

# REDCENTRIC

# HOSTED PRIVATE CLOUD

# SERVICE DEFINITION

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# 1) OVERVIEW

Redcentric's Hosted Private Cloud (HPC) enables the Customer to consume server, storage and network infrastructure through a simple unified platform. HPC is already used by many Redcentric Customers to deliver tier 1 applications, all benefitting from expert infrastructure support provided by Redcentric's server, storage and network teams.

HPC allows the Customer to:

- Meet assurance or performance requirements that cannot be met by using either hyper-scale public cloud or shared IaaS services.
- React faster and support business agility through faster delivery of new solutions.
- Increase business value by focusing on the applications providing services to the business
- Gracefully migrate from traditional physical infrastructure into the cloud

HPC provides the assurance of UK hosted and managed infrastructure delivered from Redcentric's ISO27001 accredited data centres. The underlying platforms are managed by Redcentric covering: performance, capacity, patching, installation and upgrades, all to a published Availability Service Level.

HPC is similar in operation and features to IaaS, but is built and operated on dedicated compute and storage infrastructure. Redcentric work with the customer during the solution design phase to select the infrastructure bespoke to the customer requirements.

Customers can deploy and manage infrastructure through a self-service interface, with the flexibility to meet scale-up and scale-out requirements. Customers can provision infrastructure from pre-built Windows and Linux templates, utilise their own templates or import virtual machines or appliances. The Customer controls the CPU, RAM, storage, network and operating system within the HPC environment. Remote administrative access is provided to Customer servers to manage applications.

HPC is delivered from the heart of Redcentric's network, allowing the Customer to utilise complementary services such as network connectivity (WAN, Internet, HSCN (N3), Janet) and security services.

## 2) SERVICE DESCRIPTION

HPC uses enterprise-class platforms deployed in Redcentric's data centres and managed end to end by Redcentric. The HPC platforms provide a controlled environment for Customers to provision server infrastructure through a self-service interface. HPC provides a number of strategic advantages over traditional physical deployments:

- Simple unified approach to provisioning and managing server, storage and network resource
- Rapid provisioning of infrastructure allowing IT to react quickly to new requirements
- Consistent, standardised and repeatable deployment of infrastructure allowing IT to focus on the application layer upwards, that delivers real business value

### 2.1) FUNCTIONALITY

#### 2.1.1) HPC Operation

HPC provides a self-service interface that the Customer can use to deploy, manage or retire infrastructure. The features available from the self-service portal allow the Customer to self-service:

- Add, modify or remove servers
- Add, modify or remove internal networks
- Migrate disk resource between storage tiers
- Add or remove CPU, RAM, storage or network resource for individual servers

Configuration changes not supported within the self-service interface can be submitted via Redcentric's change request process.

#### 2.1.2) HPC Access Methods

HPC can be accessed as detailed in the table below.

Access method	Description
Console access	The virtual server console can accessed by: <ul style="list-style-type: none"><li>• VMware vSphere client to access the virtual server console (A mix of either Windows based client or web interface client)</li><li>• RDP session to a Windows server</li><li>• SSH session to a Linux server</li></ul>
LAN	The virtual servers can be accessed on the LAN by: <ul style="list-style-type: none"><li>• Other virtual servers deployed by the Customer on the same network</li><li>• Redcentric physical hosted servers deployed for the Customer within the same data centre</li><li>• Redcentric co-located hosting racks deployed for the Customer within the same data centre</li></ul>
WAN	The virtual servers can be accessed from the WAN where the:

Access method	Description
	<ul style="list-style-type: none"> <li>Customer takes WAN services from Redcentric</li> <li>Customer deploys a WAN network connection into Redcentric's data centre</li> </ul>
Internet	The virtual servers can be accessed from the Internet where the Customer takes managed firewall and internet services from Redcentric.
HSCN (N3)	The virtual servers can be accessed from the N3 network where the Customer takes managed firewall and N3 services from Redcentric. The Customer must obtain an approved HSCN Connection Agreement before connectivity to N3 or HSCN can be made.

### 2.1.3) HPC Platform Specification

HPC can be built from the following three hardware options:

- **Option 1** – Cisco UCS compute and Nimble storage appliances
- **Option 2** – HPE ProLiant compute and HPE 3PAR storage appliances
- **Option 3** – Hyper-converged infrastructure appliance using HPE ProLiant compute and VMware vSAN

Redcentric work with the Customer during the solution design phase to select an option to meet the Customer's requirements. Within each option, Redcentric are able to vary the option configuration including, but not limited to:

- Compute – Number of processor sockets selected per compute host, e.g. 1, 2, 4 or 8
- Compute – Number of processor cores per socket, e.g. 4, 6, 8, 10, 12, 14, 16, 18, 20 or 22
- Compute – Amount of memory per compute host, e.g. 128, 256, 384, 512, 768, 1024, 1280 or 1536GB
- Compute – Number of compute hosts required – Minimum 3 per HPC platform
- Storage – Quantity and type of disks required to meet I/O performance and TB capacity requirements
- Storage – Licensable features required to achieve the HPC needs, i.e. at rest data encryption, data replication, automated storage tiering, etc.

Each HPC solution is bespoke commissioned from common repeatable infrastructure building blocks, with the following subsections detailing the specific differences of each option. As vendor technologies evolve, Redcentric will update the available options, along with the specifications of each.

#### 2.1.3.1) Option 1 – Cisco UCS Compute and Nimble Storage Appliances

Built utilising a Cisco/Nimble reference architecture referred to as SmartStack. This solutions utilises either Nimble adaptive flash or all flash arrays connected into Cisco Unified Computing System (Cisco UCS) to provide an integrated compute, storage and network infrastructure. This infrastructure is suitable for desktop virtualisation (VDI), server virtualisation, combined server and desktop virtualisation, business critical applications and database virtualisation.

#### 2.1.3.2) Option 2 – HPE ProLiant Compute and HPE 3PAR Storage Appliances

Built utilising HPE ProLiant servers (rack mount and blade type) integrated with HPE 3PAR storage appliances (either hybrid or all flash appliances).

### 2.1.3.3) Option 3 – Hyper-Converged Infrastructure Appliance Using HPE ProLiant Compute and VMware vSAN

HPC delivered on hyper-converged infrastructure utilises multiple HPE ProLiant servers with local storage (SSD drives) and VMware vSAN software, to create a scale-out compute and storage infrastructure. Each server contributes both compute and storage into a cluster that makes up the hyper-converged infrastructure. The servers operate in a cluster, to allow workload mobility between servers for load-balancing purposes, and to provide workload resilience during individual server failure.

The cluster can be expanded by adding another server, of the same specification, to the cluster. The new server will contribute both compute and storage capacity to the cluster. Hyper-converged infrastructure supports scale-up by upgrading each server within the cluster, or scale-out by adding another server of the same specification to the cluster. In practise, scale-up is only performed by adding server RAM or storage.

Hyper-converged infrastructure removes the need for a separate storage appliance and is suited to use cases where a linear scale-out model is required, such as VDI.

Adding servers contributes both additional compute and storage, increasing the overall capacity of the hyper-converged infrastructure. The following points should be noted with hyper-converged infrastructure:

- All servers within the hyper-converged infrastructure must be balanced (Processor, RAM and storage)
- Adding a new server will add both compute and storage
- A spare host is required within the cluster to support maintenance and N+1 resilience
- Virtual machine storage is hosted on the server on which the workload is running, and mirrored to another server for resilience

All of the servers within the infrastructure will be of a near-identical specification, to allow effective distribution of resource across the cluster and to simplify operational management.

### 2.1.4) HPC Hardware Sharing

The default HPC offering is:

HPC service element	Dedicated or shared	Discussion
Compute hosts	Dedicated	The physical hosts running a Customer's workload will not host workloads for other Customers
Storage appliance	Dedicated	The physical storage appliances holding the Customer's workloads will not store workloads for other Customers
Network VLANs	Dedicated	The customer internal data network VLANs will not host other Customers traffic
Physical network switches (Fibre channel SAN and Ethernet LAN)	Shared	The physical switches into which the compute and storage appliances will host multiple Customers, but will utilise logical separation, such as VLANs or SAN zoning
Compute blade chassis	Shared	Where HPC is built using physical blade servers, the blade chassis may host compute blade servers for other Customers
VMware vCenter	Shared	The VMware vCenter will manage VMware clusters for different Customers, but will use logical separation (Clusters, resource pools and role based access) to segregate Customers. A dedicated VMware vCenter can be provided as needed for Customer assurance purposes

## 2.1.5) HPC Virtual Server Specification

The bespoke nature of HPC enables Redcentric to build the platform to meet the Customer's workload requirements. As a general rule the following virtual server specifications should be observed:

- CPU – Allocated 1 – 32 CPU cores to each virtual server
- RAM – Allocate memory in 1GB increments up to 128GB to each virtual server
- Storage – Allocate disk storage in 1GB increments from a storage tier relevant to the application workload
- Network – Attach the server to the network, with up to 4 network interfaces per server

### 2.1.5.1) CPU Resources

Redcentric recommend allocating a single CPU per server, unless the server application is known to benefit from multiple CPUs. In some cases, allocating multiple CPUs can lead to a performance decrease for applications that are not able to utilise the additional CPUs. Hot add of CPU resources is allowed if supported by the virtual server guest operating system.

### 2.1.5.2) RAM Resources

Each virtual server is allocated 1GB memory by default. Additional memory can be allocated in 1GB increments to a maximum of 128GB per server. Hot add of RAM resources is allowed if supported by the virtual server guest operating system.

### 2.1.5.3) Storage Resources

Each virtual server will consume disk storage to accommodate the operating system, application and data files. Storage will be allocated from the Customer's HPC dedicated storage appliance, be it Nimble, 3PAR or VMware vSAN. Each storage technology has pros and cons but essentially have the following considerations:

- Random IOPS – A measure of the number of input and output transactions that can be performed each second. Relevant to transactional applications, such as database servers, where a large amount of I/O is random in nature and requires a large number of IOPS. All HPC storage appliances can support high IOPS workloads through the use of flash technology
- Sequential bandwidth throughput – A measure of the sustained bandwidth throughput that can be performed each second. Relevant to data logging, analytics or backup workloads, where a large volume of data is moved or generated each second, typically with a large block size. All HPC storage appliances can support high sequential bandwidth workloads
- Storage latency – A measure of the response time sustained by the storage appliance. Relevant to transactional applications, such as database servers, where a fast storage response time is required to maximise the database server throughput, additionally maximising the value gained from the typically high cost database licence. All HPC storage appliances can support low latency storage, though to guarantee storage latency the use of all flash storage, be it VMware vSAN, 3PAR or Nimble, is recommended

Virtual servers deployed from Redcentric templates will typically have a single disk of at least 24GB disk for the operating system drive. This size may vary with each template used, and the Customer should check the disk size before deploying.

#### **2.1.5.4) Network Resources**

Each server will be attached to one network resource by default. The network connections are classified into internal and external interfaces. Internal interfaces connect only the Customer's servers together and can be provisioned by the Customer through the self-service portal.

External interfaces connect the Customer's servers to other network resources, such as a Customer WAN, Internet via a Managed Firewall or Customer LAN within a co-located hosted rack in Redcentric's data centre. These network resources will be configured by Redcentric as part of the service activation. Connection to the Customer's networks allows the servers to co-exist within the Customer's IP address scheme and be fully routable & integrated into the Customer's network environment.

#### **Service Management**

Redcentric will monitor and manage HPC up to and including the virtual hardware layer. The Customer will be responsible for managing the virtual server operating systems and applications hosted within HPC, unless taken as part of separate Redcentric managed service, such as Managed Windows Server, Managed Linux Server, Managed SQL Database Server or Managed Oracle Database Server.

#### **2.1.6) Software Updates**

Redcentric will monitor the product lifecycles of supporting platforms that deliver the service such as; VMware vSphere, Cisco, HPE and Nimble technologies. Critical patches, and patches required in response to published security alerts, will be applied as appropriate.

Redcentric will occasionally perform platform upgrades as new versions of software become available. These will be planned and managed through Redcentric's change process with appropriate notification issued to Customers where necessary.

#### **2.1.7) Capacity and Performance Management**

HPC is delivered in fixed capacity blocks consisting of a defined number of compute hosts and storage appliance capacity. Redcentric will monitor these platforms and limit Customer virtual server resource to maintain:

- 1 Compute host spare capacity across the cluster
- Storage utilisation to not exceed 90% of usable space
- Compute host RAM utilisation to not exceed 80% of physical host capacity

The above capacity limits are set to ensure both service availability and performance.

#### **2.1.8) Service Scaling**

Redcentric will allow a Customer to increase their HPC usage within the capacity and performance limits detailed in paragraph 2.1.7). HPC does not provide immediate scaling beyond these capacity and performance limits.

If the Customer requires additional compute or storage capacity, this can be requested via the Redcentric account manager and will incur an additional charge to procure and provision the additional capacity. The lead time to perform capacity expansion is detailed in paragraph 3) "Implementation and Acceptance".

Overtime vendors will retire particular products (CPUs, disks, server chassis, storage appliances, etc.). This may result in the need to provision new HPC compute clusters and/or storage appliances to provide additional compute capacity.

### 2.1.9) Microsoft Software Licensing

HPC utilises dedicated compute hosts which allows the Customer to bring their own Microsoft licences.

Redcentric can provide Microsoft licences via its Microsoft service provider licence agreement (MS SPLA) as a separately chargeable monthly subscription. This covers:

- All Microsoft server applications (Windows Server, SQL, Exchange, Dynamics, SharePoint, Skype for Business, System Center and so on)
- All Microsoft office application

The following points apply to the use of MS SPLA:

- Windows Desktop cannot be licence on MS SPLA
- The Customer cannot mix Customer and MS SPLA provided licences within the same operating system environment, for example a Customer could not top-up their Exchange CALS with MS SPLA provide Exchange SALs
- MS SPLA licence is a licence subscription service. The Customer does not gain any licence ownership
- MS SPLA does not come with a Microsoft support service. The Customer will be responsible for arranging their own Microsoft support agreement

### 2.1.10) Complementary Services

The service is typically deployed with the following additional Redcentric services:

- Connectivity – Redcentric's network services and/or the Internet are required to access the Virtual Server Hosting service.
- Data Management – Redcentric provides managed storage, backup and archiving services.
- Security – Redcentric's Managed Firewall Service provides protection for traffic traversing network boundaries with different trust levels.

### 2.1.11) Reporting

A real-time view of machines provisioned, regardless of whether they are switched on or off, along with allocated storage, is available via the HPC self-service interface.

### 2.1.12) Infrastructure Location

All server / storage infrastructure is provided from Redcentric managed data centres in the UK and all associated data is stored in the UK only.



## 2.2) CUSTOMER DEPENDENCIES

The following are Customer Dependencies for HPC.

- The Customer must allocate the correct quantities of CPU, RAM, Disk and Network resources appropriate for the operating system and applications within the virtual server
- The Customer must install, support, patch and upgrade the virtual server operating system
- The Customer must install, support, patch and upgrade the applications(s) running within the virtual server
- The Customer must update Redcentric on Microsoft licence usage for applications running within the virtual server
- The Customer must ensure that all Customer OS and application licences are compliant with the Customer's vendor specific licensing agreements
- The Customer must allow Redcentric administrator level access within the virtual server guest operating system, to install and execute scripts or applications, for software licence audit purposes, as required by the software vendor(s) used within the service
- The Customer shall not deploy or operate a Microsoft Windows Desktop operating system via the service. This is specifically prohibited by Microsoft within a physically shared environment
- The Customer must ensure that the required application vendor(s) support deployment within a VMware virtualised environment
- The Customer must ensure that a suitable data management policy is employed to protect against virtual server data loss

## 2.3) EXCLUSIONS

The following are excluded from the scope of HPC.

- Support of the Customer's virtual server operating system and applications
- Backup of the Customer's data within the virtual server, unless taken as part of a separate Redcentric service
- Recovery of the Customer's virtual servers to a second Redcentric data centre, unless taken as part of a separate Redcentric service

## 2.4) ACCEPTABLE USE POLICY

The following acceptable use policies apply to HPC, in addition to Clause 2.7. The Customer shall:

- Operate suitable anti-virus software on the virtual server guest operating system under the Customer's management that utilises on-access scanning for executable, known vulnerable and files with no extensions
- Update the anti-virus software in line with the anti-virus software vendor's guidelines
- Update the virtual server guest operating system in line with the guest operating system software vendor's guidelines
- Utilise suitable security policies and hardening of the virtual server guest operating system applicable to environment within which the Customer's servers are operating

## 2.5) ROLES AND RESPONSIBILITIES

The following table categorises roles and responsibilities that apply to HPC.

Use Case	Responsibility	Additional Notes
Provision a new virtual server from an Redcentric or Customer template	Customer	Customer perform via HPC self-service interface
Change a virtual server configuration (CPU, RAM, network, storage tier)	Customer	Customer perform via HPC self-service interface
Remove a virtual server	Customer	Customer perform via HPC self-service interface
Power on/off a virtual server	Customer	Customer perform via HPC self-service interface
Add disks to an existing virtual server	Customer	Customer perform via HPC self-service interface
Add network connections to an existing virtual server	Customer	Customer perform via HPC self-service interface
Increase the available resource within the HPC environment	Customer	Customer to request via Redcentric account manager. This will require a new service agreement to cover the additional chargeable services
Increase the size of an existing virtual server disk	Customer	Customer perform via HPC self-service interface
Request a clone or create template of an existing virtual server	Customer	Customer perform via HPC self-service interface
Apply virtual server level configuration, such as affinity/anti-affinity rules	Customer	Customer to request via Redcentric change request process.  Redcentric will review and validate the request before responding.Redcentric will perform this work during working hours or charge time and materials for out of hours work.
Import a virtual server into HPC	Customer	Customer perform via HPC self-service interface
Managed network services external to HPC, such as Internet network addressing, physical firewalls, WAN routing, etc.	Redcentric	Customer to request via changes to external network resources via Redcentric change request process.
Patch the hardware (compute, storage, network) supporting HPC	Redcentric	Redcentric will manage service patching via its change approval process
Patch the software (compute, storage network) supporting HPC	Redcentric	Redcentric will manage service patching via its change approval process

The response and implementation time for a Customer submitted change request is governed by Redcentric's published Customer service plan.

## 3) IMPLEMENTATION AND ACCEPTANCE

### 3.1) HPC IMPLEMENTATION

HPC provides a bespoke service built from standard server, storage and network components. Whereas Redcentric IaaS has already been designed, built and tested, HPC is designed, built and tested for each Customer. The HPC implementation process covers:

- Pre-contract discovery stage:
  - Redcentric generate a high level design for HPC
  - Agree HPC specification (Vendor technologies, specification, quantities)
- Post-contract discovery & design stage:
  - Redcentric generate a low level design for HPC
  - Agree HPC configuration, network design, assign IP addresses, storage configuration
  - Customer and Redcentric sign-off low level design
- Post-contract delivery stage:
  - Redcentric order HPC equipment (Subject to vendor delivery lead time)
  - Redcentric build and test HPC environment
  - Redcentric enable logon to the HPC self-service interface for the specific Customer contact identified on the service agreement, but can include additional Customer contacts identified during service activation

The post-contract delivery stage will only commence when both the Customer and Redcentric sign-off the low level design. Subsequent changes made to the low level design may have a material impact on the HPC delivery lead time.

Redcentric will setup network resources as part of the service activation. This will include identification of IP addresses, default gateways, firewall configuration, etc.

Upon service activation, the Customer will be able to build their infrastructure within the self-service portal. The Customer will be able to build a new server using a Redcentric provided template. Additionally the Customer can engage with Redcentric Professional Services to:

- Migrate physical server infrastructure
- Import or create a new server build template specific to the Customer's needs
- Import a server image from the Customer's hypervisor platform

The target lead time to complete service delivery is detailed in the following table. This is subject to the timescales of delivery of the specific connection mechanism used to connect the Customer to HPC, such as delivery of Ethernet access circuits, HSCN (N3) connection, Internet address allocation via RIPE, firewall configuration, options selected, etc.

Service Element	Service Activation Timescales
HPC implementation	<p>Target completion within 20 working days following:</p> <ul style="list-style-type: none"> <li>• Low level design sign-off by the Customer and Redcentric</li> <li>• Delivery of HPC hardware components</li> <li>• Customer obtaining HSCN Connection Agreement for HSCN / N3 connectivity</li> </ul> <p>Due to bespoke nature of HPC, the lead time to deploy the service may be extended as a result of design complexity. Redcentric will advise the Customer during the discovery and design stage.</p>
HPC capacity expansion	<p>Target completion within 20 workings following:</p> <ul style="list-style-type: none"> <li>• Redcentric sales process to understand requirements, design, quote and contract for additional HPC capacity</li> <li>• Delivery of HPC hardware components</li> </ul>

## 3.2) HPC ACCEPTANCE

The following are the Acceptance Criteria applicable to HPC:

- The applicable implementation and service activation activities have been completed
- Redcentric will issue a ready for use email to the specified Customer contact

The Customer will need to nominate (pre-installation) and make available an appropriately qualified representative to work with the Redcentric representative during the service delivery. The installation will be carried out between 09:00 - 17:30, Monday – Friday, except where agreed with the Customer.

## 4) SERVICE LEVELS AND SERVICE CREDITS

### 4.1) SERVICE LEVELS

The Service Level applicable to HPC is as follows:

Service Level: Availability	
Measurement Period: Month	
Service Level	Not less than 99.99%

### 4.2) FLOOR SERVICE LEVEL

The Floor Service Level applicable to HPC in respect of Availability shall be 85% in any given Month.

### 4.3) SERVICE CREDITS

The Service Credits applicable to HPC shall be calculated as follows:

$$Service\ Credit = \frac{C \times S}{MS}$$

Where:

S = the number of seconds by which Redcentric fails to meet the Service Level for Availability in the relevant Month

C = total Charges payable in respect of HPC for the same Month

MS = the total number of seconds in the same month

## 5) DATA PROCESSING

### 5.1) DATA PROCESSING SCOPE

- Redcentric does not access, alter or use any application data that is running on the HPC Service except as specifically stated below.
- In terms of operating the HPC service, the virtual server console can be accessed by the Customer as described in Section 2.1.2 of this Service Definition. API commands are passed from the virtual server console to VMWare software and associated supporting servers to orchestrate the build/management/removal of HPC resources. It is the Customer who issues these commands.
- No data is backed-up by or as part of this Service – see 5.5 below.

### 5.2) DATA STORAGE AND UNENCRYPTED DATA

- The HPC platform provided by this service consists of CPU cores, GB RAM, network access and working storage for application data that is being processed. Redcentric manages the hypervisor but not the guest Operating System, which is the responsibility of the Customer.
- In the course of normal operations, the platform generates operational data such as log files. Redcentric has access to this data because it has administrator rights to the VMWare software. This operational data does not contain Customer specific application data, including Personal Data.
- In the course of normal operations Redcentric has no reason to, and will not, access this operational data except in the course of providing support, which will be at the request of and in conjunction with the Customer.
- The application data that is stored in the storage servers can be encrypted, and this should be specified if required by the Customer during the pre-sales process. It is not possible for Redcentric to access the encrypted application data on the storage servers as only the Customer has access to the encryption keys.

### 5.3) DATA PROCESSING DECISIONS

- In the normal course of business Redcentric does not make any data processing decisions in relation to the Service. Processing is automated and instigated by the Customer.
- The decision as to whether to encrypt application data is made by the Customer.
- Redcentric Support can be asked by the Customer to intervene in the event of an issue with the Service. In such a case Redcentric may make decisions that affect data processing, but such actions will only be undertaken at the request of and in conjunction with the Customer.

### 5.4) SERVICE CONFIGURATION WITH RESPECT TO DATA

- During the pre-sales process the HPC Service configuration will be agreed based on the needs of the Customer. The Service configuration will be done by Redcentric.
- Changes to the Service configuration will be made by the Customer using the virtual server console.
- The Service configuration does not involve Customer data.

## 5.5) DATA BACKUP

- No data is backed-up by or as part of this Service. The Customer can make their own backup arrangements or contract additional Redcentric Services as described below.
- To back up application data the Customer can use the Redcentric Managed Backup Service (MBS), and in that case the Data Processing section (Section 5) of the MBS Service Definition applies; if the Customer does not use MBS, then no data is backed up by Redcentric (and the Customer is responsible for its own backup arrangements and all backed up data).
- To back up virtual machines the Customer could take the Redcentric Managed Server Service (MSS), and in that case the Data Processing section (Section 5) of the MSS Service Definition applies; if the Customer does not use MSS, then virtual machines are not backed up by Redcentric (and the Customer is responsible for its own backup arrangements and all backed up data).

## 5.6) SUB-PROCESSORS

- No other parties are involved in delivering this service, and there are no sub-processors.

## 5.7) CUSTOMER ACCESS TO DATA

- The Customer has login rights to the virtual server console and can access the virtual server by various methods as described in Section 2.1.2 of this Service Definition. This access enables the Customer to access, copy, process and back up data as it wishes.

## 5.8) SECURITY ARRANGEMENTS AND OPTIONS

- The HPC servers are hosted at Redcentric's data centres with physical data centre security and cyber security measures (e.g. Firewall) in place to protect the back end systems and platforms.
- Customers have access via the virtual console to manage the HPC configuration of their own servers, but they are unable to interact directly with underlying hypervisor and associated configurations.
- Customer access to the virtual server console uses role-based access controls (RBAC), integrated with Redcentric's customer relationship management (CRM) system and user directory service.

## 5.9) SERVICE OPTIONS

- Customers have the option to take the Redcentric Managed Server Service, in which case:
  - as part of that Service, Redcentric will manage the VM's guest operating system; and
  - the Data Processing section (Section 5) of the Redcentric Managed Server Service Definition applies.
- Customers have the option to take the Redcentric Managed Backup Service, in which case:
  - as part of that Service, Redcentric will manage the availability of backup infrastructure (although the Customer manages the backups and encryption key); and
  - the Data Processing section (Section 5) of the Redcentric Managed Backup Service Service Definition applies.

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