

# Data Center Solutions

Performance and Scalability  
Unleashed

# Introduction

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## A note from Carsten Ludwig

Market Manager - Data Center, R&M

Digitalization is profoundly reshaping business and work in many ways – and things are just getting started. Platform-based business models have been enabled. Advanced analytics, big data, and AI are helping make informed decisions and optimizing everything from supply chains to logistics. Intelligent automation is enhancing efficiency and accuracy. Digital platforms make it possible to offer personalized experiences, engage with customers in real-time, and obtain instant feedback. Employees can access data and work from anywhere, with anyone.

As these developments evolve, businesses need to keep adapting their approaches and operations. That also means rethinking Data Center infrastructure, architecture, connectivity, functionality, monitoring, optimization, and more... You need to make smart decisions about physical layout, space utilization, power, cooling, HVAC, (redundant) connectivity, safety, security, risk mitigation... Designs need to be capable of accommodating expansions and upgrades at short notice and flexibly adapt to changing technology and business needs - without over specifying or overspending.

R&M are committed to supporting you in successfully navigating these new developments, by sharing insights, experience, and knowledge. Through this publication, for example, which we hope you find helpful and inspiring. Of course, if you'd like to discuss your specific installation, requirements, or challenges, our experts are here to help!

Enjoy reading!

## Embracing the future of Data Centers

*AI, Augmented Reality, new work tools and economic platforms... Digitalization is changing our ways of living, working, and doing business – and the Data Center. Find out how new demands, technological advances, and evolving workloads will continue to affect DC design, construction, operations, and maintenance.*

# Embracing the future of Data Centers



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*Digitalization is having a profound effect on technology, economies, and societies, which is set to continue. From 5G and mobile apps to IoT and Artificial Intelligence, we're seeing a change from 'analog', 'human-centric' approaches to an increasingly automated digital world.*

As markets keep evolving, businesses must also adapt their approaches and operations. Digitalization is completely reshaping business strategies. Digital platforms allow businesses to adapt to changes fast, such as sudden demand surges and supply chain disruption. Real-time data is helping businesses make instant decisions. Digitalization enables new monetization strategies and business models. Processes are streamlined and businesses have new ways to target, reach, and engage with audiences. Working at home and on the go are here to stay. There's a growing emphasis on building ecosystems, partnerships, and integrations with other platforms and services.

As more businesses and individuals rely on digital solutions, demand for data storage, processing, and transmission is surging, requiring more servers, storage systems, and network equipment. Faster networking solutions, 5G, and high-speed intra-DC communication technologies are becoming vital to handling data traffic. Multi-Cloud and Hybrid Cloud Strategies require integration with cloud environments, for seamless data mobility and interoperability.

The processes and applications of today and tomorrow need new architectures and design methods. A robust, adaptable infrastructure will fully harness the speed and efficiency gains the digital transformation offers. This requires expansion of current data centers and the construction of new ones. In DCs, the need for high-performance computing needs to be balanced with identification and implementation of energy-efficient practices. Balancing workloads, managing virtual machines, and optimizing resource utilization are key to cost-effective operations.

## Business Drivers



### Markets

Market Developments and new technologies today and in the future



### Processes

Business processes and required software applications



### Strategies

Customers' changing tech-driven business strategies and execution



### Hardware

Hardware architecture in the DC (Servers, Switches, Storage...)

## **i** Pros Insights

### Data Centers are changing

- Business KPIs and sustainability considerations are driving DC design and construction.
- Ever-higher equipment density is changing rack specifications significantly. For example, as temperature and weight increase, (Small Form Factor) connectors and cabling sizes decrease...
- Changing architectures, densities and environmental goals are driving new developments in cooling. Do you use gas, on-board, or liquid cooling? How do you minimize energy usage and impact?
- DC efficiency is typically measured in Power Usage Effectiveness (PUE). A PUE of 2 means that for every watt of power used for computing, another watt is consumed for power distribution, cooling and related processes. Conventional DCs have a PUE value of 1.9 - almost half of the total energy consumption is not used for the actual purpose - processing power. In Germany, existing data centers must ensure a PUE no higher than 1.5 by 1 July 2027 (current average = 1.7).

# Meeting Compute Network Challenges

## Today and Beyond

### A closer look

As technology advances and workloads grow, the need to boost performance, scalability, efficiency, security, and sustainability becomes paramount. Adapting to evolving demands while ensuring seamless infrastructure for a wide array of applications is key to business continuity and future-proofing Data Centers.

DCs will continue to be affected by new demands, technological advances, and evolving workloads. Adapting to ever-evolving requirements while continuing to provide reliable and scalable infrastructure for a wide range of applications and services is a must for business continuity and future-proofing DCs.

Facilities of all sizes need to meet changing technology and application needs. They must deliver higher performance and (automated) intelligence to accommodate massive data growth, seamlessly integrate with emerging technologies, and offer more capacity when required.

### Fit for purpose

A key challenge is ensuring your DC foundation is fit for purpose and assets are used and maintained optimally - without over-specifying or overspending. Requirements can change at any time, due to market and technology developments, for example, so you can never copy previously successful designs.

DCs house a vast number of physical assets, such as servers or networking and storage equipment. This must work together optimally to avoid inefficient resource allocation, downtime, and security risks. Compliance with regulations and standards, which vary depending on location and the data being stored and processed, is required. Planning for unexpected events is essential to minimizing downtime and data loss.

Accurate asset utilization insights and capacity planning are required to utilize resources as efficiently as possible, control costs, and ensure the highest degree of sustainability. DC asset lifetimes need to be carefully managed in all phases and process design and documentation should minimize risk of human error. At the same time, however, the DC industry is facing a shortage of trained staff...

### Current requirements

- 1** Processing power, memory capacity, I/O performance
- 2** Memory management and hardware-assisted virtualization
- 3** Reduced operational cost and environmental impact
- 4** Protection against vulnerabilities and threats
- 5** Built-in redundancy

### Future requirements

- 1** Accommodate AI, Machine Learning, Edge, 5G
- 2** Modular design for compute, memory, storage allocation
- 3** Enhanced security and data privacy
- 4** More energy-efficient servers
- 5** Hybrid and multi-cloud integration



R&M integrated  
DC approach



## R&M integrated DC approach

## How we help you reach your KPI targets approach



### Up-to-date expertise

Fast-moving developments of today and tomorrow require a new approach to the data center. Designing, building, and operation requires more than installing hardware components – you need a fully integrated solution, including management. That requires up-to-date expertise and end-to-end support. Besides the usual ‘compute’ elements, such as servers and switches, you need the right ‘non-compute’ elements. That requires support with analysis, specification, consulting, installation, service, and updates – while avoiding ‘vendor lock-in’.

### One-stop-shop

R&M offers all ‘non-compute’ elements in a single portfolio under a software framework. Our ‘one-stop shop’ designs, builds, and delivers ready-to-use DC infrastructures encompassing Computing Rooms, Meet-Me Rooms, Building Entry, Campus, Data Center Interconnect, and connection to network providers. Modular infrastructure solutions integrate network connectivity, rack designs, housing, cable management, power, and DCIM. A Digital Twin can be available as part of the package right from the start.

As DC operators expand halls, densify infrastructure, or integrate applications such as ML, IoT, and 5G, they can rely on R&M to understand challenges and pro-actively suggest infrastructure solutions. We develop and test everything in house and support implementation. Anything we don’t make ourselves we obtain from trusted partners. That means we can guarantee everything will work from day one.

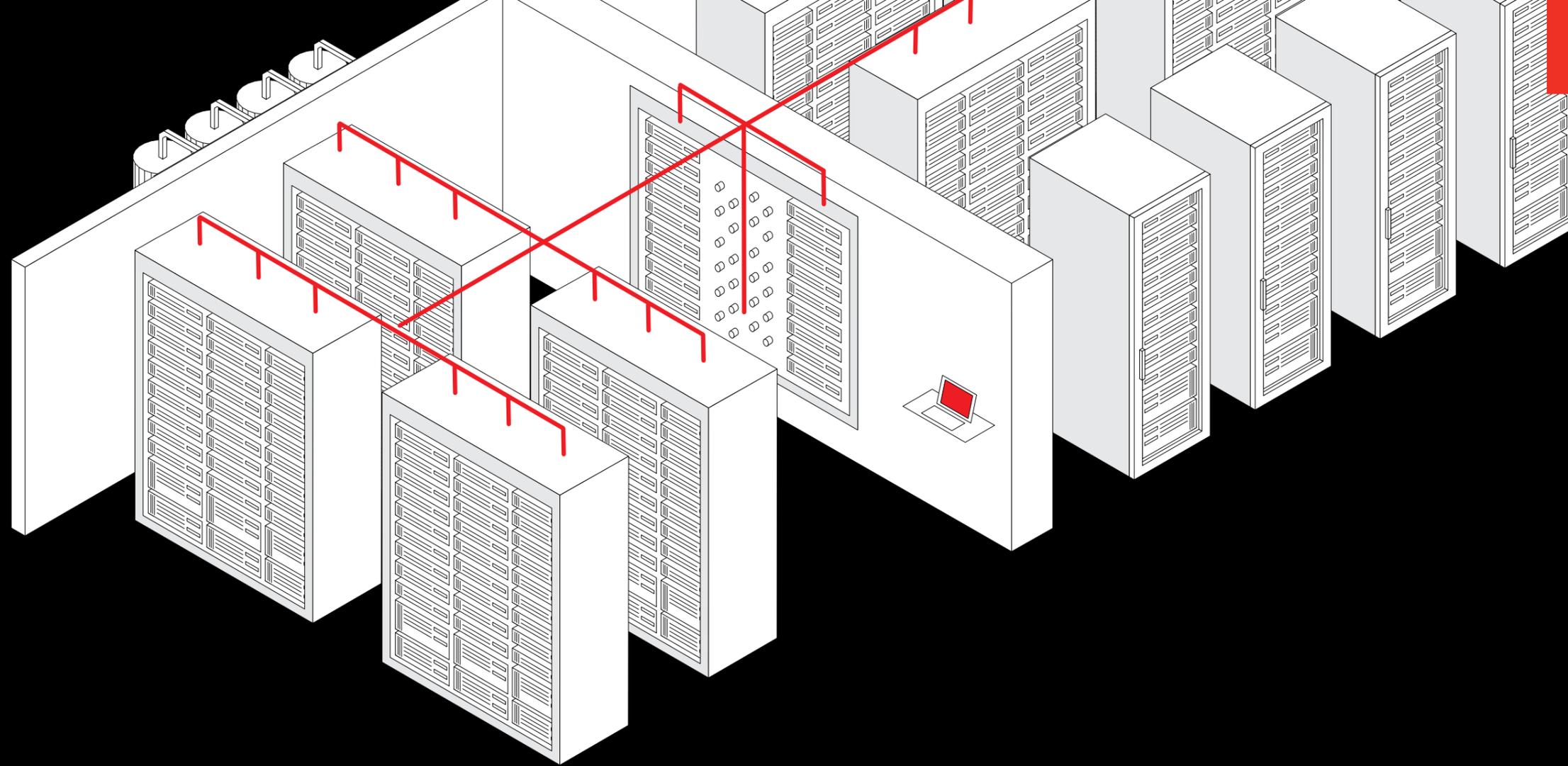
### Non-compute solution offerings

DCs are integral to future digitalization. IT architecture is essential this transformation. Based on thorough analysis of market and customer requirements we define DC Hardware architecture, encompassing Servers, Switches, and Storage. We support solution design, implementation, and service, complemented by select partners’ non-compute solution offerings.

### Integrated approach

We ensure active equipment connectivity, space, temperature, humidity, and safety requirements are met, monitor their environment, and support Operation Managers. Thanks to R&M’s integrated approach to IT infrastructure and its environment, servers and storage do exactly what they need to, today and tomorrow. Our DC solutions, including contributions from select partners, secure performance. That means you can hit every related KPI target, from speed and latency performance to service levels and sustainability goals.

## Our modular approach



### Easy scalability, lower cost, more efficiency

Modular Data Centers provide easy scalability, lower costs, higher efficiency, and significantly shorter time to market. A Modular Data Center is, essentially, an integrated, pre-designed set of modules selected and configured with possible expansion in mind, as well as the possibility of downscaling or altering functionality as and when circumstances require this. The DC is fully functional from the outset but can be scaled as business develops or IT needs and processes change. Anyone who needs to get up and running fast, or works in an especially fast-moving market, could benefit from this design approach.

### Enhanced flexibility

Modular design offers enhanced flexibility to accommodate growth or changing requirements whilst providing an opportunity to spread investment costs over time. Costs remain fixed until utilization increases, and depreciation can be managed in stages. All components of a prefabricated, pre-developed solution are highly standardized.

When specifying and building a modular solution, dealing with multiple suppliers is practically unavoidable. It makes sense to have one single representative manage all parties and ensure consistency, compatibility and interoperability of processes and products.

### Understanding dependencies

It's important that every single discipline involved in creating the data center works very closely together and exchanges information in a highly structured, standardized manner. Each individual competence area is currently highly specialized and rapidly developing. Customization, for example, is too complicated to be carried out by anyone but experts who understand all the dependencies and variables.

### Team of experts

By assembling a 'rainbow team' of experts from all relevant disciplines and appointing one single point of contact, we can take care of optimizing the modular solution, regardless of the number of variations and product types, and the resulting complexity.

# R&M building blocks

How we can help

## Full-range supplier

As data rates and speed and distance requirements change, fiber is the only solution in more and more applications. Copper cabling has its place in the DC, but its limitations must be considered. More enterprise DCs are being linked via fiber access and backbone networks. Some DCs are developing their own point-to-point optical networks to realize cost savings and meet growing bandwidth and flexibility needs.

R&M is a full-range supplier with an integrated system approach for fiber and copper cabling. Our range of DC products and services offers you the optimal cabling solution. This saves costs through shorter installation and reconfiguration times, while keeping an eye on your future network requirements.

Our approach shortens provisioning time, minimizes unplanned downtime and infrastructure management costs, frees up time for strategic activities, and ensures an automatically documented provisioning process.

## Everything from a single source

R&M designs and delivers Integrated Infrastructure Solutions for every size, category, network architecture and application. Our portfolio includes connectivity, cabling, rack equipment, housing, power, airflow, and DCIM and we know how it fits together. Infrastructure units can be delivered preconfigured and ready to install.

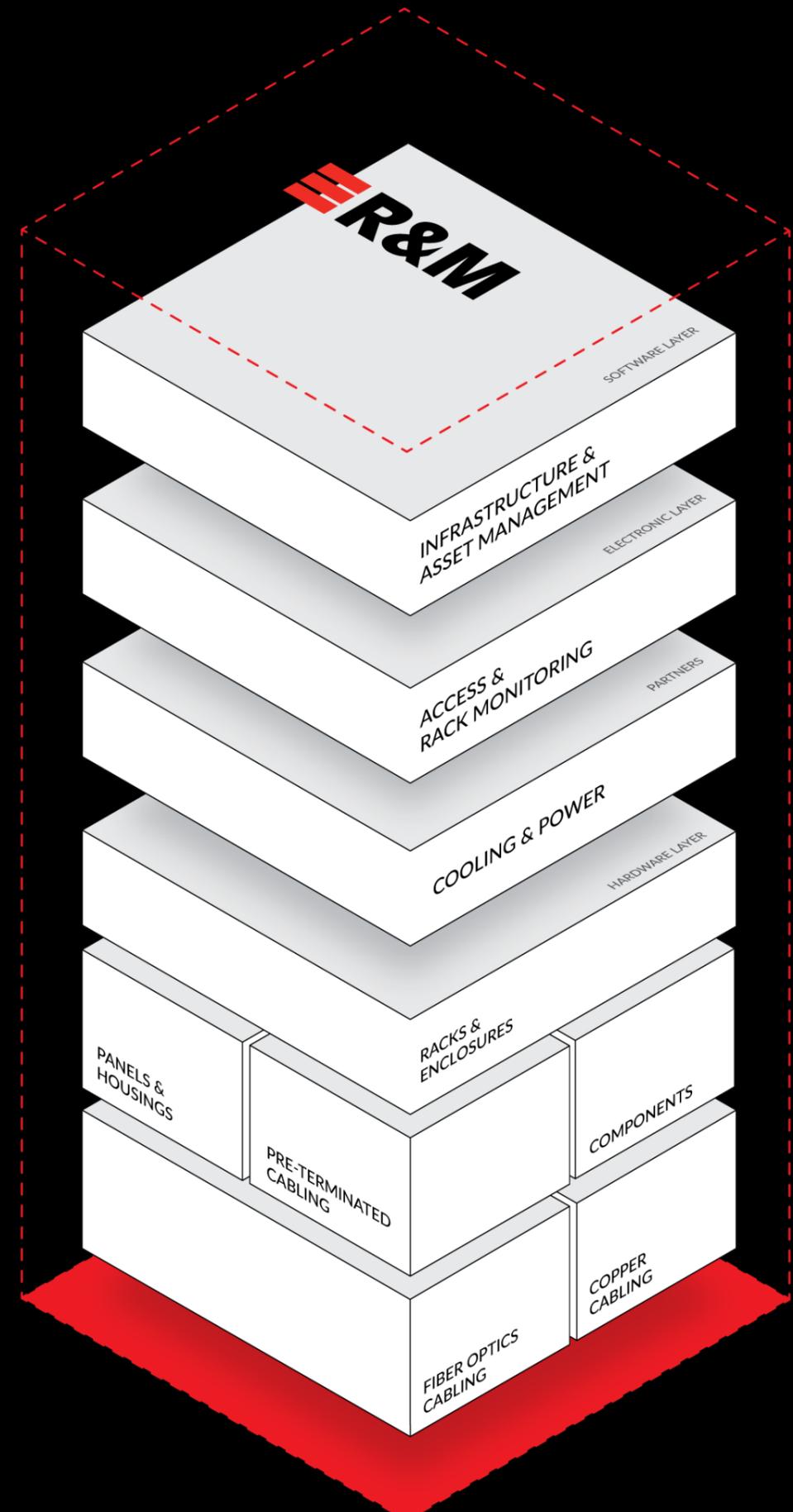
New topologies require comprehensive integration expertise. We design (local) standards-compliant solutions and help you implement your own DC architecture ideas and approaches - right from the start. Our global experts guarantee any solution specified will work as intended, securing your investment. An in-house supply chain and 14 R&M plants worldwide ensures modules arrive directly at the data center at exactly the right moment.

## Infrastructure solutions

- Hyperscale
- Colocation
- Enterprise
- Edge
- Telecom
- Internal Exchange

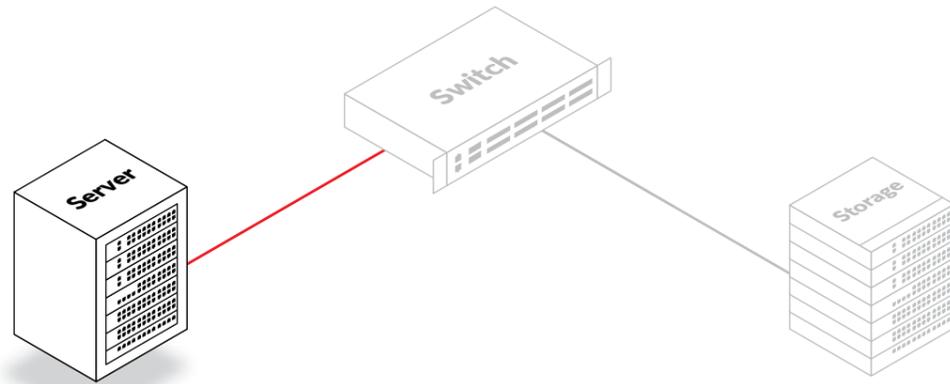
## Product categories

- Connectivity and Cabling
- Copper and Fiber
- Racks and Housing
- Rows and Cubes
- Sensors and Power Supply
- Cooling and Fire-Protection
- Safety and Security
- Monitoring and DCIM



# Servers

## Requirements



### Data Center server requirements

DCs need vast processing capacity, memory, and I/O performance for continuous availability. This must be supported by efficient memory management, hardware-driven virtualization, and automated and remote management. Highly data-intensive tasks, require high-speed connectivity. From an operational point of view, it is vital to reduce costs and environmental impact, and enhance scalability, security, and privacy.

Looking ahead, there will be more for compact, energy-efficient Edge Computing Servers and greater integration of 5G, AI, ML and hybrid and multi-cloud environments. Modular flexible design and containerized applications will be more important.

### R&M for servers

R&M's proven high-quality server solutions include copper and fiber cabling. A broad, integrated product range includes solutions for cable routing, cable management, patching, and pre-terminated options, designed to support data center server connections.

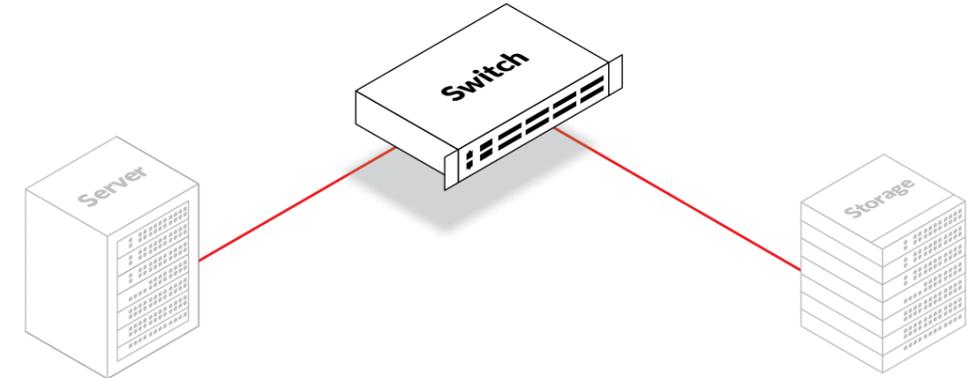
Our consultation and design services help plan and implement network infrastructure, from assessing requirements and recommending appropriate solutions to creating customized cabling designs and maintenance and service concepts. Solutions are optimized for the specific server hardware used and our ongoing research into new trends and developments allows you to make informed infrastructure decisions. Our approach ensures efficient, reliable data transmission and flexibility today and in the future.

- Copper Cabling
- Fiber Cabling
- Cable Routing
- Pre-Terminated Cabling
- Consultation & Design
- Netscale 48
- Netscale 72
- Netscale 120

Click to explore the topics!

# Switches

## Requirements



### Data Center switch requirements

Today's focus is on high throughput, low latency, high port density, horizontal and vertical scalability, robust security, and redundancy. Power consumption and operational costs need to be reduced through smart design and operations, remote management, real-time monitoring, and analytics. Demand for features such as VLAN tagging, QoS, SDN and network virtualization is growing, and we predict similar growth in AI and ML, customization, 5G traffic capacity, edge environments, Hybrid / Multi-cloud support, 400 Gbps and higher data throughput rates, and lower latency.

This will require enhanced authentication, authorization, network (micro)segmentation, analytics, telemetry, visualization, and dynamic environmental features.

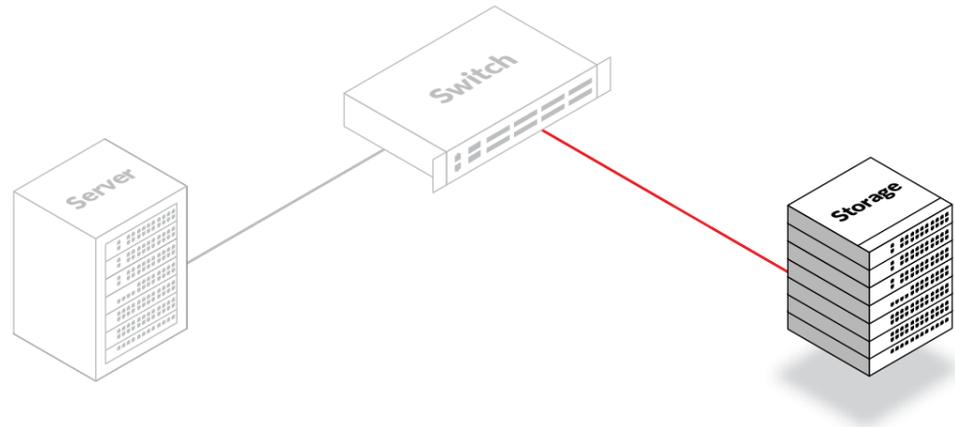
### R&M for switches

To meet today and tomorrow's business demands, trunk cables as well as transition modules must provide a clear migration path to even higher speed Ethernet without increasing footprint. R&M switches offer features such as high port density, low latency, and high throughput to support demanding workloads.

Advanced management and control features, such as Quality of Service (QoS) settings, VLAN support, and traffic monitoring allow administrators to optimize the network for different types of traffic and applications. Compatibility and interoperability with a wide range of network equipment and devices from various vendors is ensured and scalability, security, and support are all part of the overall concept.

- Trunk Cables
- Transition Modules
- Netscale Blade-Cabling Manager

# Storage Requirements



### Data Center storage requirements

Storage solutions must accommodate vast databases, user data and I/O-intensive applications, with low latency and hybrid / multi-cloud integration. There's a growing emphasis on scalability, management, data protection, security, and reducing power consumption, environmental impact, and operational costs.

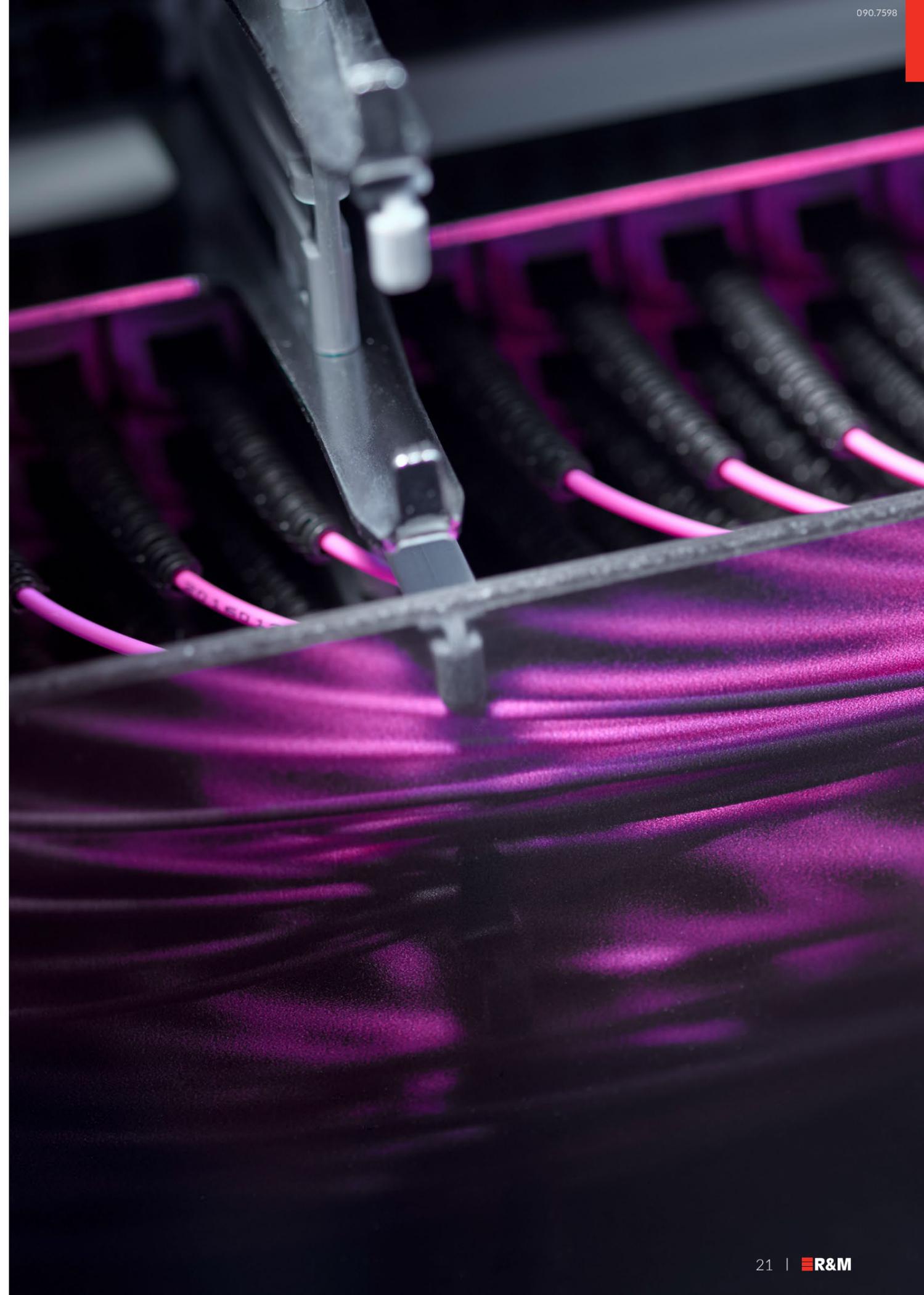
Innovative applications and market demands require advanced support for IoT, AI, machine learning, data growth, higher performance, and Quantum Computing. Features such as decentralized and distributed storage, edge/core/cloud links, unified management of on-premise and cloud resources, self-healing and automatic failover will become more important.

### R&M for storage

R&M data center storage solutions encompass a wide range of technologies and offerings designed to optimize data storage and management within data center environments. Flexibility allows businesses to accommodate growing amounts of data without major disruptions. As the amount of data and storage required continues to increase, Data Center managers are looking to implement faster backup and retrieval speeds, better scalability to add more storage, and overall better flexibility and manageability.

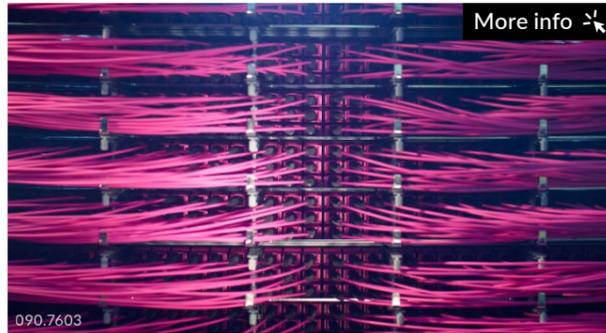
Our Storage Area Network (SAN) solutions can transmit vast data volumes between servers and storage devices with Fiber Channel. R&M supports use of QSFP optics on its Netscale platforms, including the Netscale Blade-Cabling Manager for modular switches.

Netscale 48 Netscale 72 ✦



# Discover R&M's integrated ultra-high-density platform

Click to explore the topics!



## Netscale 120

1U and 3U Netscale housings provide user-friendly, flexible ultra-high-density connectivity when combined with Netscale modules, cassettes, harnesses, trunks, and patch cords. The world's densest fiber solution offers a 67% higher density than similar systems. It provides unparalleled cable management through the Re-Cabling Manager. This ultra-high-density platform includes infrastructure management features. It also features the smallest diameter uniboot patch cable, which saves time and effort during cabling. The uniboot connector allows for push-pull operation and access from any angle. Drawers can receive modules or cassettes from both the front and rear.



## Netscale 72

This solution offers a migration path to higher-speed Ethernet for trunk cables and transition modules without increasing the footprint, this ensures versatility and future-proofs your investment. It excels in patch cable management and documentation, providing flexibility for both Base-12 and Base-8 setups.

In a compact 1U space, it achieves exceptional density with 72 ports per rack unit, supporting up to 72 MPO connections. It's adaptable to various cable types and fiber counts, even allowing splicing a 144-fiber ribbon cable onto a 12-port MPO cassette.



## Unirack2 & Fiber Easy2

Unirack2 and Fiber Easy2 19" rack patch panels feature innovative quick-mounting technology and modern lightweight construction for easy handling.



## Raceway systems

Raceway systems with their flexible and modular design provide all-round protection for optical fibers. They offer fast snap-in assembly, seamless expansion, and retrofit capabilities, reducing installation and maintenance costs. Plus, they guarantee a 30 mm bend radius.



## Netscale 48

This versatile mixed media patch panel combines copper and fiber connections in a single rack unit. It's accessible from any angle, available in 1U with 48 ports. Integrated cable management, labeling options, and high-density FO adapters are included. It supports various connectivity types, including LC, MPO, SC, E-2000™, Cat. 6, Cat. 6A, Cat. 8 for copper, and high fiber counts like SN, CS, MDC, and MPO16. The panel is also intelIphy AIM- ready, allowing for seamless expansion during operation.



## Netscale BCM

A versatile solution for both vertical and horizontal modular slots. It eliminates the need for cable routing on the side of the cabinet, thanks to pre-configured staggered cabling that matches port spacing. This allows for direct cabling paths from switches to patch panel ports, whether they are located above or below.



## Prime ODF

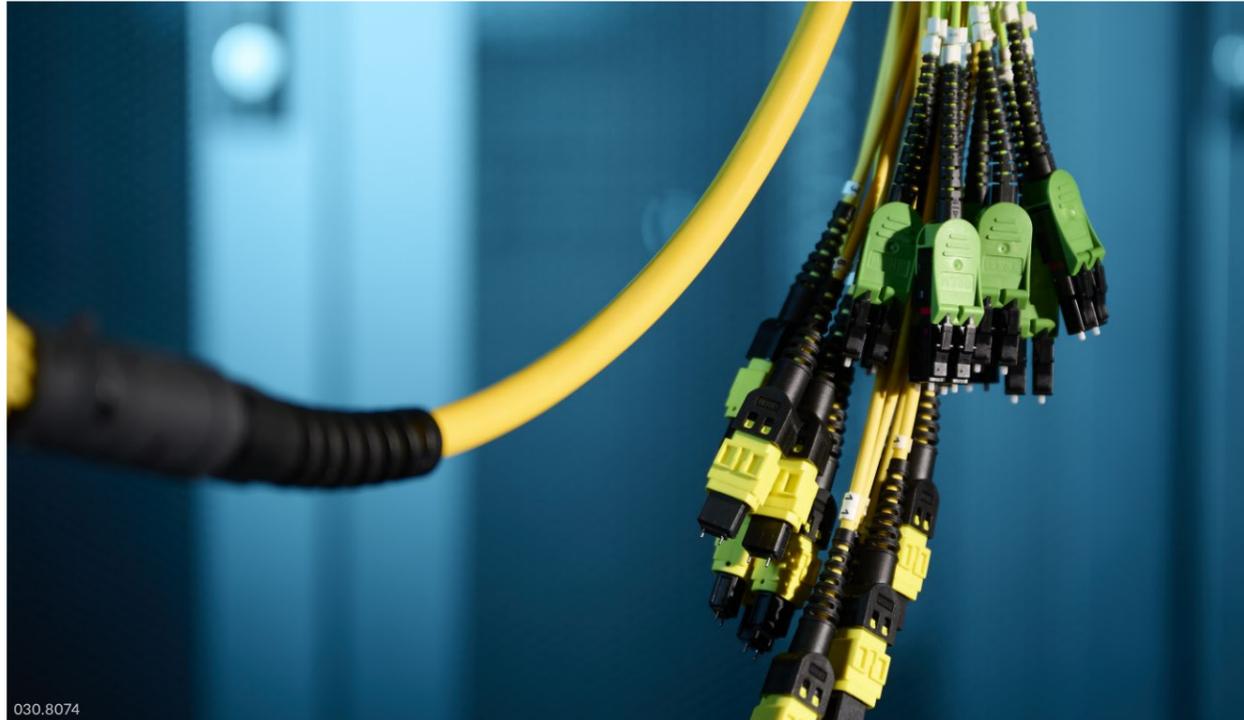
PRIME optical distribution modules are compact and versatile, ideal for tight spaces and high fiber densities. A tool-free, highly modular system for easy installation and uncomplicated migration into new or existing network infrastructures. These modules are easy to combine, extend, and swap, supporting up to 192/384 fiber connections in 3U or up to 2,688/5,376 connectors in a 2.20 m PRIME ODF rack.



## RDM-FOXS

This modular approach accommodates common LC and SC connectors across various platforms and the Single Circuit Management (SCM) system, enabling use of loose tube, blow-in, micro, and mini-cable options. It offers straightforward operation and swift assembly with minimal tool requirements, ensuring smooth and high-density fiber management on all platforms. Moreover, the connectors undergo 100% testing to ensure transmission reliability and network availability.

# Optical transmission



## Single Mode Optical Transmission

Single-mode fibers are mainly used for long-distance, high-speed communications where minimizing signal loss and dispersion is paramount. These fibers have the capability to transmit data over extensive distances, ranging from tens to hundreds of kilometers, with minimal signal degradation.

Core diameter:  
Typically, around 8-10 micrometers ( $\mu\text{m}$ )

Light source:  
Laser diode - a single wavelength of light, resulting in a narrower beam that travels in a straight line down the fiber core. Only one path is taken by the light rays. This minimizes dispersion and allows for longer transmission distances with minimal signal loss.

## Multi-Mode Optical Transmission

Suited for shorter distances where signal quality is less critical, such as short campus connections or in buildings. Multi-mode fibers are less suitable for long-haul applications because dispersion and signal loss become significant over longer distances, with minimal signal degradation.

Core diameter:  
Typically, around 50 or 62.5 micrometers ( $\mu\text{m}$ ).

Light source:  
LED or lower-cost laser diodes which emit a broader spectrum, resulting in multiple modes of light propagating through the core simultaneously. This leads to higher dispersion and modal distortion.

## **i** Pros Insights

### Parallel optics transmission

Parallel optic transmission is employed in data centers to meet the increasing demand for high-speed, high-bandwidth connectivity over short distances. This technology involves transmitting multiple optical signals (or lanes) simultaneously over multiple fibers or waveguides. Parallel optics offers several benefits:

#### High data rate

Parallel optics supports extremely high data rates, such as 40 Gbps, 100 Gbps, or even higher.

#### Short distance

Parallel optics is optimized for typical short-distance DC connections, such as links between servers, switches, and storage devices within a rack or between adjacent racks.

#### Scalability

Modular design allows easy scalability. DCs can add lanes or connections to accommodate growth without significantly reconfiguring infra-structure.

#### Low latency

Parallel optics can offer low-latency communication due to the short distances involved.

#### Aggregate bandwidth

Parallel optics can aggregate bandwidth, by transmitting multiple lanes in parallel.

#### Multiple signals

By transmitting multiple signals over individual fibers, use of resources is maximized.

#### Power efficiency

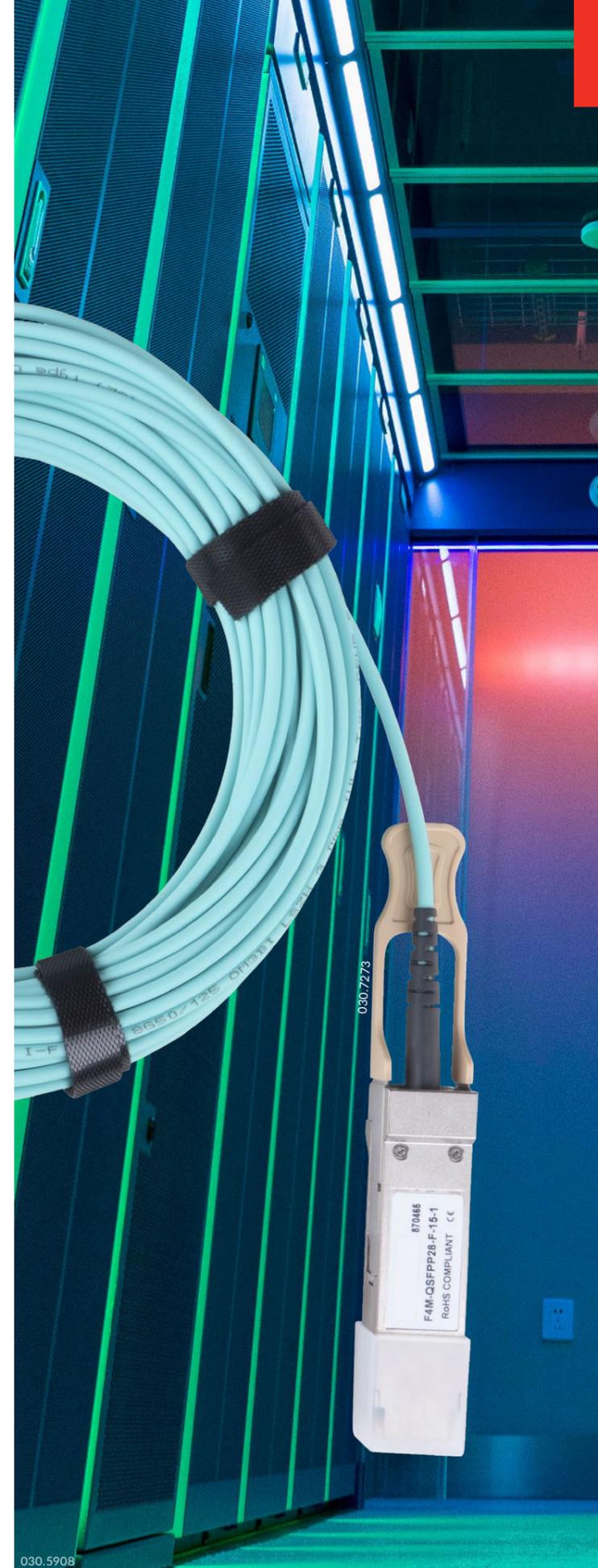
Parallel optics technology can enhance power efficiency.

#### Standardized

Standardized parallel optics form factors, such as QSFP and OSFP, are widely adopted in the industry ensuring compatibility and interoperability.

#### Various architectures

Parallel optics can be used in various data center network architectures, (spine-leaf, fat tree, hyperconverged...) supporting different connectivity needs.



# Copper connectivity

Still room for innovation

*In the DC, copper data cables, which remain robust and easier to install and terminate than fiber cables, can be used to transmit data at speeds of up to 10 or 40 Gbps.*

Copper can be used to connect servers in racks and link switches and transfer data at high bandwidths (100 Gb/s over 8 meters). For decades, multi-gigabit Ethernet over twisted-pair copper has been widely used as transport cabling for shorter runs at server, switch and top of rack layers. Partly because copper can be easily and effectively terminated on site, is cost-efficient, and requires less power and cooling. Capital savings really add up in DCs, in short links where the highest speeds aren't necessary.

What's more, copper Ethernet cabling supports Power over Ethernet (PoE). Copper can transmit data and simultaneously supply up to 100 Watts of power to devices. PoE (especially PoE+ and PoE++) is increasingly being used power a wide range of networked devices in the DC, reducing the need for separate power cables. Numerous devices in the Data Center, especially IoT-related sensors and actuators and building infrastructure components, need power and a data connection but don't require fibre-speed data transmission.



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### New PoE standards

increase power delivery by utilizing all four pairs of wires in Ethernet cables, supporting advanced devices and technologies such as advanced IoT sensors and smart lighting. Innovations in shielding techniques and materials will help ensure signal integrity and minimize EMI.

### Cat 8

offers high performance, achieving data rates of up to 25 Gbps over short distances: ideal for high-speed LANs and DCs upgrading from Cat 6<sub>A</sub> and Cat 7. Furthermore, evolutions of Cat 8, such as Cat 8.1 and Cat 8.2, are expected to provide even higher data rates and improved performance.

These standards will likely be designed to support emerging applications and technologies.



# Rack and Containment

Support for ever-growing weight and density

*Racks currently need to be designed for efficient space usage, accommodating more and more servers and networking equipment in a compact footprint.*

The focus is on cable management solutions, cooling efficiency, effective power distribution, power management, security, redundancy and monitoring and management. Load-bearing capacity needs to support the weight of increasingly dense servers, storage, and networking hardware and should be easily scalable to accommodate growth and equipment requirements.

Going forward, racks will need to accommodate even more higher-density hardware, such as GPUs, AI accelerators, and advanced liquid and air-cooling solutions that can manage heat from power-hungry equipment. Increasingly, support will be required for modular designs to accommodate changing equipment and workload demands, and edge computing. More intelligent power management options, including dynamic load balancing and granular power controls, advanced environmental monitoring, and enhanced physical security features will be required.



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## Comparing steel and aluminum solutions for data center racks

	Steel	Aluminum
<b>Strength and Durability</b>	High strength and durability, suitable for heavy equipment and high load requirements.	Less dense than steel, resulting in lower overall strength.
<b>Weight</b>	Heavier, making installation and maintenance more challenging.	Lighter and easier to handle.
<b>Cost</b>	Generally, more cost-effective.	Often more expensive due to the cost of the raw material and manufacturing processes.
<b>Thermal Conductivity</b>	Lower, advantageous in dissipating heat and preventing hotspots.	Higher, which can help in heat dissipation but might contribute to thermal conduction.
<b>Corrosion Resistance</b>	Susceptible to rust and corrosion, especially in high humidity or exposure to moisture.	Better corrosion resistance.
<b>Customization and Design</b>	More design customization options due to ease of fabrication and welding.	More challenging to weld, may have limitations in terms of design complexity.
<b>Electrical Interference (EMI) Shielding</b>	Better EMI shielding due to high magnetic permeability.	Lower magnetic permeability, may offer less effective EMI shielding.

# Cabinet, infrastructure housing and containment solutions

## Freenet 19" cabinets with 1200 kg load capacity

Save space, time and resources while enjoying maximum flexibility.

Our heavy-duty, modular cabinet design opens up countless possibilities in data centers. Cabinets need to be easily customizable to specific user needs. Our extensive range of accessories offers all you need to optimally equip your Freenet cabinet system. From cable management solutions to storage compartments and fans - we have the right accessories to optimize your cabinet for your individual requirements. Your equipment is optimally cooled - our cabinets accommodate all commonly used ventilation systems.

- 1 Specially designed for heavy loads with 800 kg to 1200 kg load capacity.
- 2 Comprehensive modularity for low logistics and storage costs
- 3 Effortlessly expand functionality with easy customization.
- 4 Prepared for built-in fans and cooling units with closed loop/open loop architecture
- 5 Easily retrofittable
- 6 Available as a flatpack version: easy to transport and assemble on site.
- 7 Optimal heat dissipation

[More info](#)



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Height  
42U to 48U

Width  
600 to 800mm

Depth  
800/100/1200mm

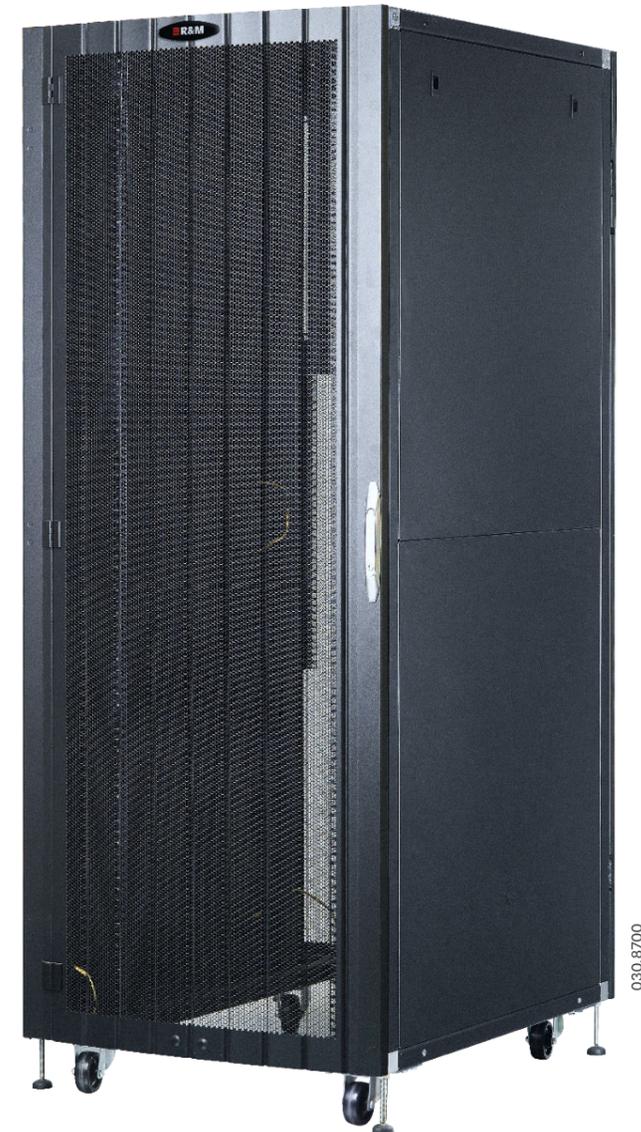
## BladeShelter Data Center Technologies

The modular data center infrastructure platform for low-energy consumption datacenters with high thermal loads

BladeShelter combines R&M's DC equipment experience with R&M Tecnosteel's design know-how.

Innovative enclosure design contributes to efficient cooling by strictly separating and optimally conditioning hot and cold air streams. BladeShelter makes it easy to plan, install and operate tailor made, flexible DC infrastructures while saving costs and energy. The program offers energy-efficient in-row cooling systems and scalable blade cooling modules. They are designed for high heat loads up to 42 kW.

- 1 Proven 19" cabinets
- 2 Enclosures for hot and cold aisles
- 3 Complete cubes for computer rooms
- 4 Expand with R&M DCIM, fiber connectivity and HD patch panels / distribution frames
- 5 Cabinets with loads up to 2000 kg



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Intelligent PDU



Sensors



Monitoring systems



Air conditioning



Access control



Smoke control



Top-of-rack power distribution



Cable ducts

[More info](#)

# Cooling

Aligning with sustainability goals

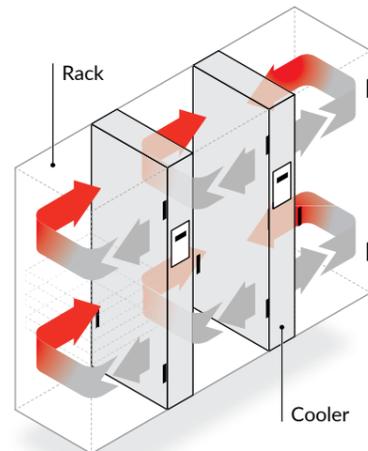
*Today's DC cooling solutions need to optimize airflow patterns to ensure even distribution of cool air to IT equipment and effective removal of hot air.*

Hot and cold aisle containment strategies help isolate hot and cold airflows. Precision air conditioning provides targeted cooling to specific areas, minimizing energy wastage and ensuring temperature control. Other key requirements include options for lowering energy usage, for example with varispeed fans, real-time monitoring and analytics to optimize cooling, prevent issues, and support backup strategies.

Cooling systems increasingly require real-time monitoring and analytics to optimize performance, detect anomalies, and reduce power consumption.

Solutions will continue to focus on innovative technologies, efficient heat removal, intelligent management, and sustainability. Granular temperature and humidity data from sensors will enable more precise cooling control. AI and machine learning algorithms, passive cooling, hybrid cooling, and liquid solutions, such as direct-to-chip and immersion cooling, are becoming more important to managing heat generated by high-performance computing and GPUs. Cooling solutions will also need to address the unique challenges of modular, edge, and hyperscale data centers.

Increasingly, liquid cooling solutions, IoT, and AI and machine learning optimized cooling will be required to manage high-performance computing heat. Further areas of interest are solutions tailored for edge DCs, scalable modular cooling, and heat recycling.



↑ (Fig.1) Row cooling closed loop example



030.7914

# Power solutions

Smarter all the time

DCs require significant power. Voltage is transferred from the grid using cabling designed to minimize heat and maximize power distribution. DCs should have sufficient redundancy to continue service uninterrupted when power fails.

Securing uninterrupted power supply in a DC involves a combination of strategies and technologies, including Uninterruptible Power Systems (UPS) with backup batteries, Static Transfer Switches (STS), redundant power, backup generators and other solutions. DCIM can monitor power usage, track equipment status, and predict issues. Advanced battery monitoring systems

are becoming increasingly important to track UPS battery health and anticipate replacements. Energy storage technologies, such as lithium-ion batteries, are being explored to enhance UPS capabilities and extend runtime. Intelligent PDUs are increasingly used to monitor power consumption, distribute loads evenly, and prevent overloading.



## Power Distribution Units (PDUs)

Intelligent PDUs provide comprehensive power consumption monitoring, uniform load distribution, and prevent overload issues.



## Uninterruptible Power Systems (UPS)

Ensure uninterrupted power during outages by providing sufficient capacity, conducting regular tests, and offering redundancy options like N+1 or 2N configurations for seamless power continuity.



## Static Transfer Switches (STS)

STS enables seamless switching between power sources like UPS, utility, or generators, with dual-path options for enhanced redundancy and failover.



## Data Center Infrastructure Management (DCIM)

DCIM software monitors power usage, equipment status, and predicts issues to ensure uninterrupted data center operations during power disruptions.



## Redundant Power Sources

Connecting multiple power sources enhances data center equipment reliability, especially when using feeds from different substations or utilities to mitigate simultaneous failure risks.



## General Backup

Generators can deliver prolonged power support during extended outages. Regular maintenance and testing are vital to ensuring consistent operational readiness of generators.



## Battery Monitoring

Advanced battery monitoring systems track UPS batteries' health and help anticipate timely replacements.



## Energy Storage Solutions

Energy storage technologies, such as lithium-ion batteries, bolster UPS capabilities and extend operational runtime.



### Pros Insights

#### Lead-Acid Batteries vs Lithium-Ion Batteries

Pros	Cons
+ Cost-effective	- Heavy and bulky
+ Widely available	- Limited Cycle Life means reduced overall lifespan
+ Fairly simple maintenance, including periodic electrolyte level checks and voltage adjustments	- Slower charging rates
+ Withstand deep discharges without major damage - suitable for applications requiring deep cycling	- Lower energy density: less energy stored per unit of weight or volume.
+ Familiar technology makes it easier for technicians to work with and diagnose issues	- Toxic materials pose environmental and health risks if not properly managed and recycled

#### Lithium-Ion Batteries vs Lead-Acid Batteries

Pros	Cons
+ High Energy Density: more energy stored in a smaller and lighter package	- Generally, more expensive upfront compared to lead-acid batteries
+ Long Cycle Life: longer lifespan with a higher number of charge-discharge cycles	- More complex management systems to prevent overcharging, over-discharging, and thermal runaway
+ Lightweight and Compact, making them suitable for portable electronics and applications	- Can be prone to overheating, swelling, or catching fire under certain conditions
+ Fast Charging: less downtime and improved user convenience	- Lower energy density: less energy stored per unit of weight or volume.
+ Low Self-Discharge rate: charge retained for longer periods when not in use	- Environmental concerns: require careful disposal and recycling
+ Usable in wide range of applications: consumer electronics, electric vehicles, renewable energy systems etc.	

## PDU

A Power Distribution Unit (PDU) in the DC plays a critical role in distributing electrical power to servers, networking hardware, and other equipment. Selecting the right PDU can be critical for efficient DC operation, manageability, and scalability.

There are several 'must haves' and nice-to-haves' when it comes to choosing a PDU for your DC. Build quality, remote monitoring, and regulatory compliance are essential. If your specific DC application requires it, it is worth investing in temperature, humidity, and airflow sensors. If additional redundancy is required, automatic failover and dual power inputs are recommended. Monitoring and switching capabilities can also bring significant advantages.

### R&M ActiPower 4.0 rack power distribution unit (PDU)

Designed to meet the needs of demanding data center and computer rooms worldwide. ActiPower offers you the industry's smartest, highest availability power monitoring distribution Unit.

- 1 Patented IEX socket allows full PDU usage all the time.
- 2 Less downtime due to hot-swappable communication card
- 3 Up to 70% energy saving with bi-stable latching relays
- 4 Easy maintenance: outlet offers any combination of C13/ C19
- 5 Redundant access thanks to two 1GB Ethernet ports
- 6 Highest security 256-bit AES encryption, Radius, SNMP v3, user permissions, SSHv2, SSL, HTTPS
- 7 Safe and reliable operation up to 60°C

[More info](#)



#### Good to know:

The patented IEX socket (with IEC/EN and UL safety certifications) can hold C14 and C20 plugs, for maximum flexibility. IEXv.5 PDU is manufactured with the most advanced hot-swap, field replaceable SNMP IP controller. It has two 1 Gigabit Ethernet ports, a full color OLED screen, cascading multi-sensor ports, enhanced security, sophisticated alarming and power monitoring across the whole power chain. Its highly reliable hydraulic-magnetic circuit breakers are not affected by ambient temperature and support delay curves appropriate for IT-equipment.

## UPS

*An Uninterruptible Power Supply (UPS) is a critical component, providing stable, reliable power to data center equipment, even in the event of power outages or main power supply fluctuations.*

Its main function is to ensure that servers, networking devices, and other critical DC infrastructure receive continuous power to operate without interruption, thus preventing data loss, system crashes, and downtime.

UPS systems typically clean and condition incoming power from the main utility source, filtering out noise, voltage spikes, sags, and other irregularities that could potentially damage sensitive equipment, and are equipped with batteries that store electrical energy.

### **NETYS RT**

This single-phase UPS series provides complete rack or tower protection for IT systems such as servers and networking devices, structured cabling systems, control systems, switching, and edge solutions. NETYS RT is easy to set up - no configuration is required upon initial launch.

- 1 Switchovers to battery mode are intelligently minimized
- 2 Full performance is maintained up to 40 °C
- 3 Range of communication protocols
- 4 IoT ready device for access to connected services.
- 5 Hot-swappable modular battery extension
- 6 Fast recharge - even for very long back-up time
- 7 Li-Ion battery technology ready



A Static Transfer Switch (STS) is a solid-state device that allows instantaneous transfer of electrical loads between two power sources. If one source fails, the load is quickly switched to a secondary source to minimize downtime.

An STS can ensure that DC operations remain uninterrupted. This is crucial for maintaining a high level of service availability. It can help with everything from energy efficiency to regulatory compliance and increasing redundancy. In instances of fluctuations in power quality, such as voltage dips and peaks, it can switch sources, making operations more resilient.

### STATYS XS

The Statys XS (Automatic Transfer System) features two independent power supply circuits supplying power to the load. In the event of a power failure in the main circuit, the Statys XS automatically switches to the other circuit to supply power to the load. The system automatically switches back to the main circuit after power is restored.

- 1 Competitive single-corded alternative to redundant power supply
- 2 Fast transfer time without source overlapping
- 3 Compact enclosure saves valuable rack space
- 4 Easy and quick connection of loads via multiple IEC 320 outlets
- 5 Hot-swappable extraction and replacement of control / power unit
- 6 Easy to use from front panel
- 7 Remote management via LAN (snMp) & Real-time monitoring (Rs485).



#### Good to know:

Particular care must be taken in choosing the right STS - especially in the transition period between using UPS standard IEC 62040 and the proper standard IEC 62310. Thanks to performance definition and safety devices, such as backfeed protection, an IEC 62310 compliant STS ensures operation reliability and protection.

# Fire protection

Increasingly proactive approaches

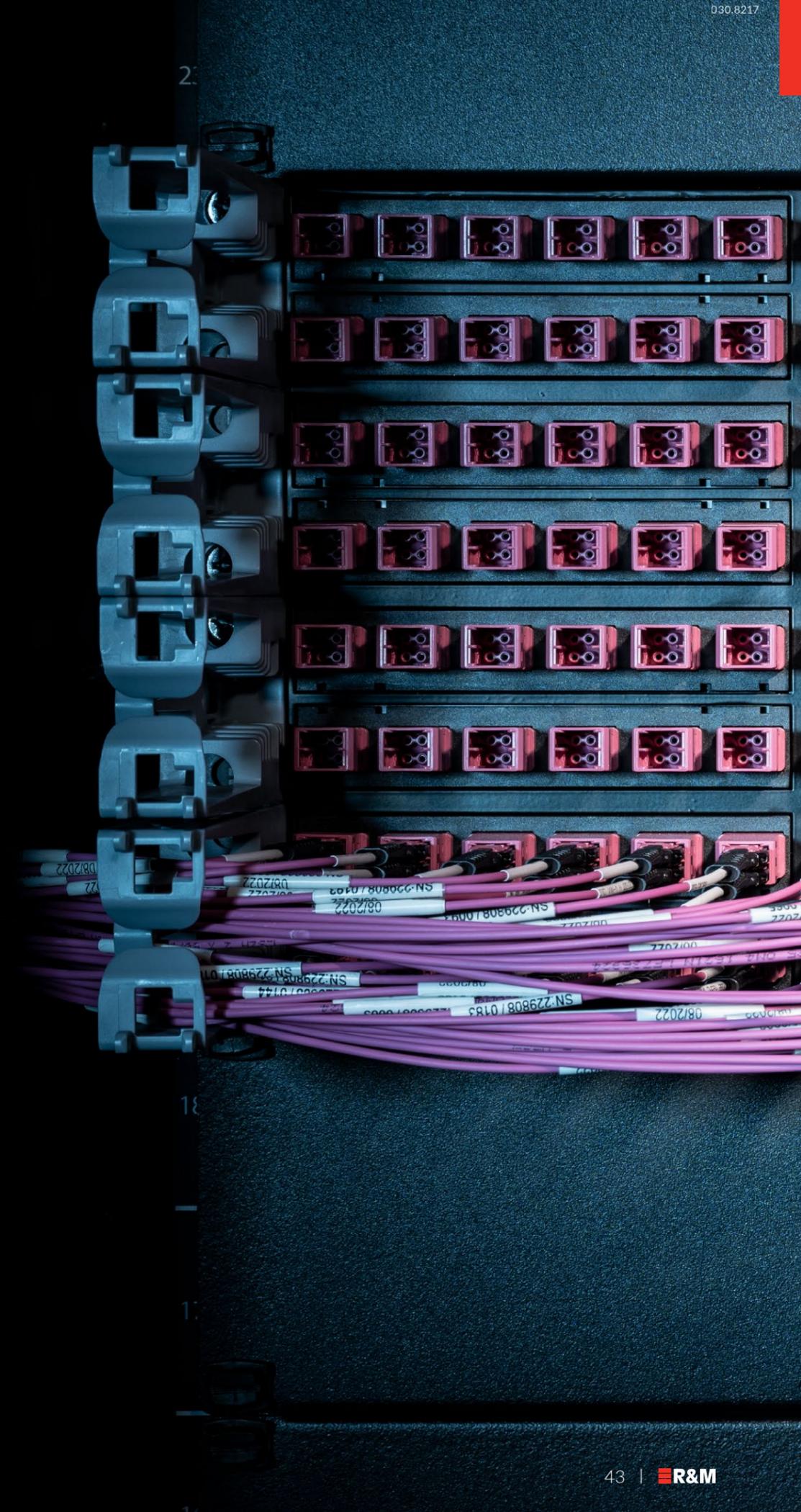
*Fire risk in DCs is a significant concern due to the potentially devastating impact on operations, data integrity, and equipment.*

Even if data is backed up remotely, the time it takes to restore systems can result in data being temporarily unavailable - a huge issue for real-time services and databases.

In safeguarding data centers against fire risks, different strategies and technologies are essential. As part of a fully integrated approach, DCs require advanced fire detection systems, automatic fire suppression systems, redundant fire protection systems, emergency response plans and procedures, training and drills. Fire-resistant barriers and walls preventing fire spread between zones and protect critical infrastructure.

Fire-resistant coatings protect structural elements and cable pathways. Tight integration with building management systems facilitates coordinated responses to fire incidents.

Fire detection systems will increasingly incorporate advanced technologies such as AI, thermal imaging, IoT, video analytics, and remote monitoring and control for more accurate and early detection. Data analytics can help predict fire risks, enabling even more efficient proactive prevention measures.



# Fire protection

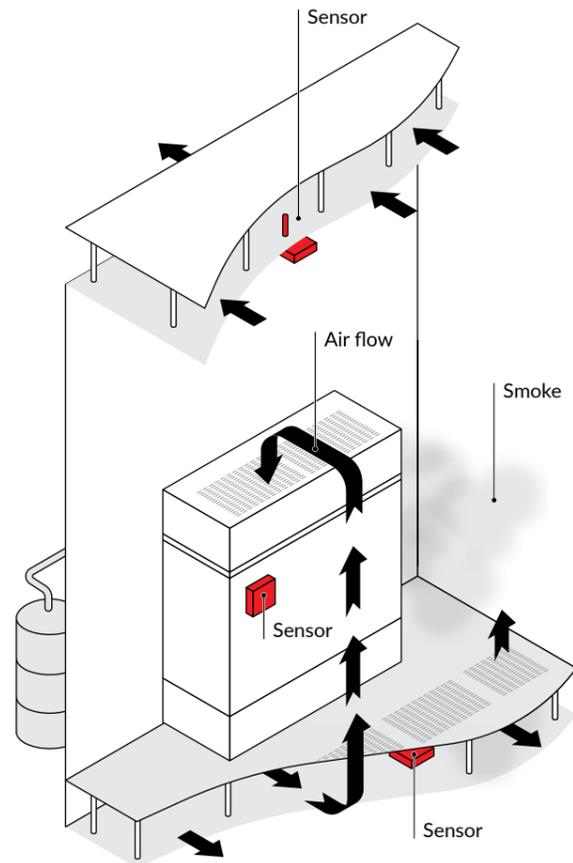
Mitigating risk of harm to the installed base

Fire detection in a data center is critical to ensuring the safety of both equipment and personnel. It is also essential for minimizing downtime and potential damage to critical business operations. Redundant detection methods and alert systems should be in place to avoid a 'single point of failure'. The earlier a fire is detected in the DC, the greater the opportunity to prevent damage.

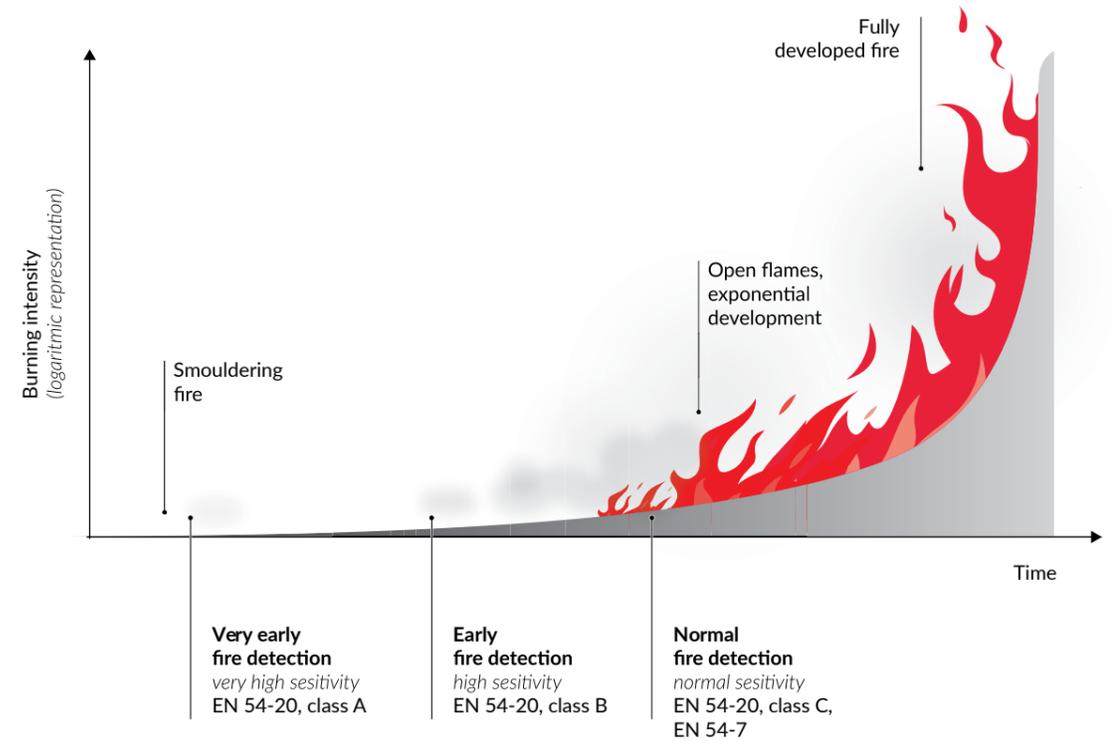
However, several factors can make timely detection harder, or increase the level of risk. Large numbers of electrical components can lead to overvoltage, short circuits, leakage currents, arcs and high heat radiation. If there is insufficient ventilation, consequences can be serious. Infrastructure and materials (such as plastics)

can also introduce risk. Also, if a great deal of cooling is needed as a result of material or infrastructure choices, it can be harder to detect fire or find the causes. Human error, bad handling, poor maintenance and defective installations or equipment introduce further risk.

Different types of sensors (such as smoke detectors, heat detectors or sprinkler systems) each need to detect fire at different times and at different stages. Coordination is vital. Placement of the detection solution in the data center is also relevant. The better they are positioned - in the middle of the normal air flow - the earlier they can identify changes.



↑ Intelligent smoke detectors



## Pros Insights

### Benefits of fog-based fire suppression

Fog-based solutions rely on a fine mist of water droplets or water-based solutions to extinguish fires. Mist is created by forcing water through nozzles or generators, producing small droplets that quickly evaporate. This process cools the surrounding area and displaces oxygen, effectively and rapidly suppressing fire.

This approach can be tailored to specific DC layouts and requirements and brings several additional benefits, such as minimal water damage and corrosion risk, no residue and cleanup, and lower environmental impact than gas-based solutions. Quick reset means faster restoration of DC operations. Fog-based fire suppression uses less water than traditional systems, can be integrated with other fire detection and suppression systems, and is safe for people.

By mitigating the drawbacks of gas and water-based methods, fog-based systems emerge as a compelling choice for data center fire extinguishing. In environments where safeguarding critical equipment and data is paramount, fog technology proves its prowess.

### Good to know:

In safeguarding data centers against fire risks, different strategies and technologies are essential.

# Data Center Infrastructure Management

Today and tomorrow's requirements

*As DCs connect more hardware, monitoring operational aspects of servers, switches, cooling, power equipment and other linked IT hardware becomes harder.*

## Challenges

DCs face the challenge of maintaining extremely high levels of availability, whilst significantly improving efficiencies and lowering costs. DCIM plays a vital role in this. DCIM systems are indispensable for providing real-time monitoring and visualizations of critical infrastructure, including power, temperature, humidity, and airflow. IT and non-IT assets, including servers, switches, cables, and physical spaces, can be tracked efficiently for efficient management and maintenance.

Space, power, and cooling resources can be optimized with capacity planning tools. Monitoring and analyzing energy consumption and efficiency help data centers identify opportunities to reduce power usage and operational costs. DCIM systems can predict potential issues, enabling proactive maintenance and minimizing downtime. Robust change management features ensure accurate documentation and compliance.

## Developing requirements for DCIM Solutions

DCIM solutions will be pivotal in further optimizing data center operations, improving efficiency, and ensuring availability of critical IT services in a changing technology landscape. As more functionality is moved to the cloud, we're seeing more cloud based DCIM systems appearing. Increasingly, a key driver for DCIM is the need for information to forecast capacity requirements. DCIM solutions need to accommodate the unique challenges of edge computing, such as remote locations, limited space, and varying environmental conditions.

AI will play a significant role in analyzing data patterns and providing actionable insights for predictive maintenance, performance optimization and sustainability. Integrating IoT sensors will provide more granular data for enhanced monitoring and control. Advanced algorithms can automate resource allocation, cooling, and workload placement for optimal efficiency. Digital twin technology can be used to create virtual replicas of the physical infrastructure for testing scenarios and optimizing operations.

# The most up-to-date Data Center infrastructure and DCIM available today

## **i** Pros Insights

*R&M's network infrastructure solutions build tomorrow's data centers of through manageability, scalability, and flexibility. We support you with extensive knowledge and know-how of centrally managed physical infrastructure and high-performance network cables. Our experience working closely with companies around the world gives us a first-hand understanding of your DCs complexities. At present, we see three key drivers affecting data center design and requirements.*



## Data volumes

Global data is expected to surpass 180 zettabytes by 2025, with 127 new internet-connected devices added every second, potentially generating 79.4 zettabytes of data by 2025. This surge in devices poses scalability challenges for data center operators, necessitating more servers, space, connections, power, cooling, and redundancy management, calling for scalable solutions across all aspects of data centers.



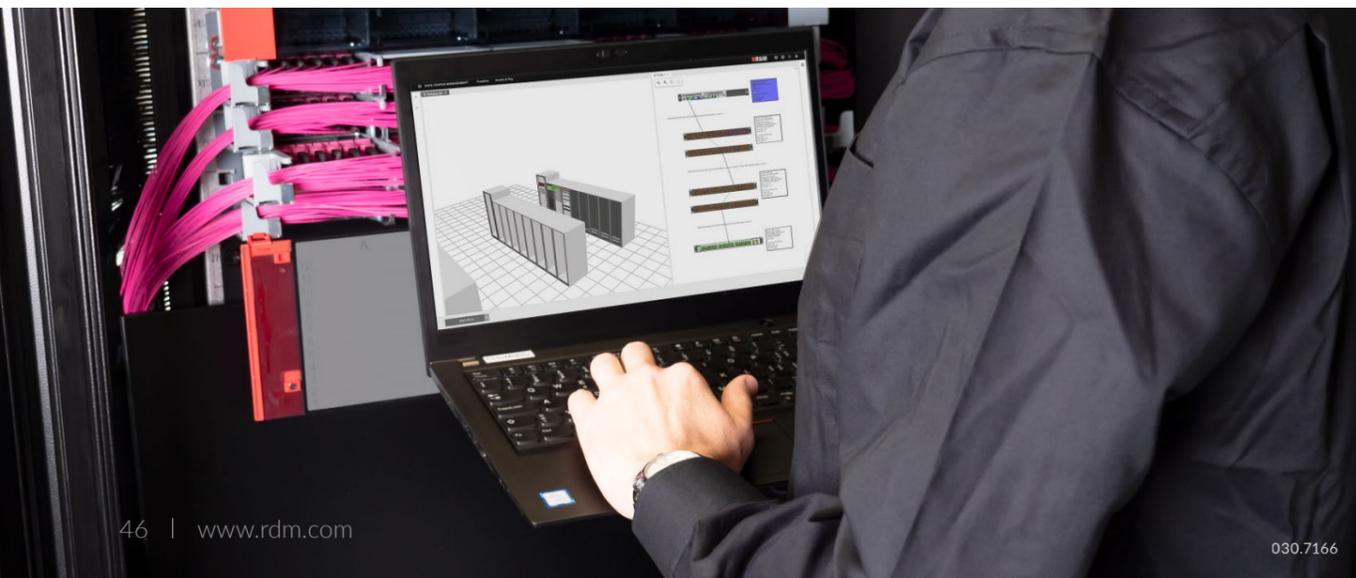
## Speed

'Traditional' 400G data centers are insufficient for modern applications such as Hyperscale, edge, and cloud facilities. DCs have been upgrading from lower Ethernet speeds (e.g., 10 Gbps) to faster options like 800 Gbps, often using two separate wavelengths to achieve 1.6 terabits of capacity. This shift is facilitated by single-mode and multimode fibers, along with modulation advancements, enabling higher data rates over longer distances. Concurrently, improved CPU technology enhances computational capabilities within data centers.



## Distance

The growing adoption of high-speed networking technologies has led data centers to employ shorter cable lengths for intra-rack and intra-row connections, preserving signal integrity and minimizing latency, particularly for high-performance computing and applications. As data centers deploy faster switches and servers, optical breakout cables have seen increased use. Additionally, higher-density switches and patch panels, which offer more ports in a compact space, demand thoughtful cable management and routing strategies.



# DCIM

*R&M inteliPhy net is an easy-to-operate DCIM solution for asset, capacity and change management. Users organize and document the entire network infrastructure digitally.*

### **inteliPhy net 4.0: a transparent software solution for centralized DCIM**

The program bundles and visualizes all information on capacities, cabling, patch panels, racks, PDUs and IT equipment in a single database. Component representations can be added and moved by dragging and dropping. Together with RFID-based monitoring system R&M inteliPhy, the program monitors all ports and patch cords in real time. Network managers can ensure they are utilizing resources and satisfying quality, compliance and service requirements. Areas of application include colocation, edge and enterprise data centers.

Furthermore, users can create their own metamodels with inteliPhy net 4.0. A metamodel can represent a pre-configured device with various plug-in cards or a completely assembled and wired cabinet. One simple step is all it takes to integrate a complete metamodel into an existing data center. Time-consuming construction of cabinets from individual components is no longer necessary.

inteliPhy net 4.0 contains tools with which Optical Distribution Frames (ODF) can be configured and visualized. This function is suitable for planning the setup of 19" and ETSI-based meet-me rooms. The software inventories the IT equipment and applications. A powerful global search function for quickly finding specific devices rounds out the feature set of inteliPhy net 4.0, optimized both in terms of performance and ease of use.



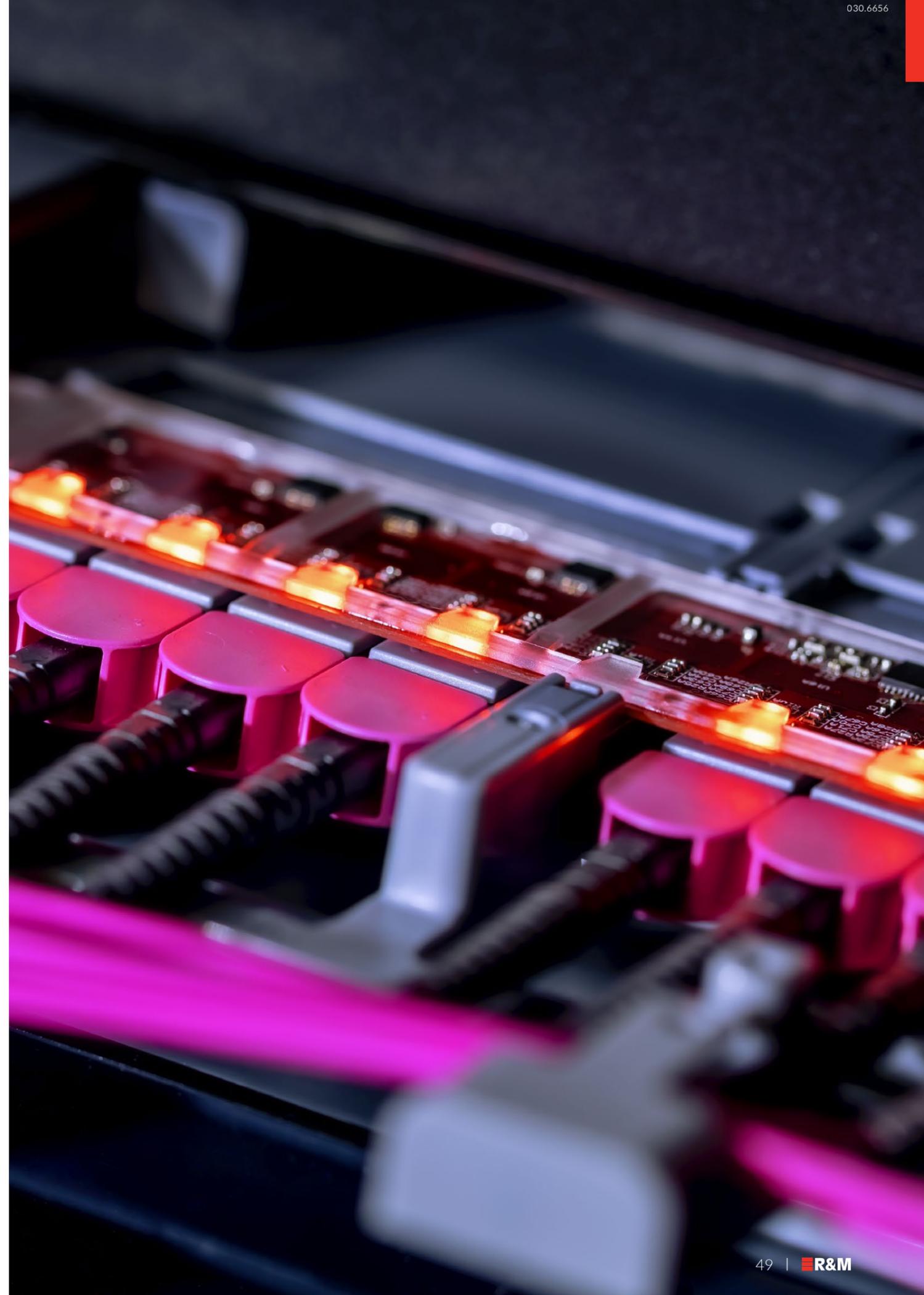
[More info](#) ↗

#### **Good to know**

The software is used to plan maintenance work or MAC processes, create reports, and complete audits. inteliPhy net 4.0 generates work orders, distributes them, and monitors their execution.

#### **Works great with**

[Netscale 48](#) [Netscale 72](#) [Netscale 120](#)



# Appendix

## Network topologies

### Spine-leaf architecture

Spine-leaf architecture (or Clos architecture) is a popular design approach to building modern DC networks. It provides a scalable and efficient way to handle increasing data traffic and ensure low-latency connectivity. In a spine-leaf architecture, devices are organized into two layers: the spine layer and the leaf layer. Each leaf switch is connected to every spine switch, creating a non-blocking, high-bandwidth network topology.

Spine-leaf architecture offers a robust, adaptable network foundation for data centers, providing the performance, scalability, and reliability needed to meet the demands of today and tomorrow.



#### Reduces latency

The minimized number of packet hops reduces latency and improves application performance.



#### Scalable

Highly scalable design allows easy addition of devices, racks, or pods without affecting performance.



#### High bandwidth

High Bandwidth between devices ensures efficient communication even in high-traffic scenarios.



#### Network performance

Predictable and consistent network performance thanks to a non-blocking design.



#### Built-in redundancy

Built-in redundancy and resilience ensure network failures do not disrupt overall connectivity.



#### Simplified management

Changes can be localized to specific parts of the network.



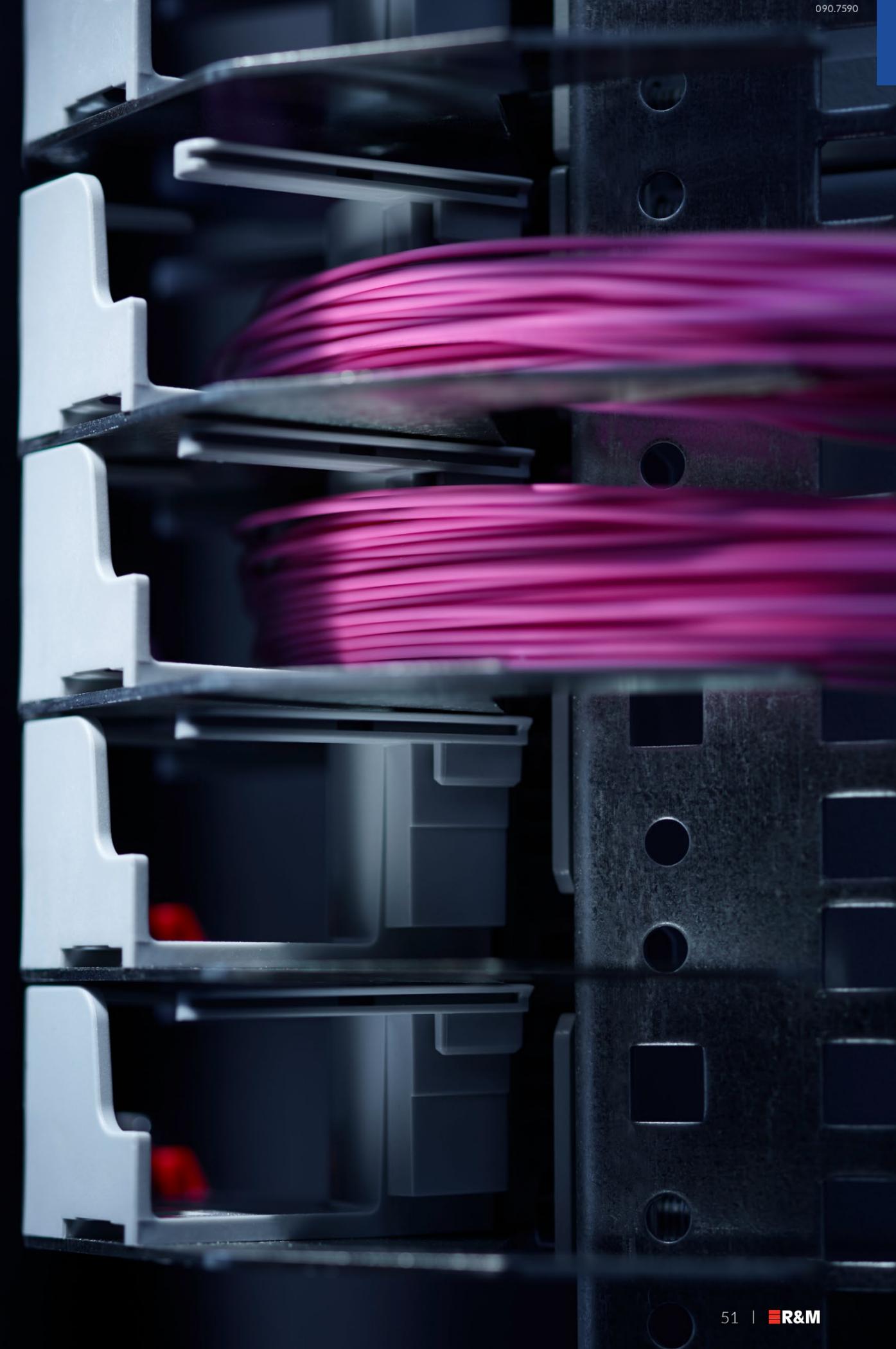
#### Virtualization tech

Support for virtualization technologies, to meet demands of current applications and virtual workloads.

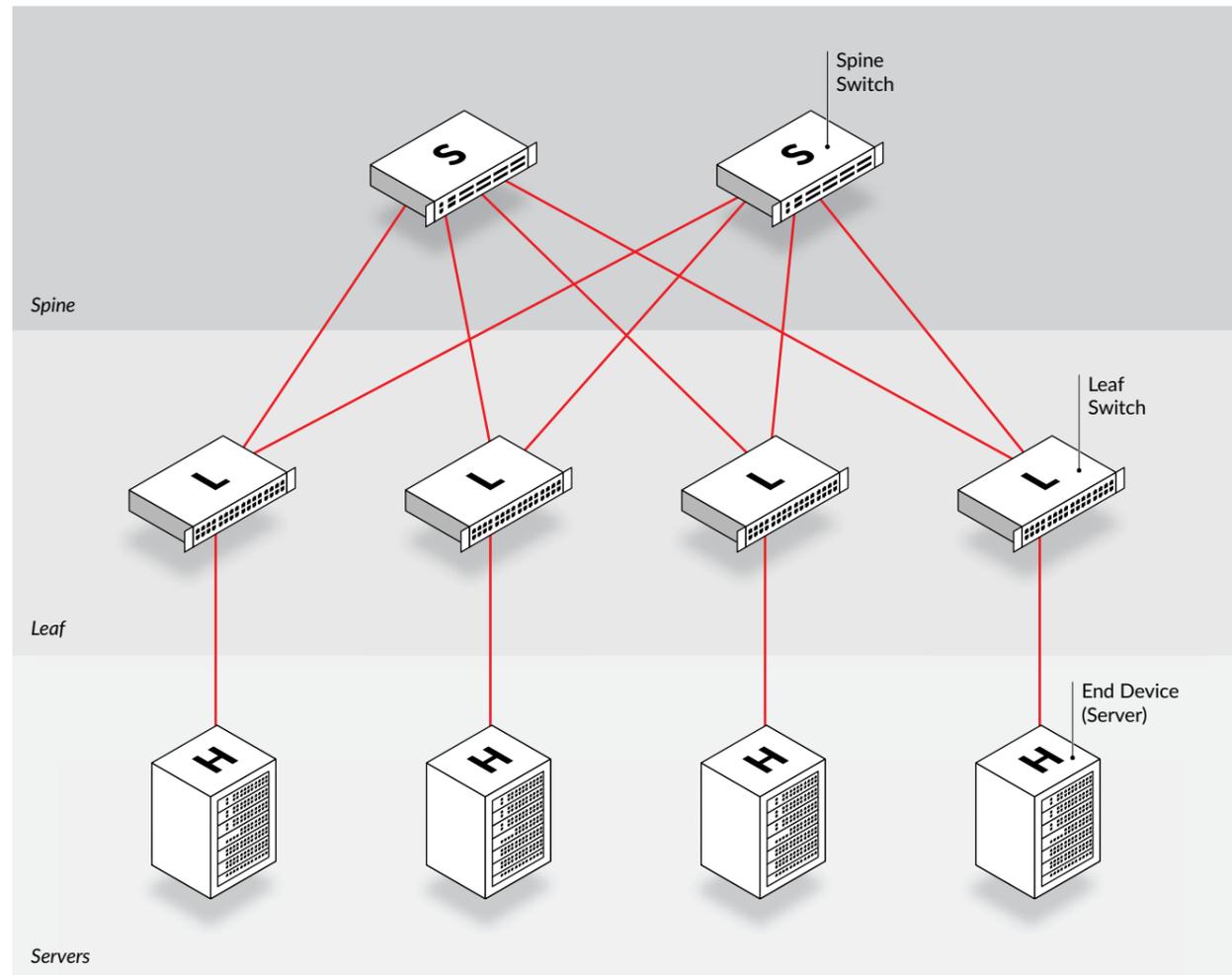


#### Flexibility

Various spine-leaf configurations allow customization to fit different data center sizes, requirements, and growth plans.



## Traditional Spine-Leaf



↑ Each leaf switch connects to every spine switch, forming a fully meshed network.

### Low-latency

Predictable, low-latency performance (traffic routed through a minimal number of hops)

### Scalability

Devices or racks can be added without disrupting the overall network

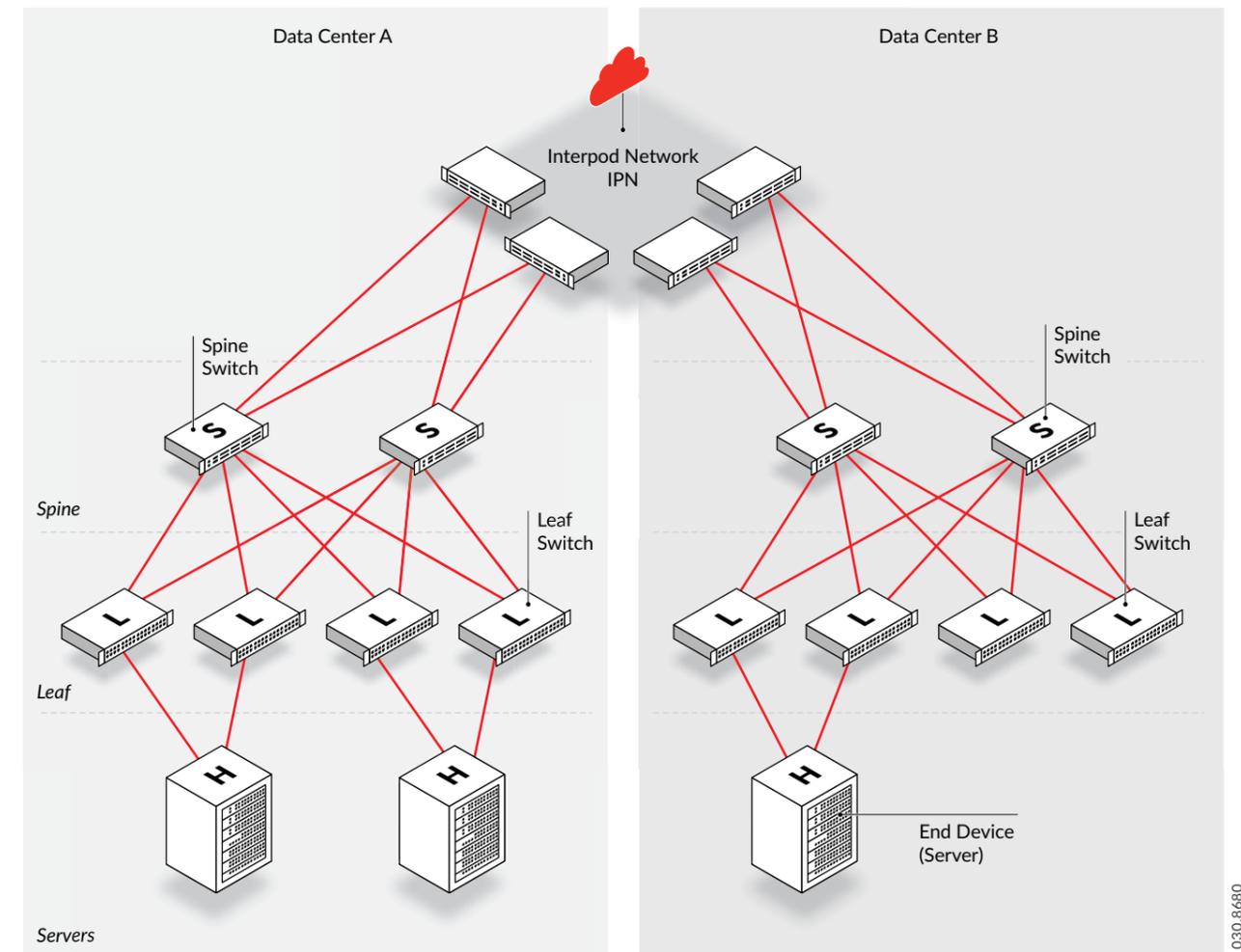
### High bandwidth

High bandwidth between any two devices, as there are multiple paths available

### Resilience

failures in one part of the network do not affect functioning of the entire network

## Multi-Pod Spine-Leaf



↑ Multiple spine-leaf clusters (pods) are interconnected to create a larger DC network.

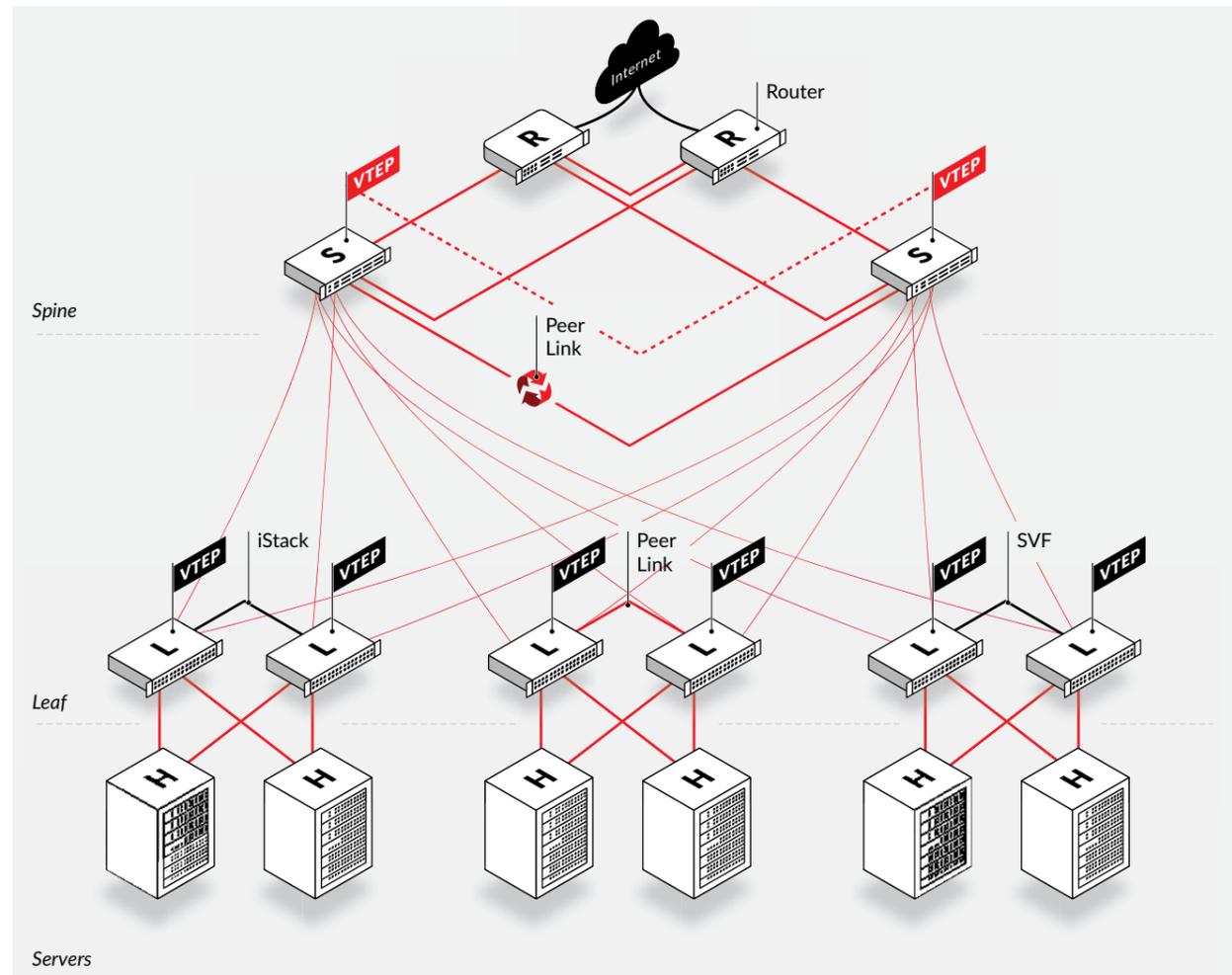
### Enhanced scalability

DCs can scale horizontally by adding more pods as needed.

### Better redundancy

Better redundancy and disaster recovery as pods can be deployed in different physical locations

## Centralized Spine-Leaf



↑ A central spine layer connects multiple leaf layers, often used for smaller-scale deployments.

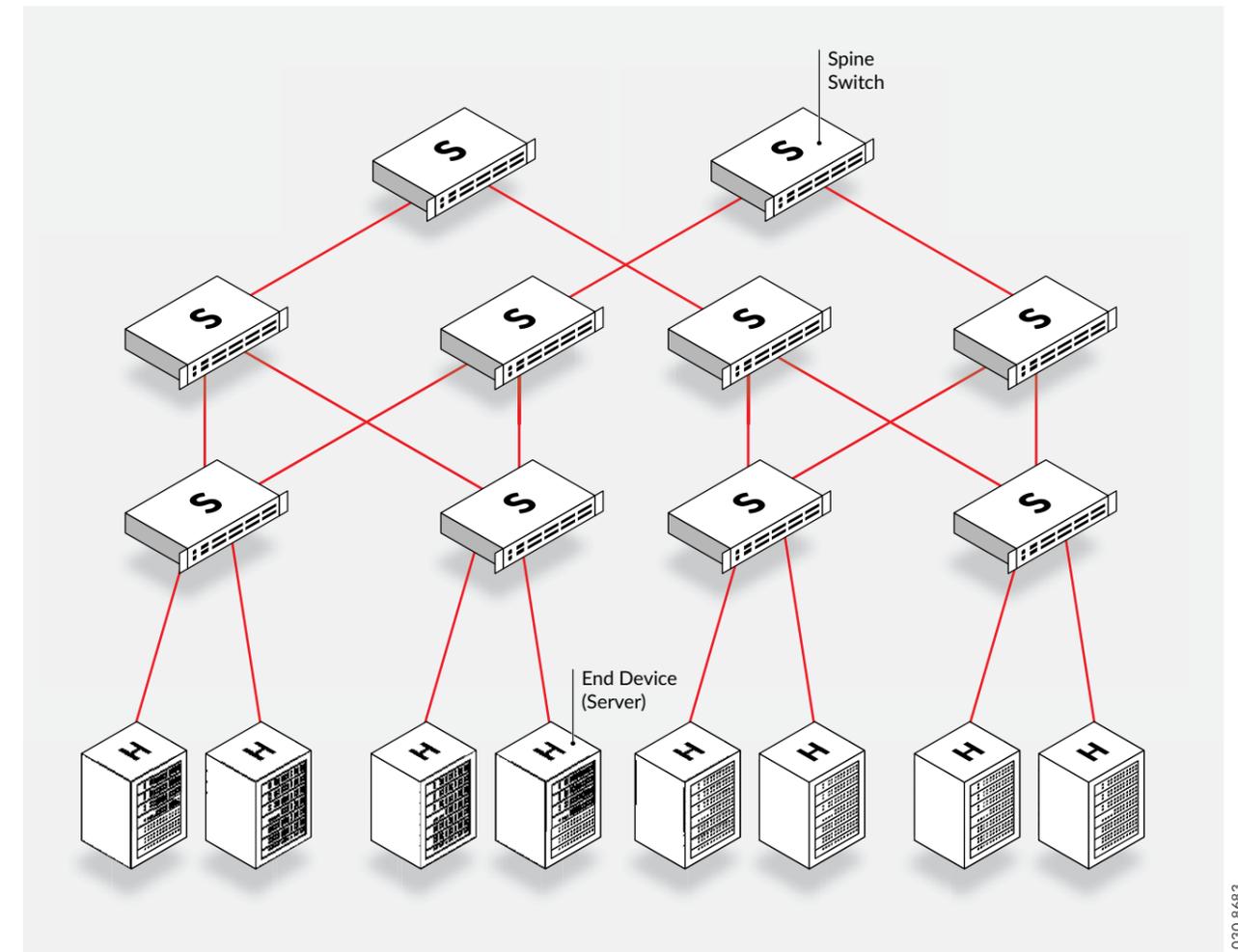
### Simplified management

Easier to manage and monitor in smaller data center environments.

### Cost-effective

Cost-effective for smaller deployments while still providing good scalability.

## Fat Tree Spine-Leaf



↑ Extending the spine-leaf concept into a fat-tree topology adds redundancy and scalability.

### Enhanced scalability

Multiple paths between devices improves network resiliency.

### Improved scalability

This approach allows for further expansion and more devices.

# Selecting copper DC cabling today

## Remote Power Categories

ISO/IEC 14763-2 and EN 50174-2 cabling standards have been extended to include Remote Power supply categories RP1, RP2 and RP3. These new categories define requirements prior to installation and after commissioning to keep cabling and PoE running safely. The RP category is determined by the maximum allowable average DC current in a cable bundle - the higher the rating, the higher the permissible current. Complying with the 'Remote Power' (RP) categories is of great importance for fulfilling warranties and preventing expensive, time-consuming equipment replacements and repairs.

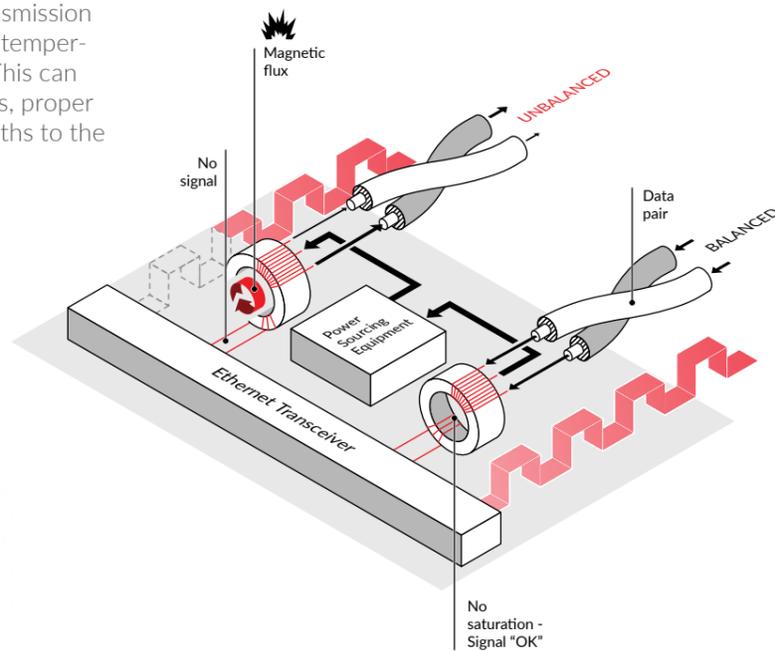
According to ISO/IEC 14763-2, an RP category must be specified for each installation. Planning and product selection must support that category. Each cable in a bundle must be able to fully support the highest PoE level. Assurance that the cable bundle will not overheat is essential to category RP3 compliance. With RP3, cabling is setup during the planning phase, so that all cables can transmit the maximum PoE current simultaneously. This makes the system very safe. In RP3 cabling, the attenuation budget for data transmission should always be respected and permissible temperature in the cable should not be exceeded. This can be achieved in part by managing bundle sizes, proper component selection, and adjusting link lengths to the installation.

### **i** Pros Insights

## Resistance Unbalance Testing

One challenge PoE introduces is the issue of resistance unbalance. In a PoE system, power is transmitted over a minimum of two pairs of wires in an Ethernet cable. However, if there is an imbalance in the resistance between wires in a pair, or between pairs, unequal current distribution may occur in the baluns\* of the Ethernet transceivers and, as a result, saturation effects in the ferrite cores of the balun can lead to disruption of the data transmission. Consequently, when using remote power supply (PoE), resistance symmetry is an absolute precondition. It is, therefore, vital to measure this and ensure it remains stable throughout every channel, end to end.

Resistance unbalance in cables may increase heat generated in a cable and invalidate RP3 certification. Therefore, thermal stress can only be managed if this resistance imbalance is kept to a minimum. Although ISO 11801-1 (6.3.3.7. Direct current resistance unbalance) defines maximum resistance unbalance figures, it does not require this element to be tested.



↑ Magnetic saturation effects in the balluns

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# Next steps for copper cabling

### **i** Pros Insights

Cat 8.1 and Cat 8.2 cabling solutions deliver higher data rates and enhanced performance to accommodate the demands of emerging applications and technologies. In response to diverse connectivity needs within data centers and networks, hybrid cabling solutions seamlessly blend copper and fiber optics, providing the necessary flexibility.

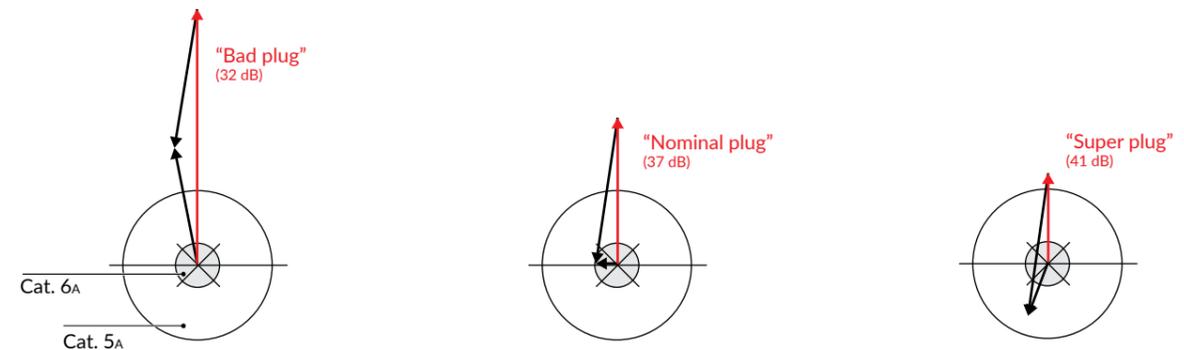
Additionally, as data rates rise and electromagnetic interference challenges become more prevalent, advanced grounding practices, including precision grounding and bonding techniques, are essential to ensure unwavering reliability in network infrastructure.

Cat 6<sub>A</sub> cabling is designed to support higher data rates and bandwidths than Cat 6, making it suitable for applications such as 10GBASE-T Ethernet and beyond. Cat 6 compensation schemes aim to mitigate effects interference that can occur at higher frequencies (such as signal attenuation or crosstalk).

The goal of these compensation schemes is to have excellent process control in the RJ45 plug (patch and production) as well as in the connection module compensation. Only by filling components with superb process control is it possible to guarantee consistent high-performance transmission.

### **i** Pros Insights

## Cat. 6 compensation schemes



### Under compensation

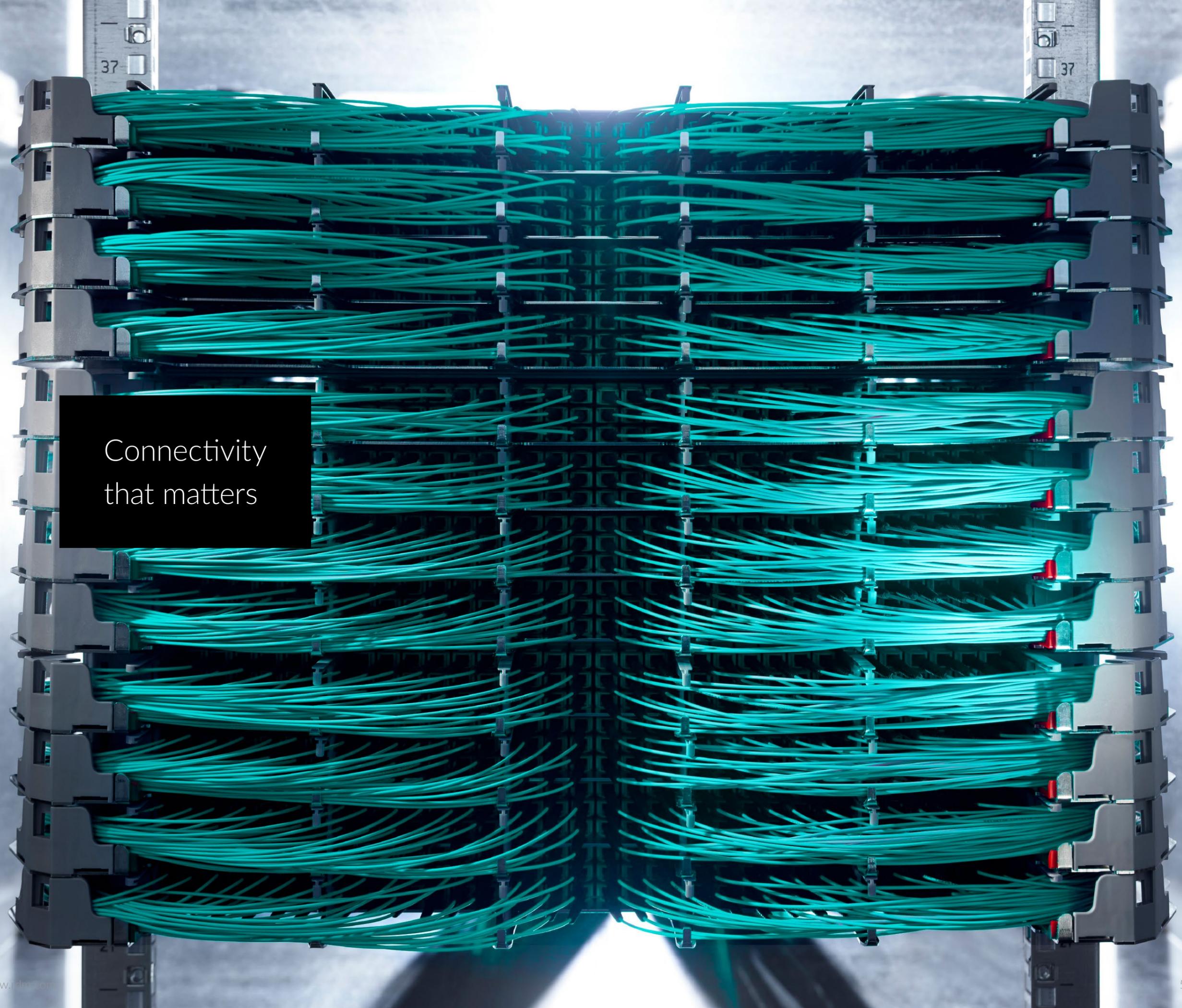
If the plug is too low of quality the connection module cannot compensate for all the crosstalk. The connection is not over Cat5.

### Ideal compensation

Aims to provide a balanced and consistent signal response across the entire frequency range of Cat 6<sub>A</sub> cabling. This involves precise engineering of the components to ensure minimal signal loss and crosstalk, resulting in reliable and predictable performance.

### Over-compensation

If the plug doesn't provide enough crosstalk, the connection module components will make overall performance worse. The connection is Cat5..



Connectivity  
that matters

# Connectivity that matters

Network technology from R&M guarantees decisive advantages. Users experience the benefits when they install cabling systems from R&M effortlessly and when they use infrastructure solutions from R&M for generations without interruption.

## High-end since 1964

R&M has been developing and manufacturing high-end connecting and distributive technology since 1964. R&M customers around the world use it to design future-proof data and communication networks for public and private applications.

## Independent Swiss family company

As an independent Swiss family company, R&M is one of the world's leading suppliers of infrastructures for telecom networks, data centers, offices and building automation. R&M covers the entire range of copper-based and fiber optic connectivity. The system approach integrates support, design and turnkey concepts for sites, buildings and housings. Software for network management rounds out the portfolio.

## Connecting people and businesses

Connectivity that matters represents decisive progress. With great innovation, R&M provides unlimited and reliable network infrastructure that connects people and businesses across the world. Together with certified partners, R&M carries out pioneering work.

## Superior performance

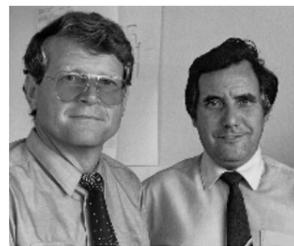
Clients who opt for R&M invest in sustainably reliable, scalable and migration-capable infrastructures. The result: networks with guaranteed, measurably superior performance.

## Global reach

R&M tailors its product offerings and performance precisely to the needs of its customers. With 14 plants at international locations, logistics hubs, sales organizations and technical consultants, R&M remains close to its customers on every continent.



R&M Cube, the company's state-of-the-art headquarters in Wetzikon, Switzerland



In 1964, Reichle & De-Massari AG (R&M) was founded by Hans Reichle & Renato De-Massari.



The garages and homes of the Reichle family in Wetzikon and the De-Massari family in Pfaffhausen served as offices, workshops and warehouses.

### Quality

Every bit reaches its goal

### Innovation

Excellent and effortless wiring

### System warranty

Lifelong commitment

### Protection of investment

Install just once and enjoy permanent use

### Customer focus

Responsible experts on site

### Sustainability

Man, nature, and the market in harmony

# Support that matters

Project success is determined by the network of project partners. The best data and communication networks are the result of good collaboration. That is why R&M resolutely forges close partnerships all over the world. Whether for individual projects and markets or for permanent, comprehensive commitment. Ideally, R&M starts off by advising investors, general contractors, planners and installers on the special issues of the project. Subsequent support extends from the design to the commissioning of the network.

It includes evaluation, configuration, customizing, logistics, installation training and measurements. R&M also supports partners on site in downstream tasks such as infrastructure management. The global R&M network comprises proprietary sales offices and specialist consulting, plants, warehouses as well as certified distributors and partners. R&M products are available locally to partners and customers in more than 100 countries.



## Lead: R&M makes partners insiders

Planners, project managers and installers gain practical insider knowledge in workshops and webinars. R&M provides information on technologies, solutions and standards. The participants share their experiences.

## Expertise: R&M certifies professionals

Network and cabling professionals take part in the R&M Academy Qualified Partner Program (QPP). They receive exclusive certifications. QPP partners receive comprehensive technical support for their projects.

## Warranty: R&M provides security

R&M assumes joint responsibility within the scope of its international warranty program. It includes a 25-year system warranty and a lifetime application warranty for fully tested cabling.



## Sustainability: R&M represents values

R&M maintains the balance between economic, ecological and social interests on the basis of exemplary ethical values. Ever since it was founded, sustainability has shaped the family business. The plan is to halve CO2 emissions by 2030, and to achieve full climate neutrality by 2050.

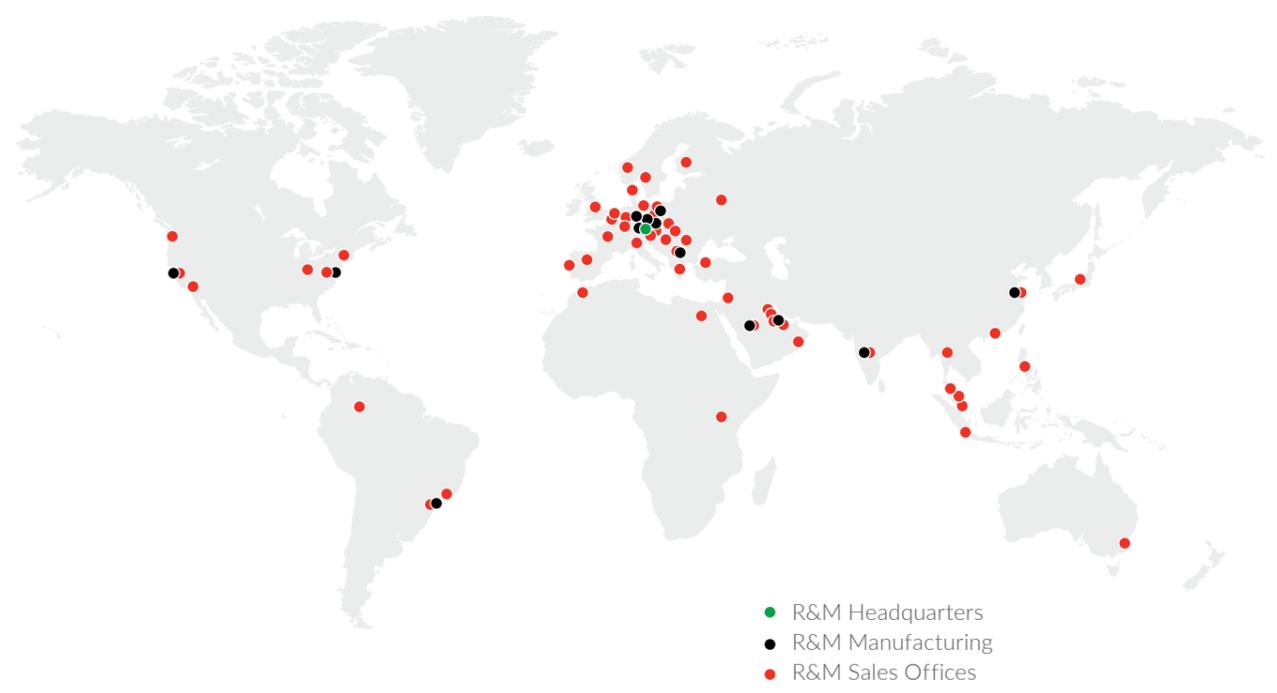


## Success: meaningful case study publications

R&M continuously documents case studies in informative reports. The case studies developed together with partners and customers give valuable insight into network technology for interested parties around the globe.

# R&M - worldwide

From project planning to operation



*R&M supports projects from start to finish: from network planning, via installation, to ongoing operation. Personal service and numerous satisfied customers worldwide give you the security of knowing you are working with the right partner!*

**Global network**  
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BCH\_Data\_Center\_Solutions\_13.12.2023\_EN\_HQ  
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