



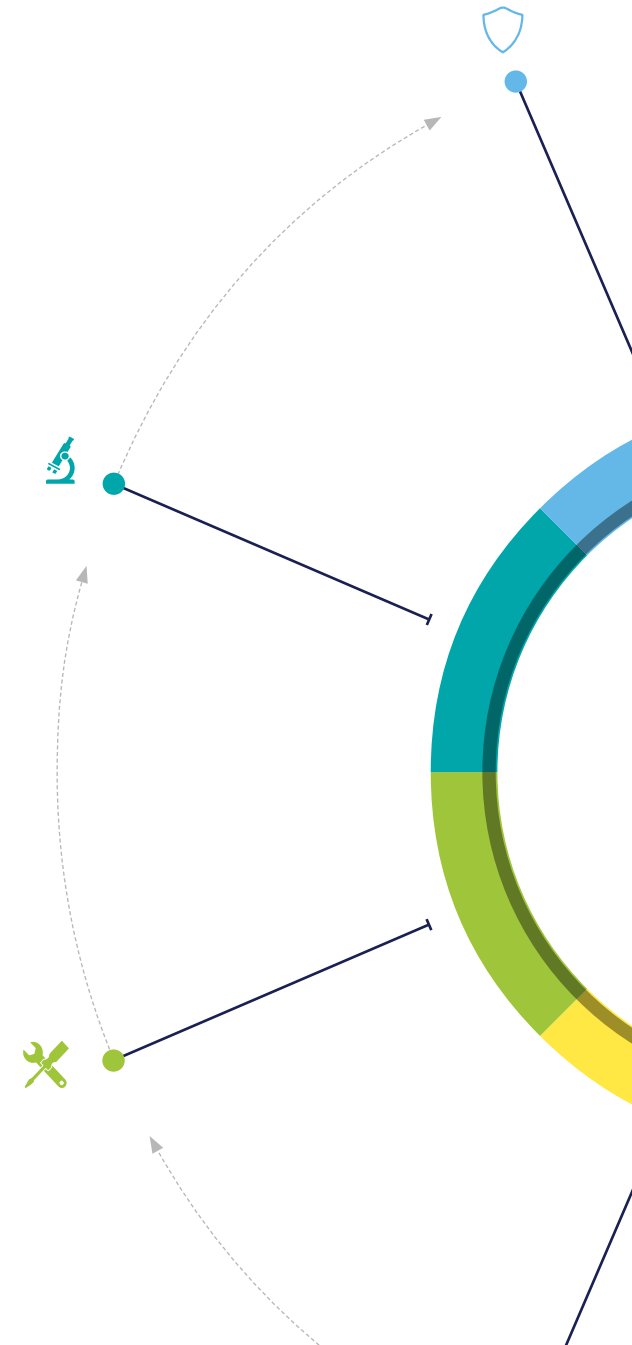
Cloud Services from O₂

Infrastructure as a Service

Product handbook

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Product overview

1.1. Introduction

Infrastructure as a Service (IaaS) from O₂ is a cloud-enabled service that gives you scalable, reliable computing power where and when you need it. As organisations become more mobile and agile, so must the computing power that drives them. For most, this means bringing cloud computing into the heart of their infrastructures. Virtualisation allows you to do this cost-effectively, using an IaaS model. You can procure your new cloud-based services as an operational cost, rather than capital investment.

IaaS is our virtual private cloud service, and is aimed at Enterprise customers who wish to virtualise their server environment. IaaS gives you a virtualised Resource Pool so you can build your own IT platforms.

Moving from a physical server environment that is owned and operated in-house to hardware virtualisation will improve the business efficiency of your IT operations and lower the total cost of ownership.

1.2. Connectivity

Connectivity to the cloud platform can consist of the following:

- Private access via a private addressing architecture set out by RFC 1918
- Public access via a public addressing architecture

In order to receive the IaaS benefits, at least one of the following must be in place from your location(s):

- **'Public access':** High-speed-internet from Telefónica
 - **'Private access':** O₂ Gateway from Telefónica
 - **'Public access':** Other licence operator connectivity – you will provide
 - **'Private access':** Other licence operator connectivity – you will provide
 - **'Private access':** Cross-connectivity - you will provide.
- For those customers with an existing presence in our data centre

For public access (high-speed-internet) or public other licence operator connectivity, Telefónica will provide setup and maintenance of the public IP addresses and routing within the IaaS platform.

For private access provided by the O₂ Gateway, Telefónica will deliver the following at both your and the data centre location(s):

- Setup and maintenance of the private IP addresses, networking and routing within the IaaS platform
- Setup and maintenance of end-to-end connectivity from your location(s) to the IaaS platform

For private other licence operator connectivity, Telefónica will provide the following:

- Installation of a network that connect(s) between private other licence operator connectivity to the IaaS platform. This network interconnect will typically terminate on the inside interface of your CPE equipment or private other licence operator-provided CPE equipment. The private other licence operator connectivity and terminating CPE will be your responsibility
- Setup and maintenance of the private IP addresses, NAT, networking and routing within the IaaS platform

For private cross-connects, Telefónica will typically provide the following:

- Installation of a network that connects between private cross-connects and the IaaS platform. This network interconnect will typically terminate on the inside interface of your provided CPE equipment. The private cross-connects and terminating CPE will be your responsibility
- Depending on the services, there may be an opportunity for Telefónica to provide the terminating CPE and potentially the private cross-connects
- Setup and maintenance of the private IP addresses, NAT, networking and routing within the IaaS platform

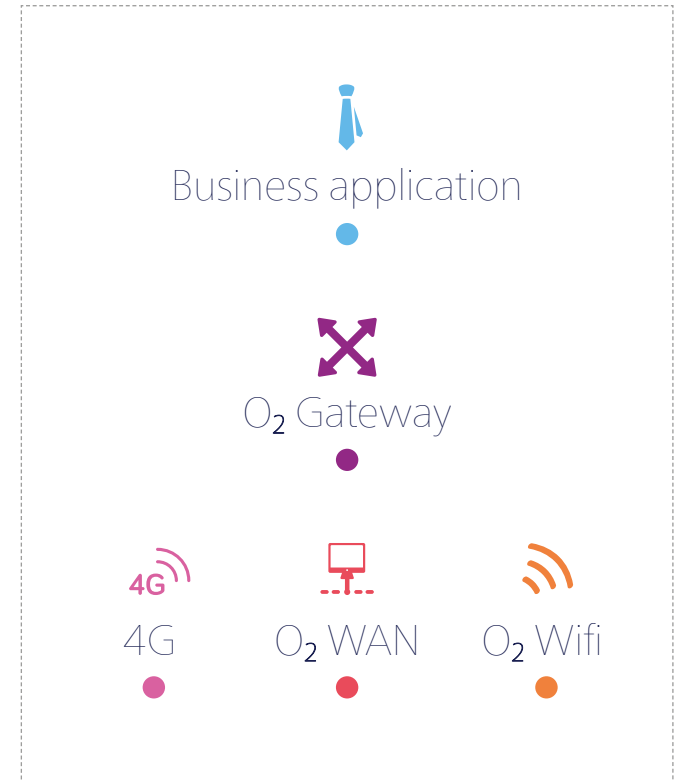
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Product overview

1.3. O₂ Gateway

IaaS gives the following advantages when delivered with O₂ Gateway:

- Your business applications built on the IaaS platform are fully connected with our O₂ Gateway network. This enables our solution architects to design topologies bespoke to your fixed and mobile requirements. The O₂ Gateway network offers unique national footprint technologies of 4G, wifi and Managed WAN
- **4G:** Private mobile datalink connects your IaaS platform to the O₂ mobile data network. It provides your people with mobile access to business-critical applications and data, enabling smarter working
- **O₂ Managed WAN:** Our virtual private network is based on IP MPLS and is flexible, reliable and secure. We handle all the links between your sites, and you can even connect individual remote workers. The connections from your sites can be between copper DSL/EFM and fibre FTTC/Ethernet up to 1Gbps
- **O₂ Wifi:** Provide visitors and employees in your building with an office wifi connection that does not require a password. Users only need to register once at any of your offices, or at any of our 10,000+ O₂ Wifi venues, and connectivity is automatic. People can be productive as soon as they enter your premises. In addition, it provides longer sessions than our standard public wifi, so people can stay connected for up to 16 hours
- With over ten million existing customers registered on the O₂ Wifi network, many people will already be registered and connection will be automatic as soon as they enter any of your buildings. There is also an O₂ Wifi mobile app to make it even easier to sign up and find other O₂ Wifi hotspots



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Product overview

1.4. Tier 3 data centre

IaaS provides the underlying infrastructure, and is hosted in secure and resilient data centre environments, so you no longer have to rack and stack hardware, power, cooling, maintenance and support. The data centre is energy-efficient and reduces cooling consumption and the amount of environmental power used. This can decrease your organisation's carbon footprint.






The primary data centre offers the following physical security features:






- Ballistic glass mantrap and air lock
- Full height in and out turnstiles
- 24x7 security guards
- Electronic – 24x7 monitoring, digital CCTV backed by 90 days of digitally recorded material
- Biometric palm scanner
- Photo ID access card (at the entrance)
- Intruder alarm

1.5. Flexible compute

Compute resources can be provisioned on demand as a utility, with the flexible and scalable platform of IaaS. Standardised provision and de-provision of VMs accelerates the development and implementation of applications. This reduces lead times and the installation and configuration processes of a traditional physical server architecture.

- Scale and automate the operations of your IT department with the support of multiple operating systems (OS) environments
- Applications will exist on the same hardware platform but in complete isolation from each other
- IaaS is built to high-availability resilience to withstand a physical server failure with ESX clusters at N+1. This allows O₂ to offer availability on Service Level Agreements (SLAs) of up to 99.9%
- Platform resilience is designed to ensure that no single point of failure exists. Capacity is available so operational service remains should a failure occur at the network, storage or physical server layer

- Telco-grade data centres 
- Reduced carbon footprint 
- Availability 
- Cooling 
- Power 

- Flexible computer 
- Virtual machine 
- Scalability 
- Storage 
- Backup 

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IaaS security

2.1. Network services security

The IaaS platform is built with a physical firewall perimeter to protect the platform, securing the applications exposed to the public internet and the support of SSL VPN termination. Backend firewalls secure connectivity of the platform's management network.

2.2. Virtualised customer security

The firewall services layer for a customer Resource Pool is a virtualised firewall environment implemented by means of the vShield Edge component and detailed in the 'virtualised network options'.

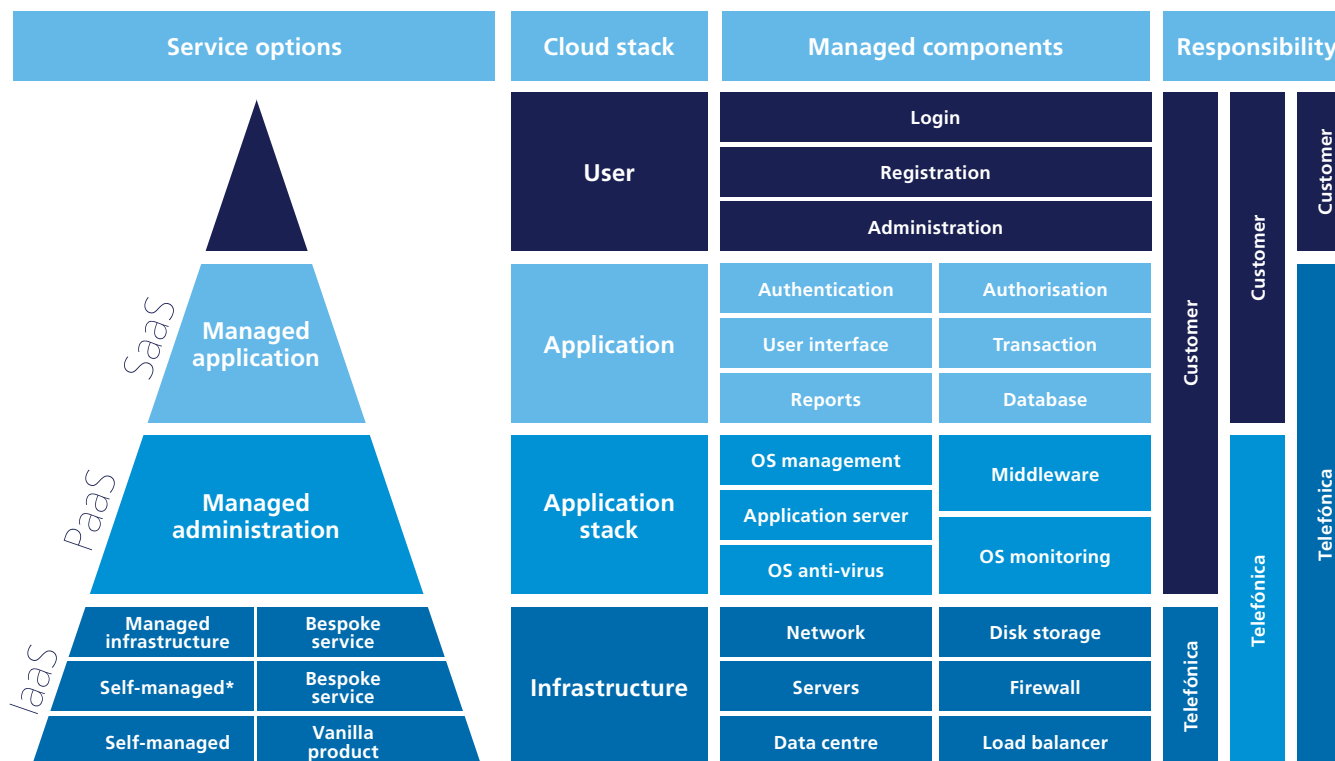
2.3. Dedicated physical firewall

You can request a physical firewall environment for your Resource Pool, but this is excluded from the IaaS and PaaS products. If you would like a dedicated physical firewall, please let your solution architect know during the design phase.

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Service model

IaaS includes the infrastructure of network, compute, storage and backup with monitoring of these services up to the hypervisor. These services are on a virtualised architecture, which is owned and managed by O₂.



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Service model

3.1. Self-managed

The vanilla product offering gives customers their own O₂ management and monitoring portal so you can manage and provision your own VMs.

Guided tour: Included within the product for self-managed, O₂ offers to carry out an online demo to explain the main features and functions of the service via the O₂ management and monitoring portal.

Self-Managed roles and responsibilities: All defined roles and responsibilities between O₂ and the customer listed within this P-Book are included for a 'self-managed' – only Resource Pool.

3.2. Self-managed+

There are two bespoke service offerings to Self-managed+ and you can choose both or either service option:

- **Commissioning:** Customers will be supported during the design phase by an architect who will advise on the best option to deploy the environments for your applications. O₂ will provision the initial configuration of the VMs and network. Once provisioned, the operational management is then handed over to the customer as detailed in 'self-managed'
- **Premium support:** This service is designed to complement customers who already have the necessary IT technical skills but need temporary help and assistance in setting up the first configurations of the IaaS environments. With this offering you have the flexibility of the 'self-managed' product with additional support during the implementation phase

Self-managed+ roles and responsibilities:

All defined roles and responsibilities between O₂ and the customer listed within this P-Book are subject to change based on any solution design incorporating:

- Self-managed+ commissioning and/or
- Self-managed+ premium support

The solution architect or service architect is responsible for updating the roles and responsibilities based on the solution requirements. This is documented in a customer-facing proposal, HLD and bespoke service schedule.

3.3. Managed infrastructure

A bespoke service offering from O₂ to provision and de-provision VMs. Access to vCentre is restricted to O₂ throughout the contract term. O₂ commissions and manages the platform at VM instance level (not at operating system level or above).

Managed infrastructure roles and responsibilities:

All defined roles and responsibilities between O₂ and the customer listed within this P-Book are subject to change.

The solution architect or service architect is responsible for updating the roles and responsibilities based on the solution requirements. This is documented in a customer-facing proposal, HLD and bespoke service schedule.

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Define a Resource Pool

It is possible to define a number of different Resource Pools for your IaaS environment. Each Resource Pool can be tailored to support multiple operating systems (OS) environments. The table below defines the feature of the Resource Pool:

Resource Pool options	Options	FAQ
Compute reservation type	Standard or Premium	Can a single Resource Pool be deployed as both Standard or Premium? No. Compute reservation is either standard or premium within the Resource Pool.
Total number of vCPU	1-8 vCPU per VM	Can each VM be built with different vCPU values? Yes. Within the Resource Pool a VM can be allocated 1-8 vCPU.
Total vRAM memory	1-64GB per VM	Can each VM be built with different vRAM? Yes. Within the Resource Pool a VM can be allocated 1-64GB in 1GB increments.
SAN storage (OS disk)	Platinum, Gold, Silver, Bronze	Can a Resource Pool support multiple options of SAN storage? Yes. A Resource Pool can be provisioned with all storage options. Each VM can be allocated only one option of SAN storage.
Total vShield licence	Compact and Gateway	Can a Resource Pool support both Compact and Gateway licences? Yes. A Resource Pool can be provisioned with both licence types.
NAS storage	Gold, Silver, Bronze	Can a Resource Pool support multiple options of NAS storage? Yes. A Resource Pool can be provisioned with all NAS storage options.
Shared storage (iSCSI)	Platinum, Gold, Silver, Bronze	Can a Resource Pool support multiple options of shared storage? Yes. A Resource Pool can be provisioned with all shared storage options.
Backup policy	Gold, Silver, Bronze, Iron, Copper	Can a Resource Pool support multiple options of backup policies? Yes. A Resource Pool can be provisioned with all backup policies.
Monitoring option	Advanced or basic	Can a Resource Pool support advanced and basic monitoring? Yes. A Resource Pool can be allocated both advanced or basic monitoring licences.

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Options within the Resource Pool

5.1. Compute reservation of CPU and RAM

The contracted level of computation is defined as either 'Standard' or 'Premium' within the Resource Pool:

- **Standard:** High level of CPU and RAM resource-sharing
- **Premium:** Dedicated CPU and RAM resources ensuring that there is no oversubscription

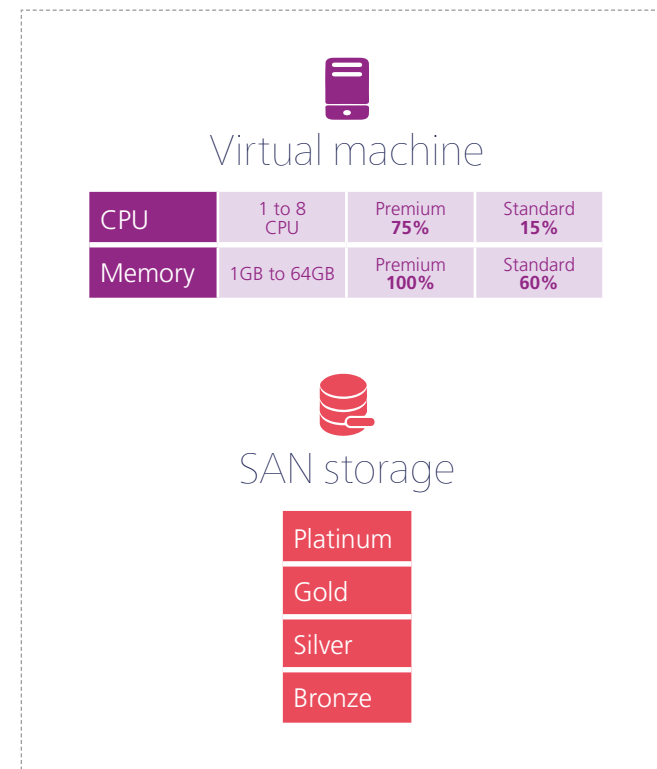
5.2. VM CPU and RAM allocation

The characteristics that define the types of VM deployed:

- Maximum permissible size for VM are 8 vCPUs and 64 GB RAM
- Each vCPU being the equivalent to a 2GHz computing capacity
- VMs allow up to 10 network interfaces

You can change the number of CPUs or GB RAM assigned to a server. This is a straightforward configuration change and, depending on the operating system, you may not need to restart the virtual server.

5.3. VM operating system disk



All VMs are configured with at least two disks – an operating system disk and a local storage disk. VMs support up to 1 TB per hard drive. Any additional hard drives must be of the same value.

The SAN (Storage Area Network) storage options for the operating system disk start at Bronze through to Platinum.

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Options within the Resource Pool

FC = Fibre Channel

SSD = Solid State Drive

IOPs = (Input/Output) Operations Per Second

LUN = Logical Unit Number

5.4. SAN storage options

SAN (Storage Area Network) provides high speed connections and is capable of large volume information transfers with little delay.



SAN storage

Platinum	FC 8GB	SSD	IOPs to LUN 3000	Silver	FC 8GB	SAS 10k	IOPs to LUN 500
Aimed at providing maximum returns. Delivered on solid state drives (SSD), this range avoids delays and is suitable for those critical applications that require transfer rates and extreme process capabilities.				Aimed at providing high performance. Delivered on Serial Attached SCSI (SAS) disks, this range is suitable for critical applications that do not need the extreme performance of SSD drives but still require a high yield.			
Gold	FC 8GB	SAS 15k	IOPs to LUN 800	Bronze	FC 8GB	NL-SAS 7.2k	IOPs to LUN 250
Aimed at providing high performance. Delivered on Serial Attached SCSI (SAS) disks, this range is suitable for critical applications that do not need the extreme performance of SSD drives but still require a high yield.				Aimed at providing moderate performance. Delivered on Nearline Serial Attached SCSI (NL-SAS) drives. An economical solution.			

- A user can deploy a VM with multiple virtual hard disks
- Overall vHDs of the same VM must have the same SAN storage quality
- After VM creation, disk sizes can be updated and new ones can be added/removed
- Upgrading the size of a vHD must be supported by the guest OS
- A minimum size of 25GB will be provided for a vHD, which can be increased in 25GB steps
- The minimum size allocated to the Resource Pool is SAN Platinum: 200 GB, SAN Gold: 200 GB, SAN Silver: 200 GB and SAN Bronze 500 GB

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Options within the Resource Pool

5.5. VM private catalogue

Administrators can create catalogue templates dedicated to your IaaS environment by importing through the portal. If a private catalogue needs a large quantity of templates, then external media can be used to upload to the IaaS environment, with the support of O₂ staff.

Please note that bespoke template uploads require a manual process that may incur additional charges. We recommend 'Bronze' SAN storage for these templates.

5.6. VM public catalogue

Please note that under IaaS, O₂ does not provide the OS licence. Additional upgrades to the latest service pack, and security updates, are the responsibility of the customer. The public catalogue includes the following templates:

OS Windows server	Release	Edition
Windows 2008	R1	Standard 32-bit
Windows 2008	R1	Standard 64-bit
Windows 2008	R1	Enterprise 32-bit
Windows 2008	R1	Enterprise 64-bit
Windows 2008	R2	Standard 64-bit
Windows 2008	R2	Enterprise 64-bit
Windows 2012	R1	Standard 64-bit
Windows 2012	R1	Datacentre 64-bit
Windows 2012	R2	Standard 64-bit
Windows 2012	R2	Datacentre 64-bit
Red Hat Enterprise	5	Linux
Red Hat Enterprise	6	Linux
Red Hat Enterprise	6	Linux

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Options within the Resource Pool

CIFS = Common Internet File System

NFS = Network File System

SAS = Serial Attached SCSI

NL = Nearline

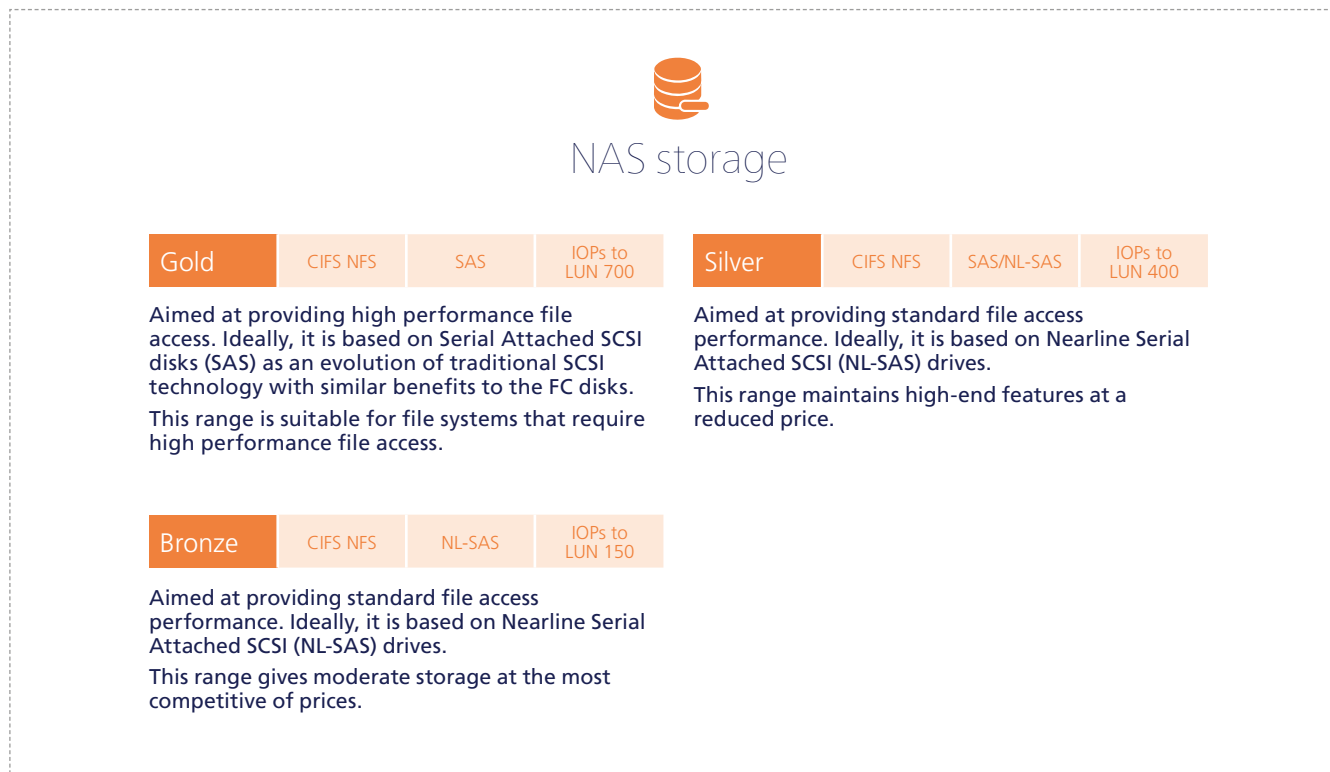
IOPs = (Input/Output) Operations Per Second

LUN = Logical Unit Number

5.7. NAS storage options

The NAS (Network Attached Storage) service provides the capability to offer different performance levels (Gold, Silver and Bronze).

NAS service can be accessed by multiple VMs belonging to the same customer.



NAS storage is provisioned manually via a service desk ticket. The minimum sizes offered to a Resource Pool are: NAS Gold: 200 GB, NAS Silver: 500 GB and NAS Bronze: 1 TB.

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Options within the Resource Pool

SAS = Serial Attached SCSI

IOPs = (Input/Output) Operations Per Second

LUN = Logical Unit Number

5.8. NAS storage isolation

A dedicated VLAN (Virtual Local Area Network) is created and assigned to each NAS customer, and exposed only to the customer's VMs. This guarantees NAS traffic isolation between customers, and is used to connect customer VMs (at OS level) with the NAS access systems (HP File Controller) responsible for providing NAS access to the storage array.

Access to the service is provided via two protocols:

- CIFS access (typically for Microsoft Windows VMs)
- NFS access (typically for Unix/Linux VMs).

Please note: It is not possible to access the same file system using both CIFS and NFS.

NAS authentication is optional and, if required, NFS and CIFS will be configured to support user/password authentication using an Active Directory. This Active Directory is part of the NAS service and shared by all NAS customers.

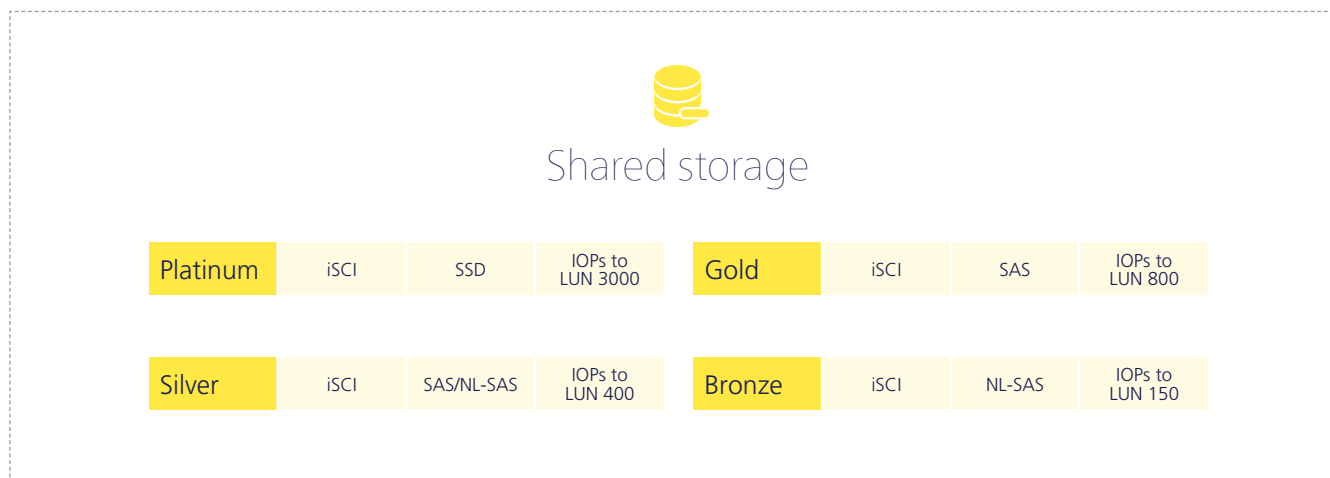
Customers' credentials will be populated by the operations team via a service desk ticket as part of the manual provisioning procedure. This procedure consists of:

- Creating NAS volume
- Creating customer NAS VLAN
- Creating ACLs
- Connecting customer NAS VLAN with customer org(s).

NAS authentication is reached through a common PVLAN (Private Virtual Local Area Network) shared by all customers. All customers share a common Active Directory domain ('TELEFONICA') to perform authentication.

You can request the creation of multiple NAS users, and you can define which volumes are accessible for each of them (i.e. a single volume can be accessed by multiple users, and one user can access multiple volumes).

5.9. iSCSI shared storage



Shared storage is provisioned manually via a service desk ticket. The minimum sizes offered to a Resource Pool are: Shared Platinum: 500 GB, Shared Gold: 500 GB, Shared Silver: 500 GB and Shared Bronze 500 GB.

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VM backup policy

6. VM backup policy

O₂ offers five options for VM backup, and will create the backup schedule according to individual or grouped VMs:

- Backup is the hypervisor-level of the VM
- Restoration of VM will be done by a customer self-serve portal



Backup

Gold	Daily 28d	Weekly 12w	Monthly 12m	Silver	Daily 14d	Weekly 8w	Monthly 6m
<ul style="list-style-type: none"> • One full weekly backup and six incremental backups for four weeks (28 days) • Retention on full weekly backup is 12 weeks • Incremental daily retention is four weeks • In addition, a monthly backup is taken (one of the weekly backups) and this is kept for 12 months 				<ul style="list-style-type: none"> • One full weekly backup and six incremental backups for 1st and 2nd weeks • Retention on full weekly backup is eight weeks • Incremental daily retention is two weeks • In addition, a monthly backup is taken (one of the weekly backups) and this is kept for six months 			
Bronze	Daily 7d	Weekly 4w	Monthly 3m	Iron	Daily 7d	Weekly 4w	
<ul style="list-style-type: none"> • One full weekly backup and six incremental backups for the 1st week • Retention on full weekly backup is four weeks • Incremental daily retention one week • In addition, a monthly backup is taken (one of the weekly backups) and this is kept for three months 				<ul style="list-style-type: none"> • One full weekly backup and six incremental backups for 1st week • Retention of full weekly backup is four weeks • Incremental daily retention is one week 			
Copper	Daily 7d	Weekly 1w					
<ul style="list-style-type: none"> • One full backup and six incremental backups for 1st week • Retention: full and incremental backups kept for one week 							

7

Virtualised network options

7.1. vShield Edge Gateway

Connection to external networks – either by public internet and/or private WAN via O₂ Gateway – requires traffic to be routed via vShield Edge Gateway.

An Edge Gateway is an interface element that simulates a virtual router for organisation networks. It allows the setup of DHCP services, firewall, NAT, static routing, VPN connections and load balancers:

- The Edge Gateway allows up to 10 interfaces. These interfaces allow up to a maximum of 10 external interfaces between external Organisation networks
- External networks can only be created by O₂ administrators
- The Edge Gateway is always configured in high availability

7.2. vShield firewall

You will be able to configure your own firewall rules for access to external network interconnect via the self-serve portal:

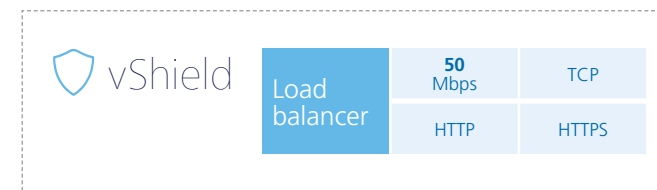
- Allowing all traffic
- Denying all traffic
- Configuring FTP rules that filter setting (21), SSH port (22), HTTP (80) or other ports to enter the client on TCP, UDP or ICMP protocols. Valid values to filter may be any IP address, CIDR range of IP source or destination



7.3. vShield load balancer

You will be able to configure your own load balancing via the self-serve portal:

- Balancing TCP, HTTP and HTTPS
- Establish policies for balancing traffic distribution among group members. The following balance algorithms are supported:
 - **IP hash:** depending on the source address and destination of the packet
 - **Round robin:** distributes traffic evenly between servers pool
 - URI algorithm
 - Minimum number of connections distributed to members of the pool where fewer connections are active



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Virtualised network options

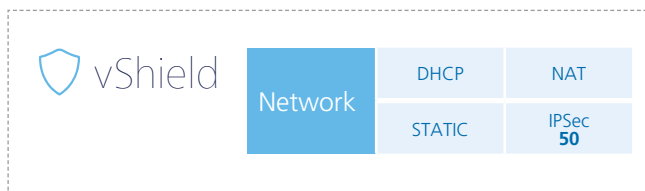
7.4. vShield network

The following additional services are supported:

- **NAT:** The Network Address Translation (NAT) modifies the IP source and destination addresses of packets arriving or departing the Edge Gateway. Source NAT (SNAT) translates the source address of a packet before leaving the Edge Gateway, while destination NAT (DNAT) translates the IP or destination port of a packet received by the Edge Gateway addresses
- **DHCP:** The Dynamic Host Configuration Protocol (DHCP) automates the assignment of IP to VMs connected to the network addresses organisation. You can configure and manage IP address ranges and parameters for each concession network, organisation or Edge Gateway connected to this
- **Routing:** Assigned static routes allow traffic between networks
- **VPN tunnels:** The IPSec VPN service helps you to create secure VPNs between gateways
- Each service that is active will require an IP layer: one IP if the firewall is activated, another IP if the load balancer is activated. One for each NAT (1:1 ratio) and one to access the VPN tunnels

7.5. vShield Edge Compact

Allows for a next level of safety between vApps and network organisations. These services allow Edges DHCP, firewall, NAT and the static routing equivalent to having an Edge Gateway. These firewalls have no flow limitation as they exist only in the virtual domain.



8

Monitoring the virtualised platform

8.1. Self-service portal

The O₂ monitoring portal of the IaaS is a monitoring tool based on the solution of CA Technologies (Nimsoft). It provides a simple and intuitive way to check system health from a web portal.

You can perform the following actions through the monitoring portal:

At portal management level:

- Configure and manage monitors from a single portal
- Customise parameters and thresholds for each monitor

At reports management level:

- Create and customise real-time reports (dashboards)
- Schedule reports or generate with long-term data
- Send reports by email

At event management level:

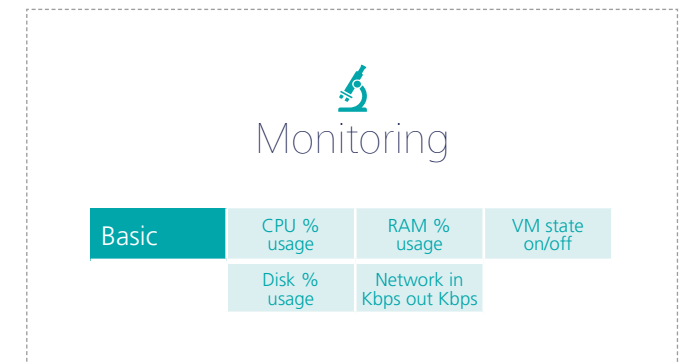
- Retain and archive events for long periods of time
- Correlate faulty events with performance events
- Set the ability to notify technicians by email

All these features will be described in the user manual.

8.2. Basic monitoring

The basic mode covers the monitoring of parameters for the performance of a VM that runs on a vApp.

- Usage of vCPU
- vRAM memory usage
- Disk occupation capacity
- Turning on the VM
- Transmitted input and output data by VM (Kbps)



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Monitoring the virtualised platform

8.3. Advanced monitoring

The advanced mode offers a more granular monitoring, based on agent installation, depending on the application you want to monitor. Advanced monitoring includes basic monitoring at no additional charge.

The advanced monitor is linked to each VM and allows the installation of as many agents as required within the VM. The packages included in advanced monitoring are as follows:

- Use of vCPU
- Use of vRAM
- Use of vRAM by process
- Use of file system
- Control of raised ports (ICMP)



Monitoring

Advanced	Tomcat	JBoss	Weblogic
	WebSphere	Windows ports processes	Linux ports processes
	Apache	IIS	MySQL
	Oracle	Microsoft SQL	

Please note: Advanced monitoring on application servers is only available on Linux OS. For advanced monitoring a Nimsoft monitoring robot must be installed on the virtual machine OS

8.4. Service request



Service requests

O₂ Portal (SNOW)

Incident

Inventory

Change

Service Now

Service Now is the IT Service Management toolset used by the O₂ Unify service desk. The toolset consists of applications based on the ITIL standards. It allows the service desk to log, update and manage incidents, service requests, problems and changes.

Service Now is accessed via a single web-based portal. Work queues are managed according to priority and pre-defined Service Level Agreements. The system is configured to send email updates to the end customer, internal resolver groups and other interested parties as records are updated.

9

IaaS customer journey

9.1. Architecture engagement

We recognise the importance of a successful transition and proven delivery methodology across our supply chain. Working with you, we will ensure a risk-free and timely migration. Reliability is key to every stage of our proposed solution, from design, architecture, capacity, flexibility and governance. This will remove exposure to the business continuity risks inherent with any on-premise infrastructure.

An O₂ solution architect will work with your IT team to design the Resource Pool requirements. During this phase, detailed discovery will be completed for all applications in-scope for migration.

We will begin by analysing your estate and establishing the readiness for migration. We will then identify application dependencies and hierarchy in order to recommend the least disruptive and most efficient migration strategy.

9.2. Resource Pool flexibility

O₂ understands that IT environments have different flexibility needs for compute elasticities. An O₂ solution architect will work with you to understand the potential growth of IT workloads to design Resource Pools that can flexibly grow with your business.

9.3. Commercial proposition

After completion of the discovery, analysis and mapping, O₂ will submit a proposal document providing a commercial price for each Resource Pool and the technical parameters for each pool.

9.4. Resource Pool identification

Each Resource Pool within the IaaS environment is identified with a unique ID. The ID will be used to interact with the following product features:

- Service request submissions to SNOW (Service Now portal)
- Pool resources identified on your bill
- Capacity reporting via VMware's vCentre operations management suite
- Infrastructure utilisation via CA technologies (Nimsoft)

A customer end user guide will be available for each product feature.

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IaaS roles

10.1. Server hardware roles

The table below describes the server hardware roles and responsibilities between O₂ and the customer:

Server hardware	O ₂	Customer
Implementation of hardware upgrades	●	
Monitoring of key server components	●	
Maintain existing server documentation including server design documents and schematics	●	

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laaS roles

10.2. Virtualised environment roles

The table below describes the virtualised environment roles and responsibilities between O₂ and the customer:

Virtualised environment	O ₂	Customer
Technical qualification of hardware and software incidents	●	
Escalation to Tier 2 support	●	
Escalation of Tier 3 (incidents to vendors)	●	
Installation of application patches to virtual infrastructure	●	
Installation of service packs to virtual infrastructure	●	
Installation of security patches to virtual infrastructure	●	
laaS capacity management	●	
Fault logging and progression with virtualisation vendor	●	
Virtual server guest management		●
Tuning and analysis of virtualisation infrastructure up to hypervisor	●	
Tuning and analysis of virtualisation infrastructure VM and above		●
Monitoring of key virtual infrastructure services and components up to hypervisor	●	
Monitoring of key virtual infrastructure services and components, VM and above		●
Maintain existing virtual server documentation including VM design documents and schematics		●

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laaS roles

10.3. Storage and backup hardware roles

The table below describes the storage and backup hardware roles and responsibilities between O₂ and the customer:

Storage and backup hardware	O ₂	Customer
Hardware management	●	
Installation of firmware and software upgrades as required	●	
Implementation of hardware upgrades	●	
Monitoring of key storage components	●	
Maintain existing storage documentation including storage design documents and schematics	●	

10.4. Storage and backup management roles (table one)

The table below describes the storage and backup management roles and responsibilities between O₂ and the customer:

Storage and backup hardware	O ₂	Customer
Monitor and manage backup process – VM and customer data	●	
Report on backup failures of the VM	●	
Manage archiving and vaulting – VM and customer data		●
Manage off-site media storage requirements – VM and customer data		●
Manage and implement restore requests of the VM	●	
Manage and implement non-standard backups – VM and customer data		●
Monitor and manage backup process – customer application data		●
Report on backup failures – customer application data		●

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laaS roles

10.5. Storage and backup management roles (table two)

The table below describes the storage and backup management roles and responsibilities between O₂ and the customer:

Storage and backup hardware	O ₂	Customer
Manage archiving and vaulting – customer application data		●
Manage off-site media storage requirements – customer application data		●
Manage and implement restore requests – customer application data		●
Manage and implement standard and non-standard backups – customer application data		●
Manage and implement changes to backup schedules – customer application data		●
Manage and implement regular test restores to ensure accuracy and validity of data – customer application data		●
Provision of disk media to an agreed standard	●	

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laaS roles

10.6. Portal management roles

The table below describes the portal management roles and responsibilities between O₂ and the customer:

Storage and backup hardware	O ₂	Customer
Hardware management	●	
Installation of firmware and software upgrades as required	●	
Implementation of hardware upgrades	●	
Monitoring of key server components	●	
Monitoring of key portal components	●	
Maintain existing portal documentation including portal design documents and schematics	●	
Monitoring portal availability	●	

10.7. Provisioning roles

The table below describes the provisioning roles and responsibilities between O₂ and the customer:

Storage and backup hardware	O ₂	Customer
Customer set-up on provisioning portal	●	
Solution build document (IaaS provision form), customer information Resource Pool parameters, user profiles		●
Implementation of customer Resource Pool, user profiles and additional services (basic and advanced monitoring), checking base log files for errors	●	
Implementation of operating system, software application, migration and testing		●
Configuration, design and testing of the VM, virtual compute and storage environment		●

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Definition of terms

11.1. Definition table one

The table below describes the abbreviations and terms within the product handbook:

Term/expression	Customer	Term/expression	Customer
ACLs	Access Control Lists	NAT	Network Address Translation
CIDR	Classless Inter-Domain Routing	NFS	Network File System
CIFS	Common Internet File System	NL-SAS	Nearline Serial Attached SCSI drive of the Virtual Machine storage device
CPE	Customer Premise Equipment	Organisation	A top-level container that contains storage, compute (such as CPU and memory) and the catalogue entities. It owns all the virtual resources for the customers cloud instance
CPU	Central Processing Unit	Organisation networks	A network that allows vApps within an organisation to communicate with each other. An organisation network can also connect to an external network to provide external connectivity
CIFS	Common Internet File System	PaaS	Platform as a Service: Adding managed Windows server and SQL database to your IaaS capability
DHCP	Dynamic Host Configuration Protocol	pCPU	Means a physical Central Processing Unit of the Virtual Machine(s)
FTP	File Transfer Protocol	PVLAN	Private Virtual Local Area Network
HTTP(S)	Secure Hypertext Transfer Protocol	RAM	Means Random-Access Memory of the Virtual Machine(s)
IaaS	Internet as a Service: a virtualised Resource Pool	Resource Pool	The number of compute resources that the customer uses to provision their applications
ICMP	Internet Control Message Protocol		
iSCSI	Internet Small Computer System Interface: a standards-based protocol for connecting SCSI attached data storage volumes over an Internet Protocol (IP) network		
LUN	Logical Unit Number		
NAS	Network Attached Storage		

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Definition of terms

11.2. Definition table two

The table below describes the abbreviations and terms within the product handbook.

Term/expression	Customer	Term/expression	Customer
SAN	Storage Area Network	vApp	A collection of Virtual Machines (and potentially other vApp containers) that are configured, operated and monitored as a unit
SAS	Serial Attached SCSI drive of the Virtual Machine storage device	vCentre	A centralised management tool from the VMware suite that allows for the management of multiple ESX hosts and Virtual Machines (VMs) from different ESX servers through a single console application
SCSI	Small Computer System Interface is a set of parallel interface standards for attaching disk drives	vCPU	A virtual Central Processing Unit of the VM(s)
SNOW	Service Now portal	VM (plural VMs)	A Virtual Machine (or Virtual Machines), sometimes referred to as a Virtual Server or an Instance or a Virtual Instance
SSHport	Secure Shell Port	VLAN	Virtual Local Area Network
SSD	Solid-State Drive of the Virtual Machine storage device	vShield Edge Gateway	Virtualised edge network security for the IaaS that provides essential security gateway services and load balancing for performance and availability
Storage and backup	The storage container for files, assigned to the Virtual Machine and typically hosted on a SAN. The Virtual Machine and any data is then stored on a backup device (disk) against the contracted backup rota frequency and retention policy. Storage and backup operates at a Virtual Machine level and does not provide application level data backup and restore capabilities. Customers need to implement their own application data recovery solutions		
TCP	Transfer Control Protocol		
UDP	User Datagram Protocol		
URI	Uniform Resource Identifier		

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