

Service Catalog

March 1, 2021

Content

Scope of Validity	1
1 IONOS cloud Compute Engine.....	1
1.1 Data Center Designer	1
1.2 Multi-User.....	2
1.3 2-Factor Authentication.....	4
1.4 SSH Key Support	4
1.5 Remote Console	4
1.6 IONOS Cloud APIs	5
1.7 Virtual Data Center	6
1.8 Virtual Server	6
1.9 IONOS cloud Block Storage	9
1.10 Virtual Network	13
1.11 External Network	13
1.12 Internal Network	14
1.13 Core Network.....	14
1.14 IP Address Management.....	14
1.15 Network Services.....	16
2 IONOS cloud S3 Object Storage.....	20
3 IONOS cloud Backup	21
4 IONOS cloud Managed Kubernetes.....	21
5 IONOS Private Cloud powered by VMware.....	22
6 24/7 Enterprise Level Support	23
7 Data Centers.....	23
7.1 IONOS cloud Compute Engine Locations.....	23
7.2 IONOS Private Cloud powered by VMware Locations	26

Scope of Validity

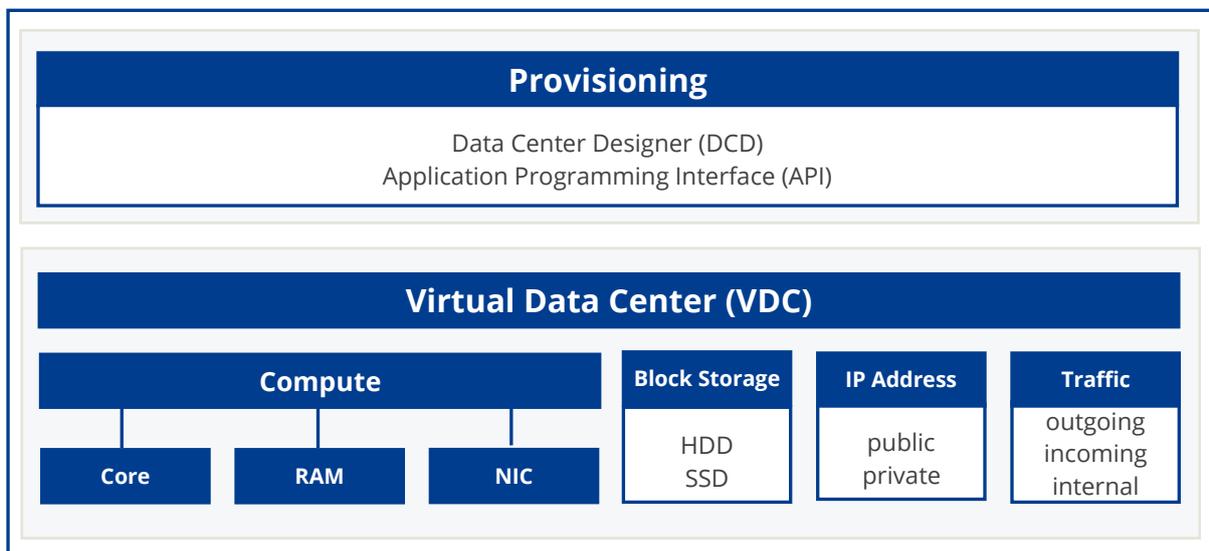
The Service Catalog is the central source of information regarding the IONOS cloud services to its customers.

1 IONOS cloud Compute Engine

Under the term “Compute Engine”, IONOS cloud offers its customers Infrastructure as a Service (virtual computing, storage and network resources). The customer is able to make use of these resources on a flexible basis as required. The resources used (cores, RAM, storage) are billed to the customer by the minute based on the price list, which is valid at the time. External data transfer, as far as relevant for billing, is priced based on volume.

The customer performs the hiring and returning of resources. IONOS cloud provides interfaces for this purpose, so that the customer can flexibly control the resources.

IONOS cloud Compute Engine model



1.1 Data Center Designer

IONOS cloud provides the customer, in their personal customer area, access to a web application called the “Data Center Designer” (DCD). The DCD is a web application that the customer is able to access via modern Internet browsers. The DCD allows the

customer to both control and manage the services or sub-services provided by IONOS cloud, including:

- Creating, editing and deleting virtual data centers
- Creating, (re-)starting, stopping, and deleting virtual servers, including optional storages
- Configuring / modifying existing virtual servers, including optional storages
- Creating, editing and deleting snapshots
- Uploading, editing, using and deleting private images
- Reserving and managing static public IP addresses
- Creating and managing private and public LANs incl. firewall setups
- Creating and managing SSH keys
- Management of integrated cloud services (IONOS cloud S3 Object Storage, IONOS cloud Managed Kubernetes, IONOS cloud Backup)

1.2 Multi-User

The authentication on the IONOS cloud DCD takes place based on an account to which at least one user name and one password are assigned. A distinction is made between three types of accounts:

- **Contract Owner** – this account is created automatically for the user that initially registered with IONOS cloud. A “Contract Owner” type account is authorized to fully access all resources, create “User” type accounts and assign an “Administrator” role to them. Only one account of the type "Contract Owner" exists for each contract concluded with IONOS cloud. User – with the “Customer” type account, for each contractual relationship, which is concluded with IONOS cloud, it is possible to create or delete an unlimited number of accounts which are of the “User” type. “Administrators” can assign “Administrator” roles to accounts of type “User”.
- **Administrator** - The role "Administrator" has the same permissions as an account of the type "Contract Owner" with the restriction that the payment method of the contract cannot be changed. It is possible to revoke the "Administrator" role again.
- **User** - with the “Contract Owner” as well as "Administrator" type account, for each contractual relationship, which is concluded with IONOS cloud, it is possible to create or delete an unlimited number of accounts which are of the “User” type. Accounts of type "User" can be upgraded to "Administrators".

The Multi-User Management enables access to be generally limited to the following resources types:

- Virtual Data Centers
- Snapshots
- Images
- IP Blocks
- Backup-Units
- Kubernetes Clusters

The assigning of rights is based on groups. A group contains one or several “User” type accounts. A “User” type account can be a member of several groups. “Contract Owner” or “Administrator” roles do not need to be managed in groups as they have access to all resources of the contract.

The Multi-User Management distinguishes between the following authorizations for resources:

- **Read** – the resource and the objects they contain are visible. The attributes of objects can be displayed. The resource and the object it contains cannot be changed, nor can additional objects be added. The read authorization is implicit as soon as a group is assigned to a resource.
- **Edit** – the resource and the objects they contain are visible. The attributes of objects can be displayed and changed. The resource and the objects they contain can be deleted.
- **Sharing** – authorizations for access to the resource can be changed.

The following group rights can be configured per group:

- **Create Data Center:** create new virtual data centers
- **Create Snapshots:** create snapshots of storages for which the group members hold at least “read” authorization
- **Reserve IP Blocks:** reserve additional IP blocks and / or give back IP blocks, which are available to the group members via the “edit” authorization
- **Create Internet Access:** Allows provisioning of public LANs inside a virtual data center
- **Use Object Storage:** access IONOS cloud S3 Object Storage
- **Create Backup Units:** create new Backup Unit account for backup agent registration and activation
- **Access Activity Log:** view Activity Logs for the entire contract
- **Create Kubernetes Clusters:** create new Kubernetes clusters

1.3 2-Factor Authentication

For every account that is configured for access to the IONOS cloud DCD ("Contract Owner", "Administrator" or "User"), the use of 2-Factor Authentication can optionally be configured with a one-time password pursuant to RFC 6238 TOTP. 2-Factor Authentication provides increased security during the login process. In addition to their user name and password, when they log in, they are required to provide a code, which is generated using a special application (an "authenticator").

Each account type can activate or deactivate this option in DCD > Account management > Security for the respective account.

"Contract Owner" type accounts can make the use of a 2-Factor Authentication a mandatory requirement for "Administrator" and "User" type accounts.

1.4 SSH Key Support

Customers can inject the public part of an SSH key prior to provisioning using the IONOS cloud DCD or Cloud API (version 2.0 or higher) in order to create an SSH login for storage volumes based on a public IONOS cloud Linux image. This feature is not available for snapshots, private images and Windows OS images as well as MS SQL images provided by IONOS cloud.

In DCD, it is possible to store up to 100 public SSH keys for later re-use. It is possible to mark individual SSH key as "default" which are applied to every provisioning automatically if previous mentioned requirements are fulfilled. Independent from SSH key store, customers can add SSH keys ad-hoc without storing them before. It is not possible to share access to SSH key store across multiple users. Each user has access to his own SSH key store independent of his account role.

In Cloud API, it is only possible to add SSH keys ad-hoc. You cannot access the SSH key store.

1.5 Remote Console

A HTML5 Remote Console is available for every provisioned server via a customer's DCD or the Cloud API. The Remote Console allows the customer complete access to the server's monitor, mouse and keyboard. The customer has access to his server with the Remote Console even in the absence of SSH or RDP connectivity.

The HTML5 Remote Console has been developed for browsers that do not support Java. It uses HTML5 and JavaScript, which makes it independent of third party software or additional installations since all it requires is a modern browser.

1.6 IONOS Cloud APIs

1.6.1 Cloud API

IONOS cloud provides the customer with an Application Programming Interface (API). This API gives the customer automated control over the functions from the DCD. Upon request, IONOS cloud will provide an API reference along with example software (Cloud-CLI) on how the Cloud API can be used (links below).

IONOS cloud provides access to the cloud functionality for developers based on REST (Representational State Transfer). All account types are able to use the Cloud API.

Documentation on the Cloud API	https://devops.ionos.com/api/cloud/v5/
Web service end-point of the Cloud API	https://api.ionos.com/cloudapi/v5/

1.6.2 Reseller API

The Reseller API allows managing contracts and their associated admin users. The API allows resellers to create/update/delete subcontracts and update contract resource limits. New contract administrators can also be created, updated and deleted using the Reseller API.

Documentation on the Reseller API	https://devops.ionos.com/api/reseller/
Web service end-point of the Cloud API	https://api.profitbricks.com/reseller

1.6.3 Activity Log API

The Activity Log API allows the customer the retrieval of a list of activities conducted either in the DCD or in the Cloud API within a specific IONOS cloud contract. Accounts of the type "Contract Owner" and "Administrator" are authorized by default to access the Activity Log API and are permitted to grant access to the Activity Log API for the "User" type accounts.

Documentation on the Activity Log API	https://devops.ionos.com/api/activity/
Web service end-point of Activity Log API	https://api.ionos.com/activitylog/v1/

1.6.4 Billing API

The Billing API enables “Contract Owner” type accounts to check the current usage and latest invoices of their IONOS cloud account.

Documentation on the Billing API	https://devops.ionos.com/api/billing/
Web service end-point of the Billing API	https://api.ionos.com/billing/

1.7 Virtual Data Center

On the IONOS cloud platform, the customer can create so-called “Virtual Data Centers” (VDC). A VDC serves as a repository for using the resources ordered by the customer. Access to the resources in a VDC – similarly to operating a physical data center – is only possible via a corresponding network or Internet connection. Within a VDC, the IONOS cloud software allows for the distribution of various resources to different availability zones.

IONOS cloud provides the customer with the flexibility to change the ownership of the VDC. Any IONOS cloud customer who is a billing contract owner has the capability of transferring the ownership of a VDC created under the scope of his account with all related rights and responsibilities to any other customer having a billing contract with IONOS cloud. In order to change the ownership of his VDC the customer is requested to contact the 24/7 Enterprise Level Support.

1.8 Virtual Server

The customer can lease various resources from IONOS cloud and combine them into a virtual server. Within a VDC different resources can be distributed across different availability zones. A virtual server consists of the following components:

- Memory (RAM)
- Processor cores
- Network interface cards (NICs)
- Storage volumes (optional)
- CD-ROMs (optional)

Virtual servers can boot from a storage volume, a CD-ROM, or a NIC.

Furthermore, it is also possible for a virtual server to be configured with the help of advanced settings for the use of “Live Vertical Scaling” (LVS). LVS allows further resources to be added to a virtual server while the operating system is in use. The scaling of resources without having to restart a virtual server can be applied as follows:

- Upscaling: CPU, RAM, NICs, storage volumes,
- Downscaling: NICs, storage volumes.

For IONOS cloud provided public Images LVS is activated by default. LVS capabilities on private images and snapshots can be changed before applying them to new instances. The Image Manager provides edit functionality to these properties. Linux supports all standard LVS functions, Windows server instances, however, only support upscaling of CPU, NICs and storage volumes, and downscaling of NICs at this time. LVS for RAM is possible starting from 1 GB RAM and in full increments of GB.

Possible configurations of a virtual server are presented in the table below:

AMD Processors:

Components	Minimum	Maximum
Processor core (core)	1 core	62 cores
Random access memory (RAM)*	0.25 GB RAM	230 GB RAM
PCI Slots (NICs and storage volumes)	0 PCI Slots	24 PCI Slots
CD-ROM	0 CD-ROM	2 CD-ROMs

* Increment/decrement of 1 GB when LVS is activated, RAM expansion beyond the defined maximum size possible on request.

Intel Processors:

Components	Minimum	Maximum
Processor core (core)	1 core	51 cores
Random access memory (RAM)*	0.25 GB RAM	230 GB RAM
PCI Slots (NICs and storage volumes)	0 PCI Slots	24 PCI Slots
CD-ROM	0 CD-ROM	2 CD-ROMs

* Increment/decrement of 1 GB when LVS is activated, RAM expansion beyond the defined maximum size possible on request.

1.8.1 Core

IONOS cloud allows the customer to assign the appropriate processing power in the form of cores. IONOS cloud will allocate these exclusively to the virtual server specified by the customer.

Model	AMD Opteron	Intel Xeon (Haswell / Broadwell)	Intel Xeon (Skylake)*
Use	Exclusive	Exclusive	Exclusive
Clock frequency	2.8 GHz	2.1/2.4 GHz	2.1 GHz

* Intel Xeon (Skylake) are available in our data centers in Berlin, Frankfurt and London.

AMD Core

The AMD cores IONOS cloud provides are AMD Opteron processors, optimized for high performance within cloud infrastructure.

Thanks to the processor design, allowing for a high number of cores within one host system, virtual instances with up to 62 AMD cores are feasible.

Intel Core

The Intel cores IONOS cloud provides are Intel Xeon processors that enable simultaneous computing of two threads or sets of instructions.

For each physically present processor core, the operating system addresses two virtual cores and shares the workload between them. This so-called hyper-threading approximates a system with two physical cores.

While hyper-threading can improve data processing performance, in order to exploit the benefits, it relies on the software to support the use of multiple processors. Current versions of Windows and Linux support this feature and can benefit from it.

1.8.2 Host Systems

A large number of host systems are kept ready at each location for operating virtual servers for the customers. Each host server is redundantly connected to the InfiniBand network. The host systems are assembled by the manufacturers based on our specifications and then delivered to the site.

1.9 IONOS cloud Block Storage

IONOS cloud Block Storage, also called volume, allows the customer to make use of a dual-redundant storage system.

Each block storage created by the customer is stored on two storage servers, providing active-active redundancy. For additional data protection, every storage server is based either on a hardware RAID system or on a software RAID system.

Access to the volumes requested by the customer is achieved via the internal InfiniBand (RDMA) network.

For Solid State Drive volumes, IONOS cloud offers two performance classes that can be selected at time of ordering the volume. SSD Premium is optimized for high performance while SSD Standard is recommended for fast data access with general-purpose scenarios.

HDD volumes deliver a static performance profile independent of the volume size. In comparison, SSD volumes deliver higher performance depending on the volume size and get capped at a specific size.

Hard drive	Hard Disk Drive (HDD)
Use	Shared
Minimum and maximum size	1 GiB – 4 TiB per volume* (up to 24 HDD per VM supported)
Read / write speed, sequential	200 MB/s at 1 MiB block size
Read / write speed, random	1,100 IOPS at 4 KiB block size

*Larger volumes available on request.

Hard drive	Solid State Drive (SSD) - Premium
Use	Shared
Minimum and maximum size	1 GiB – 4 TiB per volume (up to 4 SSD per VM supported)
Read / write speed, sequential	1 MB/s per GiB at 1 MiB block size
Max. read / write speed, sequential	600 MB/s per VM at 1 MiB block size and min. 4 Cores, 4 GB RAM per volume
Read speed, random	75 IOPS per GiB at 4 KiB block size
Max. read speed, random	45,000 IOPS per VM at 4 KiB block size and min. 4 Cores, 4 GB RAM per volume
Write speed, random	50 IOPS per GiB at 4 KiB block size
Max. write speed, random	30,000 IOPS per VM at 4 KiB block size and min. 4 Cores, 4 GB RAM per volume

Hard drive	Solid State Drive (SSD) - Standard
Use	Shared
Minimum and maximum size	1 GiB – 4 TiB per volume (up to 24 SSD per VM supported)
Read / write speed, sequential	0.5 MB/s per GiB at 1 MiB block size
Max. read / write speed, sequential	300 MB/s per VM at 1 MiB block size and min. 2 Cores, 2 GB RAM per volume
Read speed, random	40 IOPS per GiB at 4 KiB block size
Max. read speed, random	24,000 IOPS per VM at 4 KiB block size and min. 2 Cores, 2 GB RAM per volume
Write speed, random	30 IOPS per GiB at 4 KiB block size
Max. write speed, random	18,000 IOPS per VM at 4 KiB block size and min. 2 Cores, 2 GB RAM per volume

1.9.1 Snapshot

IONOS cloud allows the customer to create so-called snapshots of individual block storages. The copy created of the block storage can be accessed (and deleted) via DCD and Cloud API, and new block storages can be created based on a snapshot. Provision speed is 50 MB/s.

The following upload servers are available:

- Berlin: ftp-txl.ionos.com
- Frankfurt: ftp-fra.ionos.com,
- Karlsruhe: ftp-fkb.ionos.com,
- London: ftp-lhr.ionos.com
- Las Vegas: ftp-las.ionos.com,
- Newark: ftp-ewr.ionos.com.

Once the image has been transmitted to the upload server, the image will be converted into the internal image format of IONOS cloud. The user will be informed by email when the conversion process starts.

Once the conversion is complete, the image will be available for use in the DCD or Cloud API under the name by which it was transmitted to the upload server.

1.9.4 Data Upload Service

IONOS cloud offers customers who utilize the data centers in Frankfurt, Karlsruhe and Las Vegas the ability to transfer large amounts of data via a physically mailed data storage medium. This service supports a variety of data carrier interfaces like USB or SATA. To ensure data security, the data on the delivered data storage medium must be encrypted and have a total size of at least 1 TB.

All uploads are performed as a 1:1 copy to a volume and provided in the data center indicated by the customer. The customer is able to attach this volume to a virtual server of his choice in the chosen virtual data center.

After completion of the upload, the data storage medium will be returned to the customer. The data upload service can be requested by the 24/7 Enterprise Level Support.

1.9.5 Storage Availability Zone

In order to secure data, improve reliability and create high availability scenarios, customers can assign availability zones to HDD storage volumes (Storage Availability Zone for SSD will be provided at a later point in time). Virtual storage volumes to which different storage availability zones are assigned are operated on different physical resources. Availability zones can be assigned using the DCD or the Cloud API.

1.10 Virtual Network

IONOS cloud allows virtual entities to be equipped with network cards (“network interface cards”; NIC). Only by using these virtual network interface cards is it possible to connect multiple virtual entities together and / or to the Internet.

Throughput, internal	MTU 1,500	3 Gbps
Throughput, external	MTU 1,500	700 Mbps
Maximum number of packets per VM	100,000 packets/s	

The maximum external throughput may only be achieved with a corresponding upstream of the provider.

Compatibility

- The use of virtual MAC addresses and/or the changing of the MAC address of a network adapter are not supported. Among others, this limitation also applies to the use of CARP (Common Address Redundancy Protocol).
- Gratuitous ARP (RFC 826) is supported.
- VRRP is supported based on gratuitous ARP. For VRRP to work IP failover groups must be configured.

1.11 External Network

Depending on the location, different capacities for transmitting data to or from the Internet are available for operating the IONOS cloud service. Due to the direct connection between the data centers at the German locations, the upstream can be used across locations.

The total capacities of the respective locations are described below:

Location	Connection	Redundancy level	AS
Berlin (DE)	2 x 100 Gbps	N+1	AS-6724
Frankfurt am Main (DE)	2 x 100 Gbps 4 x 10 Gbps ¹	N+5	AS-51862
Karlsruhe (DE)	3 x 10 Gbps ²	N+2	AS-51862
London (UK)	2 x 10 Gbps	N+1	AS-8560
Las Vegas (US)	3 x 10 Gbps	N+2	AS-54548
Newark (US)	2 x 10 Gbps	N+1	AS-54548

¹ 2 x 10 Gbps toward Karlsruhe; 2 x 10 Gbps toward the Internet

² 2 x 10 Gbps toward Frankfurt am Main; 1 x 10 Gbps toward the Internet

IONOS backbone AS-8560, to which IONOS cloud is redundantly connected, has a high quality edge capacity of 1.100 Gbps with 2.800 IPv4/IPv6 peering sessions, available in the following Internet and peering exchange points: AMS-IX, BW-IX, DE-CIX, ECIX, Equinix, FranceIX, KCIX, LINX.

1.12 Internal Network

IONOS cloud operates redundant networks at each location. All networks are operated using the latest components from brand manufacturers with connections up to 100 Gbps.

IONOS cloud uses the high-speed networks based on InfiniBand technology both for connecting the central storage systems and for handling internal data connections between customer servers.

1.13 Core Network

IONOS cloud operates a high availability core network at each location for the redundant connection of the product platform. All services provided by IONOS cloud are connected to the Internet via this core network.

The core network consists exclusively of devices from brand manufacturers. The network connections are completed via an optical transmission network, which, by use of advanced technologies, can provide transmission capacities of several hundred gigabits per second. Connection to important Internet locations in Europe and America guarantee the customer an optimal connection at all times.

Data is not forwarded to third countries. At the customer's explicit request, the customer can opt for support in a data center in a third country. In the interests of guaranteeing a suitable data protection level, this requires a separate agreement (within the meaning of article 44-50 DSGVO and §§ 78 ff. BDSG 2018).

1.14 IP Address Management

IONOS cloud provides the customer with public IP addresses that, depending on the intended use, can be booked either permanently or for the duration for which a virtual server exists. These IP addresses provided by IONOS cloud are only needed if connections are to be established over the Internet. Internally, virtual machines can be freely networked. For this, IONOS cloud offers a DHCP server that allows and/or simplifies the assignment of IP addresses. However, one can establish one's own addressing scheme.

1.14.1 Public IPv4 Addresses

Every virtual network interface card that is connected to the Internet is automatically assigned a public IPv4 address by DHCP. This IPv4 address is dynamic, meaning it can change while the virtual server is operational or in the case of a restart.

Customers can reserve static public IPv4 addresses for a fee. These reserved IPv4 addresses can be assigned to a virtual network interface card, which is connected to the Internet, as primary or additional IP addresses.

1.14.2 Private IPv4 Addresses

In networks that are not connected to the Internet, each virtual network interface card is automatically assigned a private IPv4 address. This is assigned by the DHCP service. These IPv4 addresses are assigned statically to the MAC addresses of the virtual network interface cards.

The use of the IP address assignment can be enabled or disabled for each network interface card. Any private IPv4 addresses pursuant to RFC 1918 can be used in private networks.

Network address range	CIDR notation	Abbreviated CIDR notation	Number of addresses	Number of networks as per network class (historical)
10.0.0.0 to 10.255.255.255	10.0.0.0/8	10/8	$2^{24} = 16.777.216$	Class A: 1 private network with 16,777,216 addresses; 10.0.0.0/8
172.16.0.0 to 172.31.255.255	172.16.0.0/12	172.16/12	$2^{20} = 1.048.576$	Class B: 16 private networks with 65,536 addresses; 172.16.0.0/16 to 172.31.0.0/16
192.168.0.0 to 192.168.255.255	192.168.0.0/16	192.168/16	$2^{16} = 65.536$	Class C: 256 private networks with 256 addresses; 192.168.0.0/24 to 192.168.255.0/24

1.15 Network Services

1.15.1 Cloud Connect

Cloud Connect enables the customer to create a direct and dedicated Layer-3 connection between their company network and their virtual data center (VDC). The customer can use Cloud Connect if both of the following conditions are fulfilled:

1. The connecting VDC is operated at the locations of Frankfurt, Berlin, or Las Vegas.
2. The customer has a dedicated line connection to the corresponding data center.

A connection can take place in different ways, for example, Dark-Fiber, MPLS or Cross Connect. For this purpose, the customer can contract a telecommunications company to establish the connection.

The 24/7 Enterprise Level Support is available to assist with any questions concerning the topic of cloud exchange and connection.

1.15.2 IP-Failover

The IONOS cloud IP-Failover feature helps to minimize packet loss for high availability or failover setups in the event that one of the virtual machines experiences an outage. By setting up IP-Failover groups for public traffic, customers can define the network interfaces of virtual servers that are part of a high availability setup.

“User” type accounts can create or edit IP-Failover groups using only reserved IP addresses for which they have been granted access. The IP-Failover feature only provides provisioning of the same IP to multiple network interfaces from different virtual servers on the same LAN. It does not monitor the availability of the service to be accessed by the given IP. The monitoring and GARP announcements to gateways must be made by the customer individually on each virtual server that is a member of an IP-Failover setup.

1.15.3 Load Balancing

IONOS cloud offers the customer the function of a load balancer for public traffic within their infrastructure. This load balancer distributes the incoming network traffic according to an ECMP algorithm on the servers configured behind the load balancer.

Throughput	50 Mbps
Max. open connections	40,000 connections
Max. backend servers	100

1.15.4 Firewall

IONOS cloud allows the customer to use a software firewall within their infrastructure. For this purpose, the virtual network interface cards of a virtual server can be assigned a packet filter. The network traffic, which is aimed at the virtual server, is already filtered before the customer's virtual machine.

Throughput	700 Mbps
Maximum number of packets	100,000 packets/s

1.15.5 DHCP

For every network interface of a virtual server, IONOS cloud provides an IP configuration via DHCP. In this context, the type of the configuration distinguishes between whether the network interface is connected with the public Internet or a private Ethernet.

Public Internet:

The following parameters are provided for the configuration via DHCP:

- Public IPv4 address
- Network mask (255.255.255.255)
- Gateway address
- DNS server address
- MTU (1,500)

Private Networks:

The following parameters are provided for the configuration via DHCP:

- Private IP address (10.x.x.x)
- Network mask (255.255.255.0)
- MTU (1,500)

The DHCP server always uses the address A.B.C.1 in the class C network, which corresponds to the assigned IP address.

The configuration through DHCP can be optionally activated or deactivated via network interface (DCD, or Cloud API). The configuration via DHCP is activated for newly created network interfaces.

1.15.6 DNS

Caching DNS

For the resolution of public domain names, IONOS cloud operates a redundant set consisting of two DNS servers at every data center location.

These DNS servers are operated as “caching” DNS servers and / or DNS resolvers, and are automatically assigned to the virtual customer entities via the DHCP IP address resolution.

Customer-specific internal domains cannot be resolved on caching DNS servers.

Reverse DNS

A standard reverse entry is assigned to all public IP addresses, which are assigned to the virtual entities.

These entries follow the format pAAA-BBB-CCC-DDD.pbiaas.com, whereby AAA-BBB-CCC-DDD corresponds to the IPv4 octets.

For statically assigned IP addresses, the existing reverse entry can be adapted according to the customer requirements via a Service Request to the 24/7 Enterprise Level Support.

1.15.7 IONOS DDoS Protect

IONOS DDoS Protect is a managed Distributed Denial of Service defense mechanism, which ensures that every customer resource hosted on IONOS cloud is secure and resilient to DDoS attacks. This is facilitated by our filtering and scrubbing technology, which in event detection of an attack filters the malicious DDoS traffic and lets through only the genuine traffic to its original destination. Hence, enabling applications and services of our customers to remain available under a DDoS attack.

The service is currently available in the following data centers: Berlin, Frankfurt, and Karlsruhe, and will be available in the remaining data centers soon.

The service is available in two packages:

1. **DDoS Protect Basic:** This package is enabled by default for all customers and does not require any configuration. It provides basic DDoS Protection for every resource on IONOS cloud from common volumetric and protocol attacks and has the following features:
 - DDoS traffic filtering - All suspicious traffic is redirected to our filtering platform where the DDoS traffic is filtered and the genuine traffic is allowed to the original destination.
 - Always-On attack detection - The service is always on by default for all customers and does not require any added configuration or subscription.
 - Automatic Mitigation - Everytime an attack is identified our system automatically triggers DDoS mitigation by filtering the DDoS traffic and letting through only genuine traffic.
 - Protect against common Layer 3 and 4 attacks - This service protects every resource on IONOS from common volumetric and protocol attacks in the Network and Transport Layer such as UDP, SYN floods, etc.
2. **DDoS Protect Advanced:** This package offers everything that's part of the DDoS Protect Basic package as well as advanced security measures and support. Here are the supported features :
 - 24/7 DDoS Expert Support - Customers have 24/7 access to IONOS DDoS expert support. The team is available to assist customers with their concerns regarding ongoing DDoS attacks or any related queries.
 - Proactive Support - The DDoS support team equipped with alarms will proactively act on a DDoS attack directed towards a customer's resources and also notify the customer in such an event.
 - On-demand IP specific DDoS filtering - If a customer suspects or anticipates a DDoS attack at any point in time, he can request to enable DDoS filtering for a specific IP or server owned by him. This means that all the traffic directed towards that IP will be forced to pass through our filtering platform and the DDoS traffic will obviously be filtered.
 - On-demand Attack Diagnosis - A detailed report about a DDoS attack is sent to the customer, which explains the attack and other relevant details whenever requested by the customer.

NOTE: IONOS cloud sets forth Security as a Shared Responsibility between IONOS cloud and the customer. We at IONOS cloud strive at offering a state-of-the-art DDoS defense mechanism. Successful DDoS defense can only be achieved by a collective effort on all aspects including optimal use of firewalls and other settings in the customer environment.

2 IONOS cloud S3 Object Storage

IONOS cloud S3 Object Storage is a standalone object storage solution based on the S3 API (Simple Storage Services) standard. IONOS cloud provides facilities to manage and maintain accessibility to the object storage. The user can access object storage either through a browser application, or through any standard S3 client or library of their choice.

IONOS cloud S3 Object Storage offers the industry's best compatibility with the S3 API, which guarantees a high level of interoperability and compatibility with other object storage systems adhering to S3. Apart from the standard operations, which S3 entails, it allows a multitude of additional operations, such as:

- Versioning
- Logging
- Object encryption
- Detailed access management by means of access control lists (ACLs)
- Deleting multiple objects automatically
- Hosting a static website

IONOS cloud S3 Object Storage is available for every contract and does not require further registration or activation. By means of a graphical interface as well as other standard S3 clients, customers can manage their objects and define access to them applying ACLs (access control lists) as defined by the S3 standard.

Our object storage is currently available in Frankfurt am Main only. Geo-redundant backups and auto-tiering will be available at a later date.

Endpoints:

IONOS cloud S3 Object Storage:	http://s3-de-central.profitbricks.com/ https://s3-de-central.profitbricks.com/
Websites hosted on the IONOS cloud S3 Object Storage:	http://s3-website-de-central.profitbricks.com/ https://s3-website-de-central.profitbricks.com/

3 IONOS cloud Backup

IONOS cloud is implementing the backup solution in partnership with the backup pioneer and market leader, Acronis. A theoretically unlimited volume of data can be stored in data centers, guaranteed and fully certified to ISO 27001. Data cables with capacities of up to 10 GBit/s ensure seamless data throughput, even for full backups.

Features of the fully integrated backup function:

- Comprehensive image backup (full backup) and/or incremental backup
- Rapid disaster recovery and complete data restore
- Easy data migration
- Encrypted data storage in ISO-certified data centers in Germany

IONOS cloud Backup allows the customer to perform a quick and efficient backup of data from applications and any images the customer is using. The customer can also backup data from applications that run on-premises or in private clouds in commonly used virtualized environments such as VMware and Hyper-V.

The fully integrated backup system supports following platforms:

- Windows Server and Desktop operating systems
- Linux
- Mac
- Hyper-V and other Hypervisor solutions
- Workstations, physical and virtual servers

4 IONOS cloud Managed Kubernetes

IONOS cloud Managed Kubernetes (K8s) is an open-source system for automating deployment, scaling, and management of containerized applications. It groups containers that make up an application into logical units for easy management and discovery. Container technology makes software development more flexible and agile, however it is quite complex to manage and requires a certain level of expertise.

IONOS cloud Managed Kubernetes facilitates the fully automated setup of Kubernetes clusters. Several clusters can also be quickly and easily deployed, for example to set up staging environments, and then deleted again if necessary. Kubernetes also significantly simplifies the automation of CI/CD pipelines in terms of testing and deployment.

IONOS cloud Managed Kubernetes solution offers maximum transparency and control of the K8s cluster. This includes:

- Fully automated setup of entire K8s clusters and K8s node pools (with optional horizontal auto-scaling of nodes)
- Highly-available and geo-redundant control plane
- Full cluster admin-level access to Kubernetes API
- Dedicated CPU and memory resource assignment
- Double redundant and persistent HDD/SSD storage
- Easy integration of cloud services
- Regular security and version updates

IONOS cloud Managed Kubernetes is free of charge. The customer pays only for the underlying IONOS cloud infrastructure actually needed.

5 IONOS Private Cloud powered by VMware

IONOS Private Cloud powered by VMware brings VMware enterprise-class Software-Defined Data Center software to the portfolio of IONOS cloud, enabling customers to run any application across vSphere-based private cloud environments.

The Service Offering has the following components:

- Private Cloud consisting of:
 - VMware vSphere running on dedicated servers
 - VMware vCenter Server appliance
 - VMware NSX-T to power networking for the Service Offering
 - VMware vSAN aggregating host-based storage into a shared data store
- Self-service provisioning and scaling of Private Cloud on demand
- Access to the vSphere Client and NSX-T Manager, ability to configure and design the virtual data center that best fits to ones use cases
- Maintenance, patching, and upgrades of the PC (the hardware, physical infrastructure and VMware stack), performed by IONOS

IONOS Private Cloud powered by VMware can be provisioned and scaled vertically on demand. A Private Cloud cluster includes a minimum of three hosts. Customers can add hosts, up to the provisioning maximum for their organization. Customers can select the country location of the data center where their Private Cloud will be provisioned.

IONOS Private Cloud powered by VMware runs exclusively on high performance, state-of-the-art hardware and virtualization technology. vSAN, NSX-T, Intel Optane and NVMe storage provide processing speeds that significantly optimize your workloads.

6 24/7 Enterprise Level Support

IONOS cloud offers its customers technical support by telephone and email. Experienced system administrators take the customers' calls and emails and address their concerns immediately. 24/7 Enterprise Level Support can be contacted by email or telephone 24 hours a day, seven days a week, via the following contact details:

<https://dcd.ionos.com/help/en/contact.htm>

7 Data Centers

IONOS cloud uses data centers at different locations worldwide. The security concepts of the data centers are always based on the highest industry standards.

7.1 IONOS cloud Compute Engine Locations

7.1.1 Berlin (Germany)

Operator	United Internet AG
Certifications	ISO/IEC 27001
Fire protection zones	One
Power supply	Availability 99.99% p. a.
Battery buffer	Yes
Emergency power	A/B system, 2N USV redundancy, Emergency diesel generator with N+1 redundancy
Air conditioning	Cold aisle containment, blow-in temperature 23 °C
Early fire detection	Yes
Fire extinguishing system	Yes

7.1.2 Frankfurt am Main (Germany)

Operator	Equinix (Germany) GmbH
Certifications	ISO/IEC 27001, ISO 9001, SSAE 16/ISAE 3402, (SOC1, SOC2), PCI-DSS
Fire protection zones	Three
Power supply	Availability 99.99+% p. a.
Battery buffer	Yes
Emergency power	Emergency diesel generator with N+1 redundancy, capable of being refueled during operation
Air conditioning	Cold aisle containment, blow-in temperature 22 °C
Early fire detection	Yes
Fire extinguishing system	Yes

7.1.3 Karlsruhe (Germany)

Operator	TelemaxX Telekommunikation GmbH
Certifications	ISO/IEC 27001
Fire protection zones	Two
Power supply	Availability 99.99+% p. a.
Battery buffer	Yes
Emergency power	Emergency diesel generator with N+1 redundancy, capable of being refueled during operation
Air conditioning	No explicit containment, temperature within data center 23 °C
Early fire detection	Yes
Fire extinguishing system	Yes

Since 21st April 2020, it is no longer possible to create new virtual data centers in Karlsruhe.

7.1.4 London (UK)

Operator	Virtus Data Centres Ltd.
Certifications	ISO/IEC 27001, ISO 9001, ISO 14001, ISO 50001, ISO 20000, ISAE 3402 compliant, PCI-DSS compliant, BREEAM excellent
Fire protection zones	One
Power supply	Availability 99.99% p. a.
Battery buffer	No - the generators are rotary
Emergency power	Emergency diesel generator with N+2 redundancy, capable of being refueled during operation
Air conditioning	Hot aisle containment, temperature within data center 23 °C
Early fire detection	Yes
Fire extinguishing system	Yes

7.1.5 Las Vegas (USA)

Operator	Switch, Inc.
Certifications	ISO/IEC 27001, ISO 9001, SSAE 16/ISAE 3402 (SOC1, SOC2), PCI-DSS
Fire protection zones	Two
Power supply	Availability 99.99+% p. a.
Battery buffer	Yes
Emergency power	Emergency diesel generator with N+2 redundancy, capable of being refueled during operation
Air conditioning	Hot aisle containment, temperature within data center 22 °C
Early fire detection	Yes
Fire extinguishing system	Yes

7.1.6 Newark (USA)

Operator	QTS Realty Trust, Inc.
Certifications	SOC1, SOC2, PCI, ISO27001, HITRUST
Fire protection zones	One
Power supply	Availability 99,99+% p. a.
Battery buffer	No – the generators are rotary
Emergency power	Emergency diesel generator with N+2 redundancy, capable of being refueled during operation
Air conditioning	Cold aisle, temperature within data center approximately 23 °C
Early fire detection	Yes
Fire extinguishing system	Yes

7.2 IONOS Private Cloud powered by VMware Locations

7.2.1 Karlsruhe - Baden AirPark (Germany)

Operator	1&1 IONOS SE
Certifications	ISO/IEC 27001, ISO/IEC 50001
Fire protection zones	Three
Power supply	Availability 99.99+% p. a.
Battery buffer	Yes
Emergency power	Emergency diesel generator with N+1 redundancy, capable of being refueled during operation
Air conditioning	Cold aisle containment, blow-in temperature 22 °C
Early fire detection	Yes
Fire extinguishing system	Yes

7.2.2 Logroño (Spain)

Operator	Arsys Internet S.L.U. (100% subsidiary of 1&1 IONOS SE)
Certifications	ISO/IEC 27001, ISO/IEC 50001
Fire protection zones	Two
Power supply	Availability 99.99+% p. a.
Battery buffer	Yes
Emergency power	Emergency diesel generator with N+1 redundancy, capable of being refueled during operation
Air conditioning	Cold aisle containment, blow-in temperature 22 °C
Early fire detection	Yes
Fire extinguishing system	Yes

7.2.3 Gloucester (UK)

Operator	Fasthosts Internet Ltd. (100% subsidiary of 1&1 IONOS SE)
Certifications	ISO/IEC 27001, ISO/IEC 50001
Fire protection zones	One
Power supply	Availability 99.99+% p. a.
Battery buffer	Yes
Emergency power	Emergency diesel generator with N+1 redundancy, capable of being refueled during operation
Air conditioning	No explicit containment, temperature within data center 23 °C
Early fire detection	Yes
Fire extinguishing system	Yes