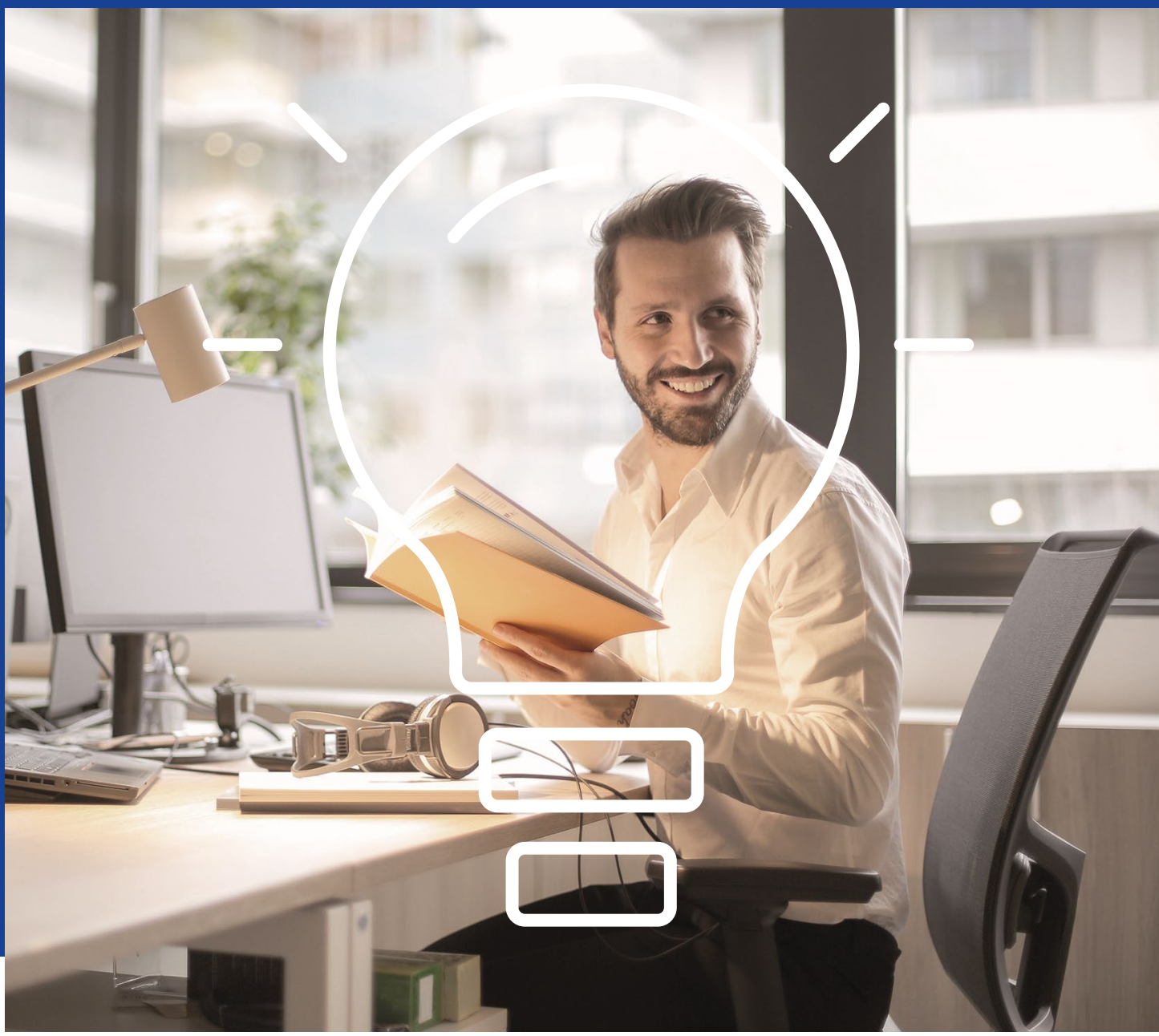
1&1 IONOS



White Paper

The First Step is Surprisingly Easy

Digitalization with the Enterprise Cloud by 1&1 IONOS

Internet made in Germany

Contents

Digitalization: IaaS Cloud Computing

Everyone is talking about digitalization. The digital transformation of entire industries means huge opportunities for companies in Germany, but also presents them with some challenges. Highly connected, more efficient production and new business models relating to the use and exploitation of the digital data generated open up new possibilities for value creation. At the same time, decisions need to be taken regarding what form the operational approach to digitalization should take, what budgets must be made available and how the volumes of generated data can be processed – keyword: Big Data.

Last but not least, there is the question of technical protection and legally compliant data protection. Technological changes are a fixture of business life, yet at least companies generally used to have time to adjust to them step by step. However, in the age of digital transformation, or indeed digital disruption, it is necessary to respond to the ever-growing pressure to act in ever-shorter time frames.

There is an increasing trend toward using cloud infrastructures and dedicated data centers while not being too committed to a specific provider.

What does digitalization mean specifically for companies?

Cloud computing has a key role in digital transformation – market and IT experts broadly agree on this. There is an increasing trend toward using cloud infrastructures and dedicated data centers while not being too committed to a specific provider.

According to the study by Crisp Research, cloud use can be a barometer for digitalization. More than 80 percent of participants said that their company is now heavily influenced by digitalization – almost twice as many as 12 months ago. In short, digitalization is regarded as a particular challenge in the German economy. So what are the objectives of cloud-based digitalization?

- **Agility and a faster time-to-market:** Digital transformation requires a new type of IT environment. It must be more agile and convert plans into new business models as quickly as possible. The Boston Consulting Group (BCG) sees

the high level of complexity of conventional IT environments as a cause of insufficient agility and excessively slow response times.

- **Cost control:** Expenses that tie up liquidity, e.g. maintenance, are eliminated, and only the actual costs of operation remain.

- **Flexible use of resources:** Rather than being technology-driven, cloud computing is more of a construct steered by business interests. Requirement-oriented and flexible use of IT is only possible with cloud computing. Technical resources are simply hired at short notice as required, and adapted to the business model.

- **Time saving:** Large and scalable capacity can be configured without long lead times.

- **Availability of data:** The cloud makes it easier to consolidate and harmonize data. In addition, a cloud platform is essential to undertaking extensive connectivity on a sound footing and gathering data, before evaluating and subsequently selling it – this is known as a data-driven business model.

In summary, it can be said that with cloud-based digitalization, capital can be used more intelligently and running costs can be reduced, resulting in greater flexibility and a competitive edge.

With cloud computing, storage capacity, processing power and network components can be purchased at the touch of a button.

What do companies particularly need to pay attention to?

EThere are lots of incentives for companies to take the step into the cloud. First and foremost, firms are willing to review their business models and processes with regard to the opportunities and possibilities of cloud services and gain an overview of the essential operational, technical and legal requirements. The threshold from trend to common practice was crossed long ago.

With cloud computing, storage capacity, processing power and network components can be purchased at the touch of a button. However, many companies have doubts about loss of control of the company's own data, worries about protection of entrusted personal (customer) data and the availability of cloud services.

Therefore, the following should be taken into account when using IaaS cloud computing:

- **Data protection:** When using cloud computing, it is important that the data-processing and data-storage rules applicable to the company are also replicated in the cloud in line with all contractual and statutory provisions. This means that security standards in force are the same as those for a physical infrastructure. The cloud-computing provider should also be subject to the same legal rules. For German companies, this means ensuring that the cloud-computing provider can also fully comply with the rules of the German Federal Data Protection Act and that these are not diluted by the 'Privacy Shield'. (What is the 'Privacy Shield' ?). An essential precondition here is that the data centers and the cloud provider itself should be based in Germany and therefore be subject to German jurisdiction.

"For German companies, this means ensuring that the cloud computing provider can also fully comply with the rules of the German Federal Data Protection Act."

- **Data security:** Along with data protection, technical protection of cloud use against system failure and force majeure is obviously another key aspect in digitalization. Cloud providers should allow dedicated connections by means of cross-connect systems, permit failover scenarios for high-availability environments and grant access to duplicated systems in different availability zones. Finally, the participating data centers should have relevant ISO certifications.

- **Compliance:** Compliance is the term for adherence to laws and guidelines relating to procedures in companies. Noncompliance with these rules can lead to penalties for the company or its management. ITIL-compliant cloud service providers simplify alignment of the system and business processes with digitalization.

In this context, companies can embrace digitalization much more intensively and with much less risk while maintaining an easily manageable data protection situation.

Despite some reservations, it should be stated that reputable cloud service providers are IT professionals, and they use and deliver suitable technologies for operation and protection of their infrastructures, applications and connections.

Typical areas of use of cloud computing in digitalizing companies are initially infrastructure services, known as infrastructure as a service (IaaS). Cloud-computing providers should make users' requirements their own and ensure backup routines, document processes properly, make access to and actions performed on customer systems clearly transparent by means of audit logs and make it possible to restore lost data. To this end, service-level agreements (SLAs) ensure readiness for operation, including access to individual virtual IT resources such as storage, servers and network components via the Internet.

It is necessary to establish which services must be performed by in-house IT, how and when, and which ones can be performed by cloud-service providers in a commercially viable way. This is done dynamically; the requirements must be determined anew on a regular basis.

In the process of digital transformation, it is necessary to stipulate how the company's IT is to be structured. Cloud computing requires paying a certain amount of attention to routine activities such as procurement, operation and maintenance.

This includes:

- Extensive automation of IT processes,
- Requirement-oriented external purchasing of IT resources,
- Focusing IT services solely on business,
- Outsourcing part of the guarantee of data security,
- Managing accelerated data growth

As a result, trends and developments in the IT world can be adopted in a targeted way and evaluated and used for the company. Overall, therefore, all requirements for contemporary IT point toward cloud computing.

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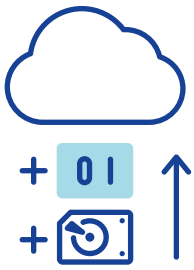
What can be digitalized?

A surprisingly large amount. A recent study by IDC shows that 'cloud disruption' is already in full swing in German companies. Some 70 percent of IT departments are testing cloud services or already using them in day-to-day business.

Initial application scenarios for use of the cloud do not have to be complex. Four examples illustrate typical use cases:

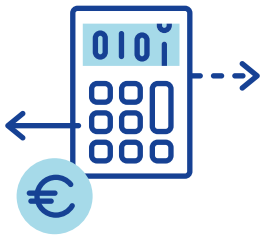


1. Expansion of processing or storage capacity:

The in-house data center remains in operation for the time being, but resorts to IaaS infrastructures for capacity expansion as required. Whenever necessary, there is automatic access to the service provider's cloud infrastructure in order to obtain more processing or storage capacity, for instance.

2. Backups:

The cloud's IaaS infrastructure can be used very effectively for automatic restoration of applications and data. Disaster recovery of this kind can be covered via backups in the service provider's cloud infrastructure.



3. E-commerce:

Hosted websites and e-commerce portals are transferred to the cloud in order to benefit from direct, requirement-oriented and uninterrupted performance adjustment, if at all possible in ongoing operation by means of (live) vertical scaling.

4. IoT:

Machines and assemblies that are connected in the context of digitalization can be managed from a back-end system in the cloud. The high level of availability of cloud systems and their geographical distribution allow the necessary availability.

Checklist: What must be taken into account in digitalization?

Digital transformation is a decision-making and planning process. It is necessary to take fundamental decisions, involve all stakeholders in the company (keywords: change management, documentation and training), draw up a plan for implementation, clarify roles and responsibilities, provide resources and finally plan implementation. A checklist can help:

Status quo

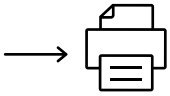
- [ ] Agility: Do your employees work in agile development environments or even in a DevOps manner?
- [ ] Scalability: Can you react to different business developments quickly?
- [ ] Connectivity: Are your technical systems powerful and redundantly connected?
- [ ] Security: Do your systems meet data-protection requirements? Essential conditions: How diverse is your IT landscape?

Requirements

- [ ] Competitive comparison: How far have your competitors gone in terms of digitalization?
- [ ] Benchmark: What benchmarks do you aim to achieve by being 'digitalized'?
- [ ] Cost savings: What cost savings are you hoping for?
- [ ] Resource savings: How many workloads do you need to outsource? What processes do you need to optimize?

Digitalization requirement

- [ ] Main objective: What is your digitalization objective?
- [ ] Dependencies: What dependencies exist in the traditionally structured company? What stages of digitalization depend on the availability of resources whenever feasible??
- [ ] Testing: What requirements are there??
- [ ] Planning: Are you planning digitalization in individual steps? Which parts of



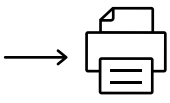
your IT can you migrate and when? How long do you need to maintain parallel systems? Do you need a service provider for this?

Change Management

- [ ] Business management: Digitalization should be driven forward by the management team.
- [ ] Budget: What budgets will you be providing initially?
- [ ] Technology: Who supports the IT and production-related aspects of digitalization?
- [ ] Persuasion: How are you getting all stakeholders in the company on board?
- [ ] Change management: How are you managing the transition process? What structural adjustments are required in the company?
- [ ] Documentation: How are you recording how the progress of change is measured and whether it is advancing on target?
- [ ] Training: What training sessions and courses are required for employees? Is there a need for new employees with relevant skills??

Essential human resources

- [ ] Consultants
- [ ] Software developers
- [ ] (Interim) experts
- [ ] Trainers/certifiers
- [ ] Full-service providers



Digitalization alone or with a partner?

Automation and, consequently, IT service management are becoming increasingly important for IT specialists in a company. These days, IT organizations need to constantly integrate new technologies in the in-house IT infrastructure, resulting in greater complexity of operations. At the same time, IT managers are required to manage IT economically on the basis of hard performance indicators. As a result, the long-term objective of IT management must be to perform IT services on a largely automated basis so that they can be performed with reproducible, consistent quality and as quickly as possible.

IT employees therefore have to perform a balancing act, as they are normally already busy with operating the IT infrastructure, but are also expected to ensure that the company's technology is fit for the future. This means that there is not enough time for strategic planning and optimization of the existing IT infrastructure and IT organization. Even if the planning has been done, there is then a lack of resources for tactical implementation of the strategy.

Here, partners can find solutions, set up infrastructures and operate them in a targeted way on the company's behalf on the basis of a cloud infrastructure. Providers can deliver standardized availability on a standardized (cloud) platform while saving costs – with sourcing and platform-development strategies and the right support concept. Technology providers as modern-style outsourcers deliver procedures for quality assurance, tools and methods for operations management of various service providers as well as proven service agreements. Companies receive the all-round care-free package along with attractive discounts.

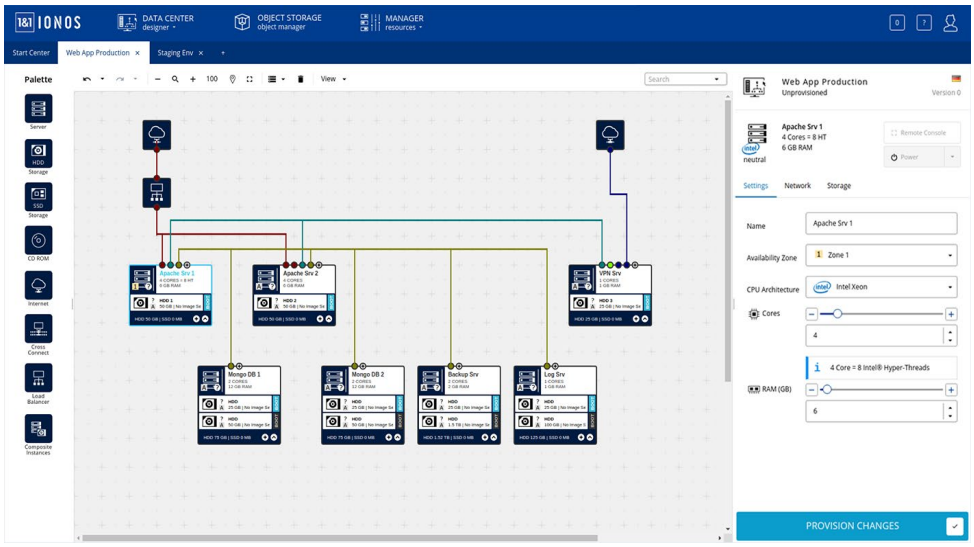
Partners of a cloud provider take on the identification, analysis, specification and validation of all requirements for IT systems that are relevant to the entire digitalization lifecycle, thus creating the requisite transparency. In connection with this, they develop architecture designs and technical concepts, draw up requirement specifications for the comparative search for suitable service providers and help companies to select the right cloud provider for implementation on the basis of a jointly defined compliance matrix.

Here, the partners' services are based on a foundation of strategy, concept and optimum technology selection.

“Partners of a cloud provider take on the identification, analysis, specification and validation of all requirements for IT systems that are relevant to the entire digitalization lifecycle.”

The first step into the cloud

Essentially, a strong, reliable cloud provider delivers a stable basis for digital transformation and creates a sound foundation for the IT workloads – whether independently or via a technology partner that provides assistance and is available at any time. In addition to the known global providers, there are also specialized German providers with granular scalability that possess relevant advantages. For instance, the Enterprise Cloud by 1&1 IONOS impresses with its unique and patented concept of the Data Center Designer (DCD), and provides functions that the user knows from a real data center. The user has the opportunity to design, configure and provision its IT infrastructure entirely intuitively itself.



The user has the opportunity to design, configure and provision its IT infrastructure entirely intuitively itself.

Figure 1: The Enterprise Cloud is the ideal platform for your digital transformation.

Summary of advantages of the Enterprise Cloud

The cloud for everyone:

- Infrastructures and resources can be mapped very easily on the graphical user interface.
- The visual and intuitive drag-and-drop concept enables quick and easy set-up, management and configuration of IT infrastructures and resources.
- An online calculator creates transparency regarding the cost breakdown of the selected resources.

Impressive results in the price/performance comparison:

- A simple pricing model based on four parameters: CPU cores, RAM, storage and traffic.
- Cancellation possible at any time, and billing on a per-minute basis. You only pay for what you actually need.
- On average, the Enterprise Cloud is twice as fast and only half as expensive as its competitors.

Cloud made in Germany:

- As a German company, 1&1 IONOS is fully subject to German data-protection requirements and provides certified German data centers.

Technically sophisticated:

- Via the Enterprise Cloud API, numerous SDKs and tools, the resources can also be managed without using a GUI.
- Scripts for system administrators can be created easily with the command line interface (CLI).
- Automated provision and management of infrastructures via container services (Docker, Rancher, etc.) and DevOps tools (Ansible, Puppet, etc.).
- Management of public keys that can be used in the initial deployment of LINUX systems.
- Private cross-connect functions give customers the opportunity to connect virtual data centers with each other within clusters.
- Free choice of operating system, which only needs to be compatible with the standard X86 architecture from Intel and AMD..

Simple modular system ensures flexibility:

- Freely configurable environments with no prefabricated instance packages.
- A complete infrastructure can be individually designed, displayed and evaluated in terms of cost in just a few minutes.
- Maximum transparency on a technical and business-management level – adapted to the respective business model.

Reliability from the Enterprise Cloud

1&1 IONOS ensures that only technologies that give the user the highest possible level of availability and outstanding resilience are used.

- If a server fails, the data is always secure, as storage devices are hosted physically separate from servers and all data stored on them is mirrored on a duplicated system in real time.
- The network connection of all servers at the Enterprise Cloud by 1&1 IONOS is redundant. Virtual servers can also be assigned to high-availability zones within a data center on request.

“1&1 IONOS ensures that only technologies that give the user the highest possible level of availability and outstanding resilience are used.”

Enterprise Cloud servers

Virtual servers can be created and taken into operation via the graphical user interface of the DCD or via the cloud API on a REST basis. The servers set up in this way are provisioned and hosted in our data centers as virtual servers on physical servers. There are no operating-system restrictions (vendor lock-in). For each server, either an image provided by 1&1 IONOS or an image provided by the customer can be used in the DCD. The customer can take into operation any number of virtual servers, each with up to 62 cores and 240 GB of RAM.

Enterprise Cloud network

A network set up in our DCD behaves like a separate LAN. The traffic on this segment is isolated from all other network segments. Network segments can be routed publicly or privately.

All protocols based on TCP/IP can be used here. Private IP addresses can be obtained via DHCP or assigned manually by the user.

As standard, public IPv4 addresses are assigned automatically by the system via DHCP. In addition to the IP addresses assigned dynamically by us, any number of fixed IPv4 addresses can be reserved and assigned to a network interface (NIC) on request. These IP addresses must then be configured within the server

operating system after assignment. To protect your network against unwanted access or attacks from the Internet, you can activate a firewall for each NIC.

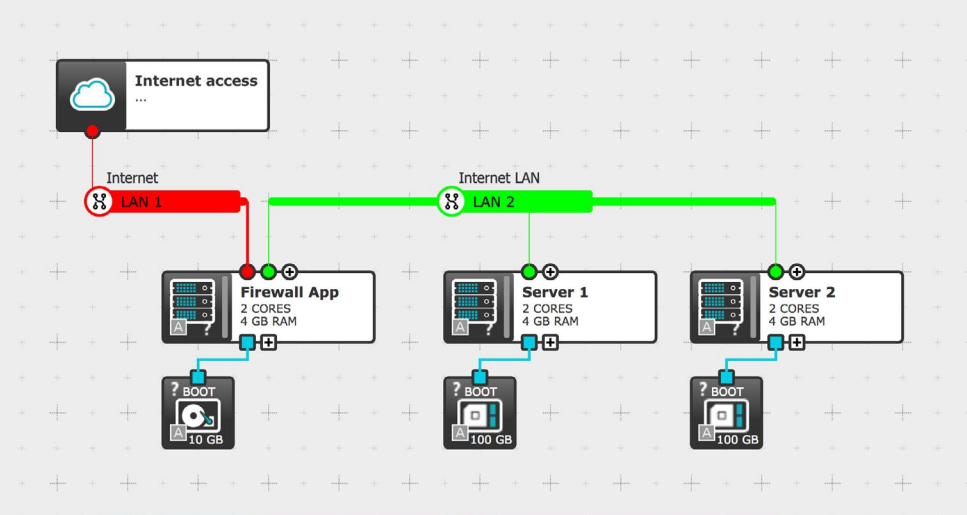


Figure 2: A network topology in the Data Center Designer

> *To ensure maximum efficiency and network speed, 1&1 IONOS uses state-of-the-art high-performance transmission technologies.*

Stable high speed from the Enterprise Cloud

To ensure maximum efficiency and network speed, 1&1 IONOS uses state-of-the-art high-performance transmission technologies. Instead of 10 Gbit Ethernet (10 GbE), we always use 4X QDR InfiniBand technology in our data centers. This supports maximum transfer rates of up to 4x10 Gbit/s with a switch latency of 200 ns. As a result, 1&1 IONOS provides 4x higher transfer rates and 10x lower latency times than comparable cloud hosters. At the same time, InfiniBand is less susceptible to failures than 10 Gbit Ethernet and allows fast scalability of the infrastructure with no loss of performance or efficiency.

Individual support

Genuine partnership – including in the protracted process of digitalization – demands support. Even before the customer relationship starts, right from the first non-binding test, 1&1 IONOS provides support through personal contacts in Account Management as well as Professional Services consultants who devise technical migration concepts in conjunction with the customer, conduct proof-of-concept audits and help with initial set-up.

In addition, trained system administrators are on hand 24/7, and are also happy to intervene and assist by telephone.

Partnernetzwerk

Furthermore, 1&1 IONOS has an extensive network of prestigious partners that offer sector expertise as well as ideal solutions for every case.

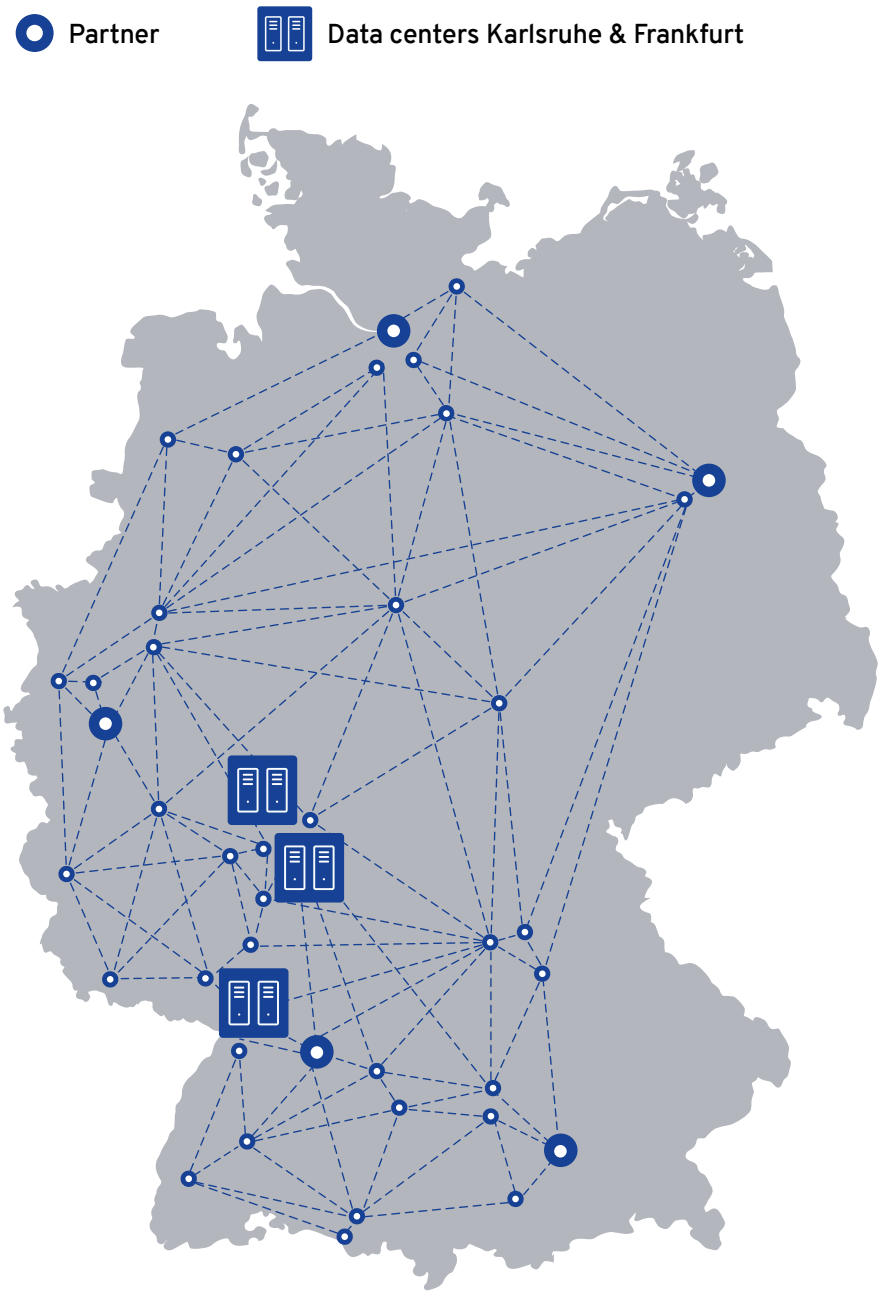


Figure 3: Partner network of 1&1 IONOS Cloud GmbH

Summary

Cloud computing pushes back the boundaries of corporate IT. Flexibility, cost optimization and risk reduction go hand in hand with the purchase of cloud services. In the context of digitalization, cloud computing simultaneously creates a new understanding of the role of corporate strategy and gives corporate IT an increasingly business-oriented focus. Enterprise growth is significantly boosted.

The white paper clearly shows that the first step into the cloud is easier than expected. Try it out. Talk to us and have a non-binding consultation.

Call us on +49 30 57700-840 or
e-mail us at enterprise-cloud@ionos.com

About 1&1 IONOS

With more than eight million customer contracts, 1&1 IONOS is the leading European provider of cloud infrastructure, cloud services, and hosting services. From VPS and bare-metal servers all the way to high-end IaaS solutions: 1&1 IONOS offers SMEs and large companies all the products they need to set up their hybrid or multi-cloud environment and is the only IaaS cloud computing provider that has its own code stack in Germany. 1&1 IONOS operates one of the world's largest and highest-quality IT infrastructures with over 90,000 servers. In the Cloud Vendor Universe from Crisp Research, 1&1 IONOS has repeatedly been named one of the leading providers of cloud platforms.

The Enterprise Cloud by 1&1 IONOS is the "Cloud – Made in Germany" with a data protection-compliant IaaS platform developed in-house for companies, system vendors/integrators, and managed service providers. It is flexibly scalable and provides free 24/7 support by qualified system administrators. During operation, the capacity of all components can be adapted to current requirements through live vertical upscaling.

1&1 IONOS was established in 2018 after the merger of 1&1 Internet and Berlin-based IaaS provider ProfitBricks and is part of the listed United Internet AG.

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