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RiMatrix Next Generation
The open
IT infrastructure platform

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Change has become a constant for IT infrastructures. Digital transformation is bringing new innovations at an unprecedented pace and IT managers know they will be constantly faced with new, as-yet unknown challenges in the future.

The challenge today is finding a way to quickly and reliably build data centres that meet current requirements, offer flexibility for the future and are a sound investment at the same time.

Find out in this white paper about the technologies and concepts related to RiMatrix Next Generation (NG) that can help meet this challenge.

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Digitalization has long since reached every organisational level, from the top floor to the shop floor. In today's smart, networked world, data is continuously being exchanged. Communication between people, machinery, robots and IT systems is generating a never-ending stream of data that needs to be controlled, monitored and processed by high-performance data centres.

As a result, the volumes of information to be processed are growing at a rapid pace and existing IT landscapes are being pushed to their capacity limits and having to be adapted faster than before. That is why IT managers need to act now and prepare their IT infrastructure for an unceasing growth in data, so their data centre can be made fit for the future.

The challenges for IT managers are set to become even more diverse. The introduction of IT systems into all the functional levels of a company and all areas of life means that greater IT performance is needed at very different locations. In the future, maximum flexibility for IT infrastructures, reliable solutions and rapid deployment will be at the top of the agenda for CIOs. The following white paper shows which technologies and concepts associated with RiMatrix Next Generation (NG) can help organisations set up new data centres, but also upgrade existing infrastructures to help drive digital transformation.

Introduction

What are the requirements that define the data centre of the future?

Whether you're talking about in-house data centre operators, colocation providers or hyperscale providers – everyone needs to adapt to the onward march of digitalization. Accelerated innovation cycles in all sectors, the ongoing digitalization of production and ultra-fast 5G mobile networks are just some of the many factors that are driving the growth of data. The challenge for IT experts is that data centres are processing more data and need to be adapted faster than was previously the case. However, the volume of data is not the only matter that needs to be addressed in strategic IT planning. There is also set to be a much greater need for specialised data centres designed to meet the needs of real-time data processing, for instance. This development is being driven by, among other things, fast 5G networks and the Internet of Things in highly automated production lines.

Smart industries need flexibility

Anyone who is designing a new data centre should align it as closely as possible with its planned usage, but should also think about how to make it fit for the future. In smart production environments, for example, thousands of sensors generate huge streams of data that require on-site edge data centres where preliminary processing can be carried out. Downstream cloud data centres then evaluate the relevant status data so that the service intervals for machines can be optimised based on long-term analyses, for example. Furthermore, these cloud data centres are essential for the entire customer interface from order through to invoice, but also need data from production so that delivery dates can be communicated transparently, for instance. Similarly, material supplies are linked in via procurement.

Each of these data centres has specific requirements for IT cooling systems, power supplies, scalability, security and monitoring. Using a modular concept ensures systems will be able to cope moving forward, even in the face of these varying requirements.

The challenges for IT experts are larger volumes of data, faster adaptation of data centres and customised structures

Planning now for an unknown future

In the future, IT managers will be working much more with distributed IT landscapes, as companies need specialised data centres for their sites. In this new world, the roles of all the various market players are changing. Colocation providers are transforming from a replaceable supplier into a valuable partner that supports its customers' operational business by running IT solutions on a cost-effective basis. The operators of hyperscale data centres have their sights very firmly set on cost and energy efficiency, since they still see themselves as pioneers for flexible cloud models and as-a-service models. CIOs, meanwhile, who are responsible for running in-house IT systems, are under growing pressure from specialist departments. Indeed, these departments have long since discovered that IT is a driving force for innovation, enhanced process efficiency and improved customer reach – and they are quick to demand new IT solutions. In all these cases, responsible IT managers face the challenge of having to build a future-proof and adaptive IT infrastructure.

The modular RiMatrix NG IT infrastructure platform helps IT organisations drive the digital revolution of classic IT and operational technology (OT) with an open platform.

The challenge – building a future-proof and adaptive IT infrastructure

RiMatrix NG – the solution approach

The concept behind RiMatrix Next Generation

Nobody who needs a new data centre right now can say with any certainty how IT requirements will change in the next three, five or ten years. Nonetheless, the planned investment in the new data centre should still provide some certainty – the certainty that the core elements of the IT infrastructure will endure and be flexible enough to meet previously unknown requirements. Experience has shown that the innovation cycles of server and storage systems are considerably shorter than those of the data centre infrastructure that surrounds them. Maximising the flexibility and modular configuration of this infrastructure helps enable organisations to meet future requirements.

Figure 1
The new RiMatrix NG open modular platform from Rittal – the flexible, reliable, fast and future-proof approach to building IT infrastructure

Modular system technology

By maintaining a close dialogue with customers, experts at Rittal have developed an ingenious, modular solution that companies can use to obtain the investment security and planning certainty they need. Its name is RiMatrix NG – an open modular system that enables IT managers to successfully design their IT landscape of the future.

It uses standardised system technology that is configured on a modular basis, which helps ensure new data centres in all output categories can be implemented quickly and without risks.

Elements such as IT racks with flexible expansion options for servers and network technology, uninterruptible power supply (UPS) systems and power distribution units (PDUs) for power supplies, energy-efficient IT cooling, and DCIM-based monitoring are just some examples of the components in RiMatrix NG. Available worldwide, this solution can be used to create customised data centres for all IT requirements. New data centres can thus be established quickly, reliably and with excellent flexibility, from small single rack installations and edge data centres to enterprise, colocation and hyperscale data centres.

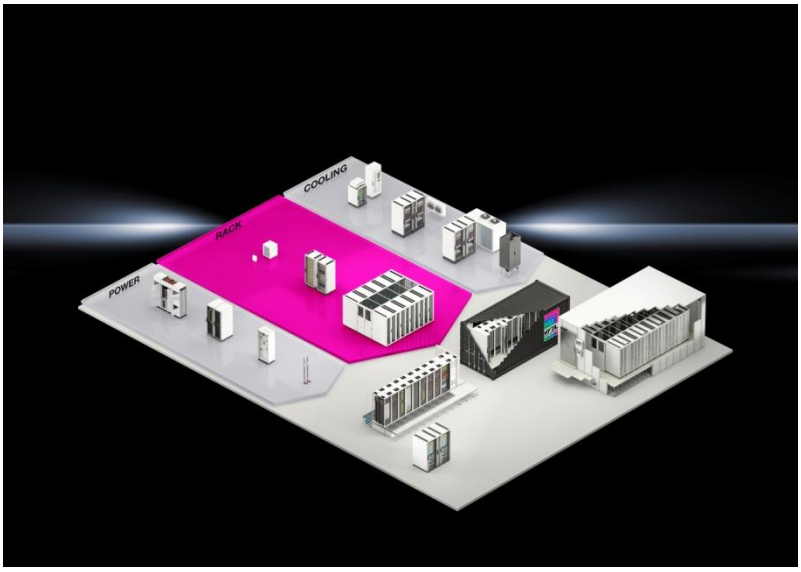

Figure 2
A modular approach for the right solution. RiMatrix NG includes modules for five functional areas – racks, climate control, power supply and backup, IT monitoring and security – that can be planned on a customised basis.

Consulting throughout the entire IT lifecycle

Besides supplying the system components themselves, Rittal also provides its customers with the advice and services they need. The company supports the entire IT lifecycle of any data centre that is based on the RiMatrix NG platform. Its service portfolio includes consulting on design, planning and configuration as well as assistance with operations and optimisation.

Design

Even in the early stages of a project, customers can draw on the support of experts from Rittal, who can assist with the concept development and design for the desired data centre. One option is CFD analysis, which uses computational fluid dynamics methods to visualise the movement of air currents, even as early as the planning stage.

Consulting for design, planning and configuration and assistance with operations and optimisation

This ensures an appropriate cooling solution is selected, identifies hotspots and adds detail to the TCO costing. This is also the stage when suitable solution components are chosen and investment (CAPEX) and operating costs (OPEX) are calculated.

Implementation

Rittal assists on site with the construction of the physical infrastructure such as racks and power supply, cooling, monitoring and security systems. The next stage is the commissioning and sign-off of the data centre.

Operation

Organisations that require support for ongoing operations can take advantage of the diverse range of managed services offered by German Edge Cloud (GEC), a sister company to Rittal. They can also link up with the central data centres run by GEC, which can lend support as back-ups or cushion load peaks.

Optimisation

Rittal analyses the efficiency, cost, sustainability and scalability of the installed solution so it can identify areas where the IT landscape can be optimised. This ensures the infrastructure always keeps pace with the state of the art and operates at maximum energy efficiency.

An overview of the special features

Flexible, reliable, fast – RiMatrix NG is an open platform on which certified products and solutions from third-party suppliers help to round out the portfolio.

Maximum flexibility

RiMatrix NG is flexibly scalable in every dimension, whether size, performance, security or fail-safe operation. At the same time, the platform can be used to build modular solutions, which makes it easier to scale infrastructures up or down. Modularity, scalability and continuous development combine to create maximum flexibility. This is further supported by the option of bringing on board certified partners who can provide power supply and fire safety modules, for example.

Furthermore, there is a high level of investment security thanks to backwards compatibility with previous versions, which means existing data centres can be flexibly expanded in a step-by-step process. Variable financing models such as leasing round off the portfolio and facilitate needs-based investment.

Reliable solutions

RiMatrix NG stands for maximum reliability. IT managers get verified Rittal quality and can rely on international approvals, which minimises project risks. Rittal also offers comprehensive documentation, training and a global service network to make sure systems can be started up safely and run efficiently.

Moreover, the open platform is being continuously developed to ensure it supports future technologies, too. One example of this is the support it offers for OCP technologies, which are becoming increasingly important as a means of building heterogeneous infrastructures. Excellent reliability, top quality and continuous development give IT managers maximum investment security.

Rapid deployment

RiMatrix NG has been designed so organisations can get a new data centre up and running as quickly as possible. Predefined, tested modules and components help with this, while the integration of high-grade standardised OCP technology into RiMatrix NG can speed up commissioning even more. Additional pacesetters include the quick and easy configuration of data centres using the Internet-based Rittal Configuration System and the unique 24/48-hour delivery service Rittal offers for standard products in Europe.

Rittal gives its customers crucial support for every step of the IT lifecycle, from planning through to operation and optimisation, meaning they can quickly and flexibly adapt RiMatrix NG to their specific requirements. The international approvals further boost the speed of IT projects, as there is no need for time-consuming permit and test procedures.

Support for every step of the IT lifecycle, from planning through to operation and optimisation

RiMatrix NG – the systematic approach

Maximum flexibility thanks to an open platform

The RiMatrix NG open IT platform from Rittal meets all the conditions necessary for an IT infrastructure that can be made available fast and scaled flexibly. The solution supports the custom creation of data centres based on pre-configured standard components. Moreover, previous RiMatrix installations can also be combined with the new NG variants in one and the same data centre. This means pre-existing IT cooling, power supply and monitoring solutions can continue to be used. Furthermore, the open concept ensures customers can integrate certified partner solutions into a RiMatrix NG data centre. Examples of such solutions include power supply systems in a range of output categories.

When planning new IT infrastructures, CIOs should opt for concepts that will enable them to establish IT systems in all areas of their company using just one basic technology. RiMatrix NG has been designed to support this requirement, and the solution features all the infrastructure components that are required in smart environments. All this gives companies maximum investment security.

The RiMatrix NG open IT platform from Rittal meets all the conditions necessary for an IT infrastructure that can be made available fast and scaled flexibly

Components for a future-proof IT infrastructure

Achieving a future-proof IT infrastructure means having a flexibly configurable platform comprising hardware, software and services. This IT platform should consist of standardised, modular system technology that offers a simple and reliable means of quickly constructing custom solutions for all current and future IT scenarios. Everything from small single rack installations through to edge, enterprise, colocation and hyperscale data centres should be covered. The platform should be open and boast exceptional compatibility and adaptability so it can cope with every demand and speed requirement in the world of IT globally.

It should be an impressive IT platform that features innovation, a carefully considered architecture, maximum security standards and energy-efficient technology and therefore demonstrates its infrastructure capabilities for the future right now.

An IT platform such as this is built on five pillars:

- IT racks with a systematic design
- IT power supply and backup
- IT climate control – generating, transporting and distributing cooling energy
- IT monitoring for measurable efficiency gains
- IT security

IT racks with a systematic design

The challenge for IT managers is that data centres now have to be available in very different output categories in order to meet an organisation's diverse needs. The basis for this is a rack platform that can be extended and adapted so it can meet any challenge and speed requirement in the global IT sector.

RiMatrix NG offers the flexibility needed to ensure IT racks can be used in very different configurations. The following sections reveal which criteria are important when selecting an IT rack.

Which criteria really matter when selecting an IT rack?

Figure 3
The new VX IT is a universal IT rack solution in a modular format that offers even more freedom for quickly building data centres and OT infrastructures on the factory floor.

Standard 19" dimension

The standardised basic version of an IT rack comprises a flexible 19" mounting level, divided side panels with quick-release fastener, and optimised cable entry with brush strips. Even in this basic configuration the rack will meet almost all the requirements of network and server enclosures. Rapid assembly technology also helps boost efficiency when customising the interior installation. This means accessories such as component shelves and sliding rails can be installed by a single person in just a few minutes without having to use any tools. Ideally, it should be possible to fix the spacing on the mounting levels manually so that in special applications dimensions of 21", 23" and 24" can also be achieved with ease.

The correct size for a rack is determined by how it is going to be used. In a network rack, for example, the individual components have a lot of wiring at the sides, which means these racks are usually 800 mm wide and up to 1000 mm deep. Racks used purely to house servers only need to be 600 mm wide, as power and network cables are usually located on the rear and don’t take up any space at the sides. These racks will be 1000 to 1200 mm deep.

More efficiency thanks to rapid assembly technology and flexible dimensions

When a rack is housing a mixture of server and network technology it will need to be 800 mm wide and 1000 to 1200 mm deep. This ensures network distributors, patch panels and PDUs for the power supply can be comfortably installed inside, as can larger volumes of cables. The appropriate heights in each case are determined based on the height units (U) required. A rack with 42 U is around two metres high and this is currently the most common height.

Using a standardised rack platform

When selecting a rack platform, companies should specify a standard solution. This ensures, for example, that all components can be installed with the same system and same fixing methods. Doors and side panels will fit in every rack. This simplifies ordering and warehousing processes, reduces the number of spare parts that need to be kept in store and minimises stock levels.

Power supply in the IT rack

When building an IT rack, PDUs are a key component in ensuring the IT equipment installed inside is supplied with power. Ideally, the rack system should allow users to install PDUs in the zero-U-space, i.e. the space between the side panel and the 19" mounting frame. This means no height units are blocked and maintenance and installation work can still be carried out even when the IT rack is fully populated. There are no obstructions to air routing either, so climate control costs can also be optimised. Furthermore, intelligent PDUs take care of important tasks such as calculating precise, individual energy consumption.

Optimising cooling in the IT rack

The cooling requirements in IT racks can differ. In server racks, cool air should flow from front to back while, in network racks, it should often be routed from one side to the other, through the components that need to be cooled. In both scenarios, it is important to partition the 19" levels to ensure cool air does not flow past the components that need to be cooled without being utilised. Open height units should be closed off to separate warm and cool air.

Requirements for high-performance computing (HPC) are a special case. Due to the extreme power density involved, the servers are concentrated in the smallest of spaces and up to 50 kW of energy is required in the rack. This kind of power density very quickly pushes the raised floor structures typically used to transport cold air right to their limits.

As a result, HPC data centres, for example, use rack-based or direct chip cooling. What matters is moving the cooling capacity as close as possible to the location where the heat is generated.

Security at rack level

IT racks in a data centre should protect against unauthorised physical access to the IT components. Depending on where it is being set up, a rack will be needed with a special protection class defined as per the IP (International Protection) standard. In an office environment, it is advisable to opt for access protection to IP 20, which features a lockable door. This will also be adequate in other lockable rooms and in a data centre that is in any case secured. If IT systems are being run in harsh production environments, they will require additional protection. Protection category IP 55, for instance, provides secure protection from dust and water jets.

Special security solutions may also be needed to protect particularly critical data. An additional enclosure offers an even higher level of security, including additional radiation protection for electromagnetic compatibility (EMC) and protection from vibrations and vandalism.

Security in line with specific requirements

Flexible use of IT racks

RiMatrix NG stands for an open-platform concept and uses, for example, the standard IT racks from Rittal, such as the VX IT and TS IT. It ensures full compatibility with the older generations of IT racks from Rittal, which means existing and future investments have the best possible protection.

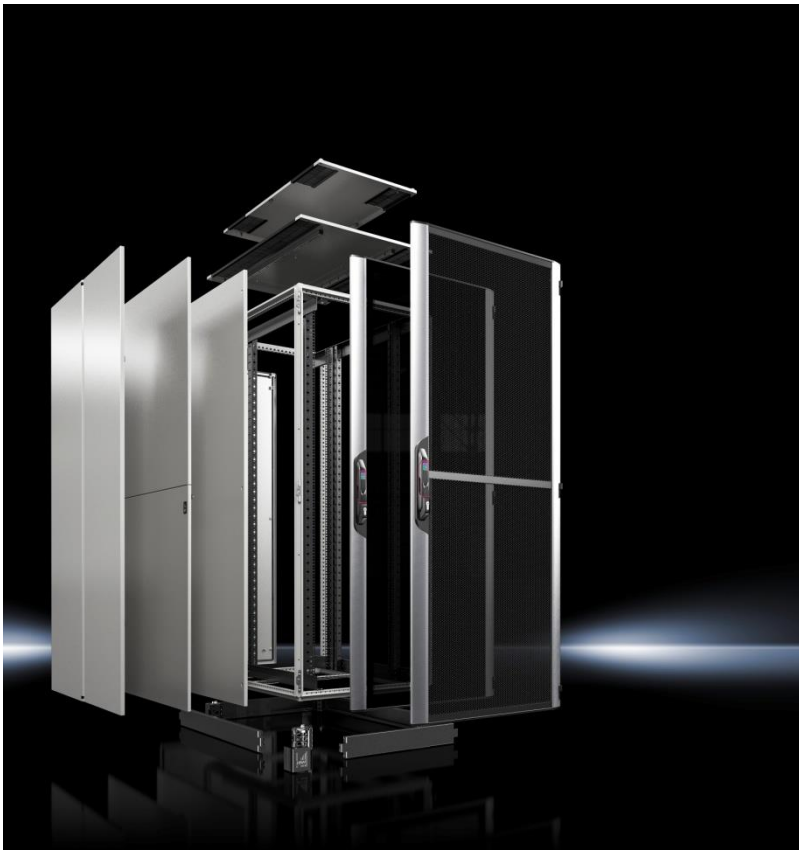

Figure 4
Flexibility thanks to rack diversity – RiMatrix NG ensures customers can use the comprehensive modular Rittal rack system to suit their needs and local preferences and configure it to be the perfect fit, either with the new VX IT or for full compatibility with older generations.

Improved efficiency thanks to direct current and OCP

RiMatrix NG supports the use of OCP components and direct current in data centres. Using OCP OpenRacks enables even greater standardisation in IT infrastructures.

The aim of the Open Compute Project (OCP) is to reduce investment and operating costs, energy consumption and the environmental impact of data centres through innovative and fully standardised IT architectures. Companies can leverage OCP to run highly homogeneous and scalable data centres and can realise cost benefits in data centres by optimising IT cooling and other elements.

As a leading manufacturer of IT infrastructures, Rittal is a driving force in the OCP community. Particularly when it comes to standardising architectures, Rittal has established itself as a strong partner for demanding OCP-related tasks. Besides supplying standardised racks in the current OCP design, the company can also meet complex, customer-specific enquiries. As well as the rack itself, Rittal offers a comprehensive range of accessories, a special power supply unit, and a cooling system tailored to the innovative OCP architecture. This means customers can easily combine the benefits of OCP technology using direct current with alternating current in standard data centres.

IT climate control

Which cooling concepts represent a sensible economic option in modern data centres? For reasons of cost alone, it is important that companies opt for a state-of-the-art cooling concept. Cooling systems account for up to 30 per cent of a data centre's total energy costs. If a company is to design its IT landscape on an efficient and sustainable basis, it should therefore pick the right cooling concept.

The IT systems installed in RiMatrix NG are cooled precisely according to needs in a controlled cycle using failsafe fan systems and refrigerant- or water-based solutions. Continuous monitoring ensures components do not fail due to overheating. RiMatrix NG can be used to implement cooling solutions for everything from individual racks and suite and room climate control through to demanding HPC (high-performance computing) with direct chip cooling (DCC).

As a consequence of digital transformation, companies are expanding their data centres and adding to their existing IT racks. This is driving up the power density in the IT rack, with the result that pre-existing cooling systems are often being pushed to the limits of their capacity or being run in performance ranges that are economically unsustainable. Whether adding to existing systems or building a new one, the cooling concept must be appropriate for the planned use of the data centre.

Cooling solutions for everything from individual racks and suite and room climate control to HPC

Room cooling

Conventional room cooling based on a high-precision climate control system and an air circulation system is widely used. Cooling is taken care of by a CRAC (Computer Room Air Conditioning) unit that operates in a similar way to a conventional air-conditioning unit. Cold air is blown into the data centre and spreads throughout the entire space or is routed to the racks via ducting or a raised floor. Using CRAC systems for cooling is a suitable approach for data centres with low to medium output per IT rack.

Room cooling is used with open IT racks. The fans in active IT components draw in the cold air and expel it back into the room as warm air. Fully populated IT racks generate hotspots in the data centre, thereby necessitating targeted cooling for individual racks. Under some circumstances, this can have a negative impact on the overall efficiency of the data centre.

In large data centres such as hyperscale data centres, air handling units (AHUs) and precision air handling units (PAHUs) are often used for room cooling. The ventilation system delivers a high cooling output without taking up floor space in the data centre. Since the heat loads that need to be dissipated are generally considerable, the air current needs to have a correspondingly large volume capacity. If the outside air at the location is cooler than the air expelled from the IT systems, then an active cooling system is not required and the principle of indirect free cooling is adequate. Adiabatic or evaporation cooling can further optimise this concept, as spraying the heat exchanger with water helps to cool the intake air before it reaches the data centre.

Is free cooling completely cost-free?

When talking about climate control technology, the term “free cooling” does not actually refer to a completely cost-free IT cooling system. The point is rather to minimise the use of compressor-based coolers as much as possible. Ideally, this could be done to such an extent that power is needed merely to drive the fans of the free cooler and potentially some cold water pumps. As a result, the efficiency of the system as a whole depends to a very large extent on the local climate. In other words, a data centre in Scandinavia can be run much more cheaply than one in southern Europe.

The systems used in free cooling work on the principle of convection, whereby the surrounding air is used to extract heat from the cooling medium, which is usually a mix of water and glycol. This process takes place through a free cooler that is set up outdoors. The cooler can contain a membrane heat exchanger through which the warm water flows or a similar technology. In this case, heat is extracted from the water, and the bigger the contact surface of the membrane, the more efficient the system. Additional fans can be employed to increase the volume of air flowing through the system and thus boost cooling performance. The return for this outlay is lower energy consumption for heat dissipation. However, in this kind of scenario, the achievable inlet temperature is only slightly above that of the ambient air. As a guideline, when designing systems, climate control specialists work on the basis that it will be around three degrees Celsius higher.

Minimising the use of compressor-based coolers as much as possible

Suite cooling

Suite cooling, which is based on the principle of containing enclosure suites, promises greater cost efficiency than room cooling. In this scenario, areas in front of and behind racks are each partitioned into hot and cold aisles. This helps increase energy efficiency, as the cold and hot air masses are kept strictly separate and lower volumes of air need to be moved than is the case with room climate control.

Rack cooling

Rack-based cooling offers the best possible energy efficiency, as only minimal volumes of air are moved. In this scenario, the IT rack and cooling unit form a sealed unit. This means that even the highest HPC loads of up to 50 kW per rack can be cooled. The up-front investment is higher, as a separate cooling unit is needed for each rack.

Best possible energy efficiency with rack-based cooling

Hybrid IT cooling reduces energy costs

The latest generation of hybrid cooling units featuring integrated passive cooling are also very cost effective. There are units on the market with a cooling output of three kilowatts and two cooling circuits. These cooling units work with either a passive cooling system, for which they utilise a heat pipe, or a refrigerant-based cooling system that includes a regulated compressor. Measurements taken while these units are in use show that average energy costs can be reduced by up to 75 per cent compared to when using simpler cooling units.

Companies needing a higher cooling output can choose hybrid systems up to around 35 kW that operate with both a water-based and a coolant-based circuit. When temperatures are low, the solution automatically uses indirect free cooling based on an external hybrid condenser with an integrated free cooling system. When external temperatures get higher, a compressor starts up that cools the refrigerant, which in this case is water. Ongoing operating costs are also reduced noticeably by using indirect free cooling. Rittal offers precisely this kind of hybrid solution for maximum IT cooling energy efficiency in the form of its Blue e+ units.

In general, it can be expected that the power density in data centres will continue to grow. Since air is known to be a poor conductor of heat, direct CPU cooling is likely to find its way back into data centres in the future. This can be implemented conventionally as water cooling, which would once again call for a technology that was used in the heyday of mainframe computing.

However, new technologies such as direct chip cooling (DCC) that use more advanced refrigerants offer an alternative to water cooling.

Direct chip cooling

The highest efficiency values in IT cooling can be achieved using intelligent direct chip cooling (DCC). A new, water-free, two-phase liquid cooling system from Rittal and ZutaCore is one example of DCC.

This solution operates on the principle of evaporation cooling and uses latent energy to evaporate refrigerant ("direct contact evaporative cooling"). The advantage is that the solution targets especially high-performance cooling precisely where hotspots and performance peaks occur. This means operators can run HPC nodes efficiently on a fail-safe basis and reduce IT outages to a minimum – even in data centres that are heterogeneous or have grown organically.

DCC from Rittal and ZutaCore

The DCC solution from Rittal and ZutaCore works on the following principle: The liquid refrigerant Novec flows into specially developed evaporators on the server processors. As it absorbs the heat from the processors, the refrigerant evaporates and is converted into gas. The gaseous refrigerant is then converted back into a liquid in the heat exchanger. The temperature of the airflow is sufficient for this purpose. A pump ensures the liquid refrigerant flows back into the cooling system. This solution can achieve heat dissipation of up to 900 watts per server.

The other solution from Rittal and ZutaCore is an in-rack solution available as an air- and water-cooled variant. The air-cooled solution supports up to 20 kW of heat dissipation per rack with the aid of an in-rack air-cooled condenser. It can be easily installed in any rack in virtually any environment, and has been designed in response to the sharp growth in demand for cooling powerful processors at the "edge". With a water-cooled condenser, the water-cooled in-rack version supports energy-efficient cooling of up to 70 kW heat dissipation per rack. It is designed primarily for rapidly growing processor and server outputs.

Generally speaking, it is advisable to work with the cooling unit supplier to draw up a location and cost analysis so that the exact return on investment can be calculated.

Building redundancy into power supplies and ensuring their fail-safe operation is crucial to the overall reliability of a data centre. In its continuous power & cooling concept, Rittal has developed a way of bridging short-term power failures for a defined period.

This ensures data centres can be transferred to a safe condition after a power failure, which means supplying power to both active IT components and other infrastructure elements such as IT cooling systems for long enough to complete the transfer process.

Continuous power and cooling

Solutions for the entire energy chain

Solutions from Rittal support the entire energy supply chain. This runs from the main infeed, through central UPS systems and sub-distribution systems, up to the socket systems in the IT racks. Ri4Power from Rittal provides a reliable main infeed for the power supply and is suitable for use with open and compact circuit-breakers from all well-known manufacturers. Rittal also offers uninterruptible power supply (UPS) solutions in various output classes in cooperation with global technology partners. These solutions are closely integrated into RiMatrix NG and form part of the overall concept. Another power supply component is the Power Distribution Rack (PDR), which distributes electrical current within a suite of IT racks. Integrated energy monitoring is an optional extra for this solution. Rittal supplies its Power Distribution Units (PDUs) as a solution for distributing power within the rack itself, and these can be installed in all standard IT racks.

Power distribution in the IT rack

PDUs are especially important for distributing power within an IT rack. They are high-quality multiple socket outlets that are fuse-protected to industry standards and offer optional monitoring, switching and measuring functions.

Ideally, PDUs are installed in the zero-U-space – in other words, in the space between the side panel and the 19" mounting frame. This way, no height units are blocked, and maintenance and installation work can still be conducted on the IT components, even when an IT rack is fully populated.

Smart PDUs

Figure 5
Electricity costs under control – the intelligent variants of Rittal PDUs are supplied with detailed measurement functions for precisely analysing power consumption in the IT rack, thereby enabling IT managers to optimise data centre energy costs.

The core task of a PDU is to distribute energy, which is why they can be found in the A and B power supply on a redundant basis. Depending on their design, PDUs can monitor and switch the power supply down to the level of individual socket outlets, which also means these network-capable devices support remote maintenance.

Moreover, intelligent PDUs use additional sensors to record a wide range of environmental parameters. For example, sensors for access monitoring enhance IT security at rack level. Remote monitoring is particularly advantageous for installations such as floor distributors and autonomous edge data centres, as the PDU can be used to integrate the IT rack comprehensively into an overarching monitoring system.

PDUs also perform a vital role in the planning and modernisation of IT systems. When it comes to IT load management, they provide precise data about energy consumption in the IT rack, which is fed into overarching management platforms such as Data Centre Infrastructure Management (DCIM).

Ultimately, IT managers and Facility Management departments thus gain access to crucial data they can use to optimise operations and plan for the future.

Tip – using PDUs to save power

PDUs can use two different switching processes to interrupt the energy supply – the loads can be switched using electronic or mechanical relays. However, if there is a power failure that affects only the PDU, both the electronic and mechanical relays lose their control current and fail. This usually shuts down the slot concerned and its consumer. In addition, a constantly energised mechanical relay permanently consumes energy. In a fully populated PDU, this can amount to as much as 50 watts. Companies that wish to save energy therefore use units with bistable relays. These remain at zero current in their respective switching state, thereby lowering the inherent consumption of a PDU. This way, energy costs can be perceptibly reduced, especially in the case of 24/7 operation.

PDUs with bistable relays offer advantages when it comes to energy

IT monitoring for measurable efficiency gains

While it was good enough in the past simply to optimise the PUE (power usage effectiveness) value in the data centre, companies can now use the Smart Monitoring concept from Rittal to monitor their entire IT infrastructure from IT to OT (operational technology).

Smart Monitoring automates all the monitoring processes and helps identify critical deviations from target values at an early stage. At the same time, the solution also provides a detailed insight into the availability and performance of the IT landscape and offers effective assistance functions to help overcome the day-to-day challenges involved in running data centres.

Monitoring for more security

Another task that comes under monitoring is to bolster IT security and thus defend against cyber threats and physical risks. Digital security management with event-controlled, automated processes can help to considerably reduce potential downtimes. For example, the system as a whole can be protected from remote access by third parties with the assistance of access controls using two-factor authentication and intelligent handles. Prescribed penetration and resistance tests and corresponding certifications provide information on the relevant security standard of the solution being used.

In the case of RiMatrix NG, Rittal supports effective protective measures with monitoring solutions such as the Computer Multi Control III (CMC III) high-performance monitoring system and Data Centre Infrastructure Management (DCIM) software. Sensors for measuring humidity, temperature, differential pressure and vandalism, for example, are available for these solutions.

DCIM is a central tool

By using DCIM, IT managers are supporting the transformation of the data centre, helping it become a holistic IT system with fully automated processes. While, in the past, IT components have been serviced, configured and monitored manually, the ideal modern data centre operates on a largely autonomous basis. In particular, DCIM helps safeguard the energy supply and climate control on the infrastructure side, monitor the physical security associated with the IT racks, and build a bridge between the infrastructure and the active IT components. The high degree of automation that can thus be achieved frees up IT experts so they can focus more on the strategic development of the data centre.

Scope for strategic development through DCIM

IT security

To ensure IT environments remain functional at all times, Rittal offers effective protective measures and monitoring solutions for the RiMatrix NG platform. Besides physical protection for systems and guarding against unauthorised access, companies today are increasingly requesting measures to safeguard data sovereignty. Data sovereignty essentially refers to companies deciding for themselves how they utilise operational data from machines, systems and vehicles, including in global ecosystems and multi-cloud environments.

Indeed, maintaining data sovereignty has become a key competitive factor for companies. This applies across all sectors, particularly those where product and production data needs a high level of protection as intellectual property, such as the manufacturing industry and other sectors, as well as areas with strict security requirements, such as healthcare and banking.

Maintaining data sovereignty has become a key competitive factor for companies

Major European digital projects such as Gaia-X are aiming to develop a European data infrastructure for securely networking industry. If successful, this would mean that smaller, geographically dispersed data centres with open cloud stacks might be able to create a new class of industrial applications.

These would support real-time control and carry out initial data analyses directly at the location where the data is created, before then using the cloud for downstream analyses. Under this concept, companies stay in full control of how their data is used throughout all the networking along the entire supply chain. After all, this data is their intellectual property and embodies their innovative prowess.

Reinforcing physical security

If maximum IT security is required at individual sites, Rittal offers the option of an additional basic protection room. This is built as a modular room-in-a-room solution and gives a standard data centre additional protection against fire, water and smoke. The flexible modular solution ensures systems can be extended while still operational. A high-availability room offers even more security. The system has been certified by the European Certification Body GmbH (ECB) to ECB·S regulations. The modular concept offers the same benefits as a basic protection room, but with a higher level of protection.

Annex

Glossary, abbreviations

5G: The fifth generation of mobile communication is a mobile standard that promises data rates of up to 10 Gbit/s, higher frequency ranges, real-time transmission and latency times of a few milliseconds.

AHU: Air Handling Units are cooling units used to cool rooms in a data centre. The ventilation system delivers a high cooling output without taking up floor space in the data centre.

CAPEX: CAPital EXpenditure refers to a company's investment spending or costs.

CFD: A Computational Fluid Dynamics analysis is carried out to visualise the movement of air currents in the data centre in order to identify hotspots in the IT cooling system.

CMC: The CMC (Computer Multi Control) range of products is an alarm and monitoring system from Rittal for network and server racks, data centre containers and technical rooms.

CRAC: Computer Room Air Conditioning is a cooling concept that operates in a similar way to a conventional air-conditioning system and cools entire rooms. Using CRAC systems for cooling is a suitable approach for data centres with low to medium output per IT rack.

DCC: Direct Chip Cooling is a process for carrying out cooling directly on the chip in order to achieve maximum efficiency.

DCIM: A software solution for Data Centre Infrastructure Management offers a range of function blocks that are needed for everything from ongoing operations to planning the capacity of IT infrastructures.

ECB: The European Certification Body GmbH is a neutral, accredited certification body that issues certificates for products from the security industry. These certificates give customers certainty when making investment decisions and provide the insurance industry with an objective basis for calculating risks.

Edge data centre: These data centres are located close to the place where the data is generated. This location may be at a remote production site, in retail outlets or in a 5G transmitter station – in other words, "at the edge" of a network. The aim is to process data in real time on site.

EMC: Electro-Magnetic Compatibility is a feature of a technical device that indicates the device will not disrupt other devices or suffer damage itself as a result of electrical or electromagnetic effects.

HPC: High-Performance Computing is an umbrella term for the types of high-performance computers used in research, for crash tests and other simulations, and for weather forecasting.

IP: The International Protection code indicates the degree of protection that an enclosure offers against direct contact, foreign bodies or water.

OCP: The "Open Compute Project" initiative is a consortium of various organisations that are active in the IT industry and are championing energy-efficient data centre design based on open technology standards. The initiative's aim is to reduce the investment and operating costs, energy consumption and environmental impact of data centres through the use of standardised IT architectures.

OPEX: OPerational EXpenditure refers to all the costs that are incurred during the course of operational business activities.

OT: Operational Technology is the hardware and software used in a smart factory to monitor and control physical devices, machines, systems and their processes.

PAHU: Precision Air Handling Units, see AHU

PDR: The Power Distribution Rack is a power supply component and distributes electricity within a suite of IT racks.

PDU: A Power Distribution Unit is a high-quality socket strip manufactured to safety standards. It is used for distributing power in IT racks.

PUE: Power Usage Effectiveness is a metric that can be used to map the energy efficiency of a data centre.

U: A unit of height in a server rack. A rack with 42 U is around two metres high and this is currently the most common height.

UPS: An Uninterruptible Power Supply filters the mains voltage and safeguards the energy supply to the IT components when there are fluctuations or failures in the mains power.

Zero-U-space: Describes the space between an IT rack's side panel and the 19-inch mounting frame.

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