it is essential to choose

components that are reliable, and which can be incorporated into the system both quickly and easily to elevate data throughput levels within the centre.

The key to secure systems



Robustness

The quality of each element in the system matters, and irrespective of how often they are used, couplings must be easy to disconnect without any danger of seizing.

The superior quality and strength of Stäubli couplings reduce data centre maintenance and improve reliability. These quick-release couplings represent an essential link in the cooling system and are not disposable "consumables" to be purchased at the lowest cost. The total cost of ownership of the component over time must be taken into account, not just its purchase price. Another factor which should be taken into consideration is that metal parts offer an infinitely more reliable and durable design than plastic alternatives.

"Stäubli couplings guarantee the integrity of the cooling circuit for our Fugaku, the number one TOP500 supercomputer. Their superior flow rate capacity and the protection guaranteed by their contact surfaces deliver the highest levels of performance and long-term reliability, which are essential assets for a project of this magnitude."

Fujitsu



Watertight Seals

Liquid cooling systems mean that the coolant is in close proximity to the electronic circuitry, which could cause significant damage in the event of a leak. Stäubli has unrivalled expertise in thermal management applications, where flawless reliability and watertight seals are prerequisites. The company's skills have gained recognition over many years within demanding industries such as the rail and aviation sectors as well.



Anti-pollution technology

The flat-face design of Stäubli's quick-release couplings guarantees seal integrity, safety for operators and installations, and security of fluids. No contamination is able to enter the circuit during connection, and the environment is protected during disconnection. Stäubli's anti-pollution technology helps improve data centre reliability by shielding the circuits from contamination and protecting the electronic components from any damage.

"With Stäubli couplings, components can be disconnected from the cooling circuit easily and effortlessly. It only takes a few seconds, and crucially, there are no water or coolant spillages."

R. Januszewski

Improving energy efficiency

Data centres have a voracious appetite for energy. For example, if the internet were a country, it would be the third largest consumer of electricity in the world. To reduce their carbon footprint and tackle global warming, the PUE (Power Usage Effectiveness) of these energy-intensive centres must be improved urgently.

PUE is an energy efficiency indicator that refers to the ratio between the total amount of energy used by the data centre, and the total amount of energy used by its computing equipment (servers, storage, network, etc.).



The key to energy efficiency

Reducing energy use is one of the main challenges facing data centre providers as they strive to increase their profitability whilst minimising their environmental impact. To support the implementation of a green IT strategy, and develop infrastructure usage effectiveness (IUE), Stäubli offers a number of high-performance solutions.

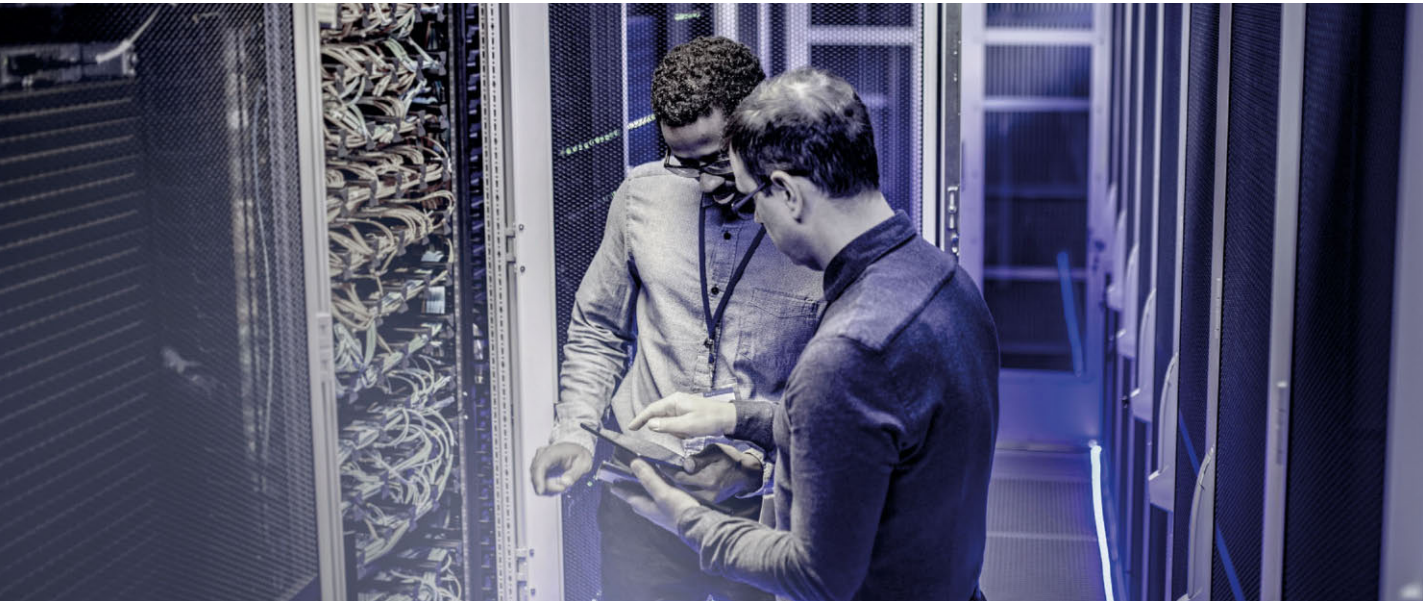
Optimal flow rate

The flat-face non-spill technology ensures perfect watertight circuits during connection and disconnection. Stäubli couplings feature an internal design which guarantees a surface condition that will optimise fluid flow and minimal pressure loss. These quick change connectors therefore allow for rapid maintenance and generate energy savings. By reducing pressure drops, they require less pressure and therefore minimize the amount of energy required for cooling.



Data centres continue to impact the environment

- Data Centre cooling systems consume almost 50% of their total electrical energy.
- A 10,000 m² data centre uses the same amount of energy as a city with 50,000 inhabitants.
- Google and Facebook server farms consume up to 100 million watts every year, i.e. a tenth of the output from a thermal power plant.
- In 2016, data centres in France already accounted for 8% of the national electricity consumption.
- In 2017, the data centre industry consumed about 1% of the world's total energy.



Support for improving your performance

Stäubli has been a true trailblazer, by embracing liquid cooling technology from the outset and guiding its partners through this technological revolution. We have pioneered coupling solutions for these applications, and our experts are available to offer qualified support and advice when designing your projects, however technologically advanced, by consistently staying ahead of the innovation curve.

Stäubli is committed to producing ever more sustainable solutions and developing coupling systems to ensure even greater cooling performance for electronic components. We have expertise in all the production facilities required for this high-tech industry. All of our liquid cooling solutions are designed to fulfil your specific requirements. They are adaptable and can be customised whatever your application and environmental constraints may be.

A leading partner

As a reliable partner to the world's most demanding industries, Stäubli provides its customers with a premium service that draws strength from a sales organisation across 29 countries, and production sites in Europe, North America, and China. Work with Stäubli to harness the power of an international group, together with the efficiency of a local partnership. Our close ties with our customers and their subsidiaries around the world provide us with the ideal opportunity to support and guide them during the installation of their equipment, as well as offering training for operators and customer support services.

Quality and innovation

Our commitment to quality and innovation is inherited from our extensive industrial experience, and reliability has become the hallmark of our brand. Our R&D resources are the architects of our leading-edge mechatronics solutions,

delivering the highest levels of operational safety. These innovative solutions improve the productivity of our customers' processes. As a pioneer in thermal management couplings for the rail, aviation, and medical industries, Stäubli now partners with IT players around the world.

Durability and safety

To provide our customers with the performance, safety, and durability that they expect from our solutions, we evaluate and test each of our products at every stage of their development by applying comprehensive and rigorous testing procedures. From pre-production to mass production, our components are produced on high-precision machines, ranging from single-spindle lathes to robotic multi-centres. Each component we manufacture is subject to traceability and rigorous inspection. We always perform individual quality control for all our products, and additional tests may be carried out based upon customer specifications.

Stäubli worldwide



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