

INTRODUCING OMAN'S FIRST VIRTUAL DATA CENTRE — NEBULA

A world class Data Centre solution for all of your computing needs



Issue 2

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Virtual Data Centre as a Service (VDCaaS)

A virtual Data Centre is a product of the 'Infrastructure as a Service' (IaaS) delivery model of cloud computing. It can provide on-demand computing, storage and networking, as well as applications, all of which can be seamlessly integrated into an organisation's existing IT infrastructure. The premise of the virtual Data Centre solution is to give organisations the option of adding capacity or installing a new IT infrastructure without the need to buy or install costly hardware, which takes up additional manpower, space and power. The whole Data Centre infrastructure is provided over the cloud.

One of the greatest benefits of cloud computing is to allow relatively small organisations access to IT infrastructure in the form of a virtual Data Centre without spending millions of Omani Rials in order to construct an actual Data Centre. They only need to pay for the resources that they use, which allows for great flexibility and scalability.

Oman Data Park's 'Virtual Data Centre as a Service' (VDCaaS) makes these resources available in a simplified way to both local and international organisations and provide software defined Data Centre services as complete Data Centres that are ready for consumption in a matter of minutes. It applies the principles of pooling, abstraction and automation to enable the provision of complete and operational-ready infrastructure without worrying about the physical configuration of the hardware.

Benefits

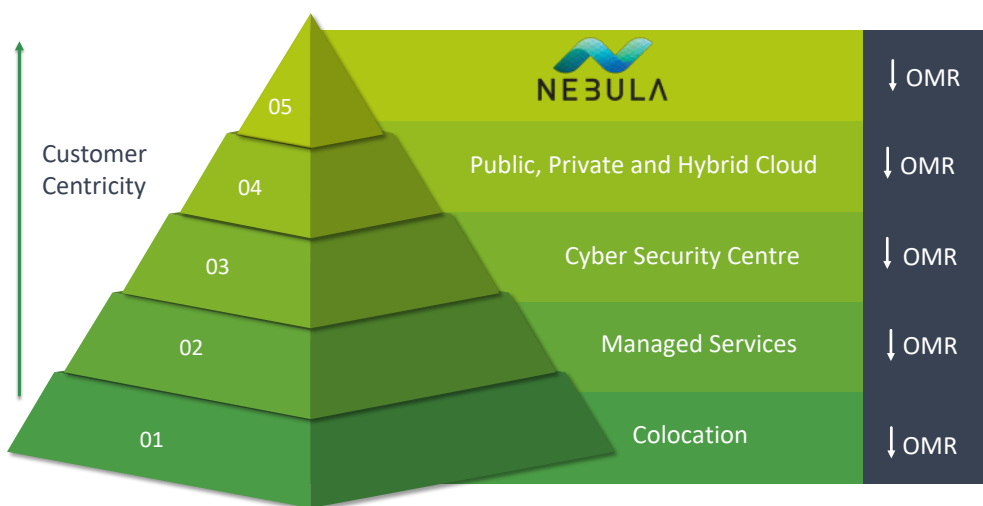
- Support of a wide range of changing business objectives
- Greater flexibility in new solutions design
- Acceleration of time to market
- Improved cost efficiency, quality of service and business agility
- Maintain security and control with policy-based user controls
- Reduce costs by efficiently delivering resources as virtual Data Centres to increase consolidation and simplify management

Source: Oman Data Park

Nebula – an Introduction

Oman Data Park's Nebula is Oman's first Virtual Data Centre offering a full spectrum of Data Centre facilities from: computing, storage, networking and network security services "on-demand"; where we provide our Data Centre infrastructure and facilities for rent or lease removing the need for any OPEX costs from an organisation. Hosted locally, Nebula also comes with its own state of the art security services operated over Tier 3 Data Centres which Oman Data Park (ODP) is known for. Supported by a highly qualified and professionally certified team of experts, this new service is a testament to ODP's continued efforts aimed at helping and guiding customers towards their agile and digital transformation in preparation towards the fourth industrial revolution and Gig economy.

FIGURE 1 Our adoption of change to satisfy market needs



Source: Oman Data Park

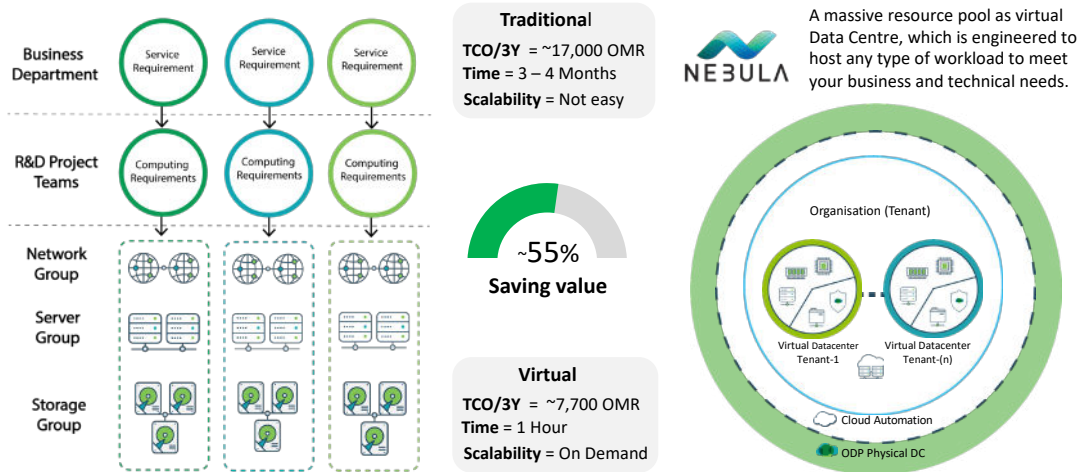
Nebula allows total self-care to an organisation so that they have full operational visibility and control over the infrastructure, network security as well as scalability and automation. Nebula will enable organisations to control their own CPU, memory and storage levels as well and adding load balancers, micro balancers, switches and routers etc, to their network. This enables the organisation to be in a unique position to be agile and respond to their market needs without having the burden of CAPEX. Furthermore, all of these benefits are enabled with real time metering so that the organisation is aware of it's own VDC (computing, storage, networking and security) usage. Nebula even offers a choice of pricing models making it ideal for any organisation along with ODP's long standing 24x7 Managed Services.

Offered as Allocation, Pay-As-You-Go or Reservation based subscriptions, Nebula is ideal for various workloads such as critical production, backup and disaster recovery or purely for test and development. Whatever the need may be, this new service is at par with international VDCs but with one clear unique selling point which is that Nebula is offered locally and therefore satisfying all local government regulations surrounding customer data security and sovereignty accompanied with our strong ICT skill sets available domestically.

Nebula is also designed with industry leading security and it will allow organisations to meet ongoing infrastructure requirements along with their compliance and security requirements. Organisations opting for Nebula will also be able to avail our Cyber Security Centre's self-service based continuous risk management, forensics and compliance services.

Available in 5 deployment models; Nebula - Private Cloud, Nebula (aka Nebula Stack) – Community Cloud, Nebula – Public Cloud, Nebula – Hybrid Cloud and Nebula – Edge/Fog compute and 3 service models; Infrastructure as a Service (IaaS), Platform as a Service (PaaS) and Software as a Service (SaaS) (with more details on page 7); organisations availing any of the Nebula deployments have the luxury of choosing a fully self-served or ODP managed option to run the Nebula services.

FIGURE 2 Data Centre comparison

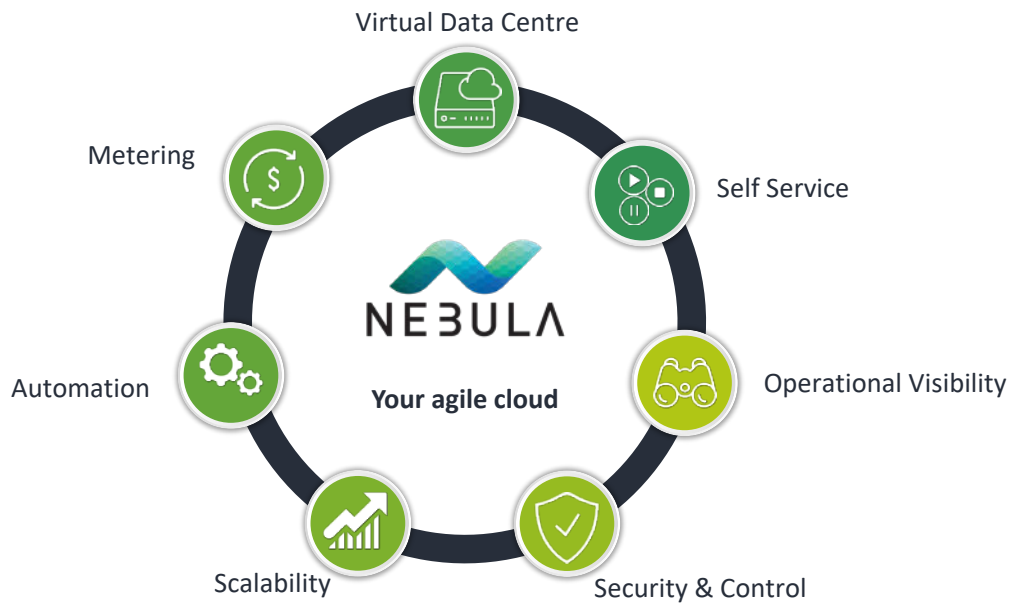


Source: Oman Data Park

Source: Oman Data Park

Nebula benefits

FIGURE 3 Nebula benefits

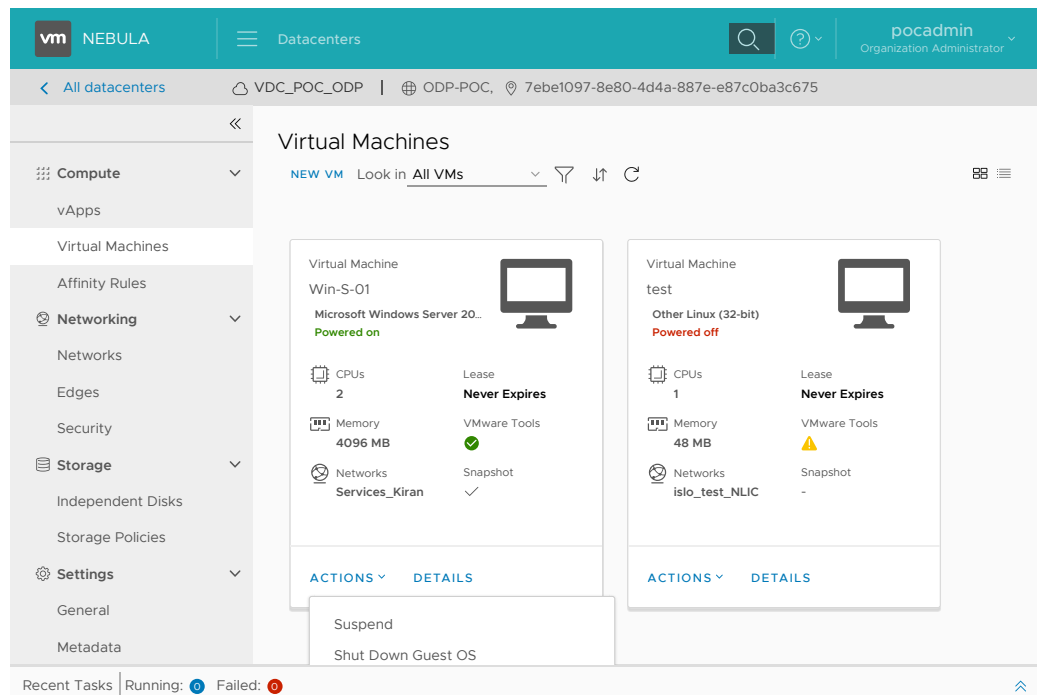


Source: Oman Data Park

Virtual Data Centre: A complete set of Public and Private cloud services that include Compute, Storage and Network capacity to enable separation between the required infrastructure services and underlying hardware.

Self Service: Tenant will have access to their Virtual Data Centres resources to manage and operate virtual workloads to perform;

- Start, Shutdown and Restart a Virtual Machine (VM)
- Provisioning/De-provisioning VM's
- Adding/Removing resources to existing VM's
- Provisioning new virtual networks with in VDC's
- Console Access to VM's to manage and control the OS setting

FIGURE 4 Self-service portal

Source: Oman Data Park

Operational Visibility and Insights: A refreshed dashboard and single pane of glass provides a centralised cloud management view. Leverage your operations based on advanced analytics, chargeback and native integration into your VMs, application and DBs for deep visibility into enterprise environments.

Scalability: Tenant workloads are easily scaled horizontally and vertically in terms of Adding/Removing new servers or Adding/Removing of resources to VM's and virtual network.

Security: Nebula is a true multi-tenant, platform isolated infrastructure. It enables customers with an Integrated SDN to control a virtual firewall for micro-segmentation, NAT, Isolated Network, Load Balancers and DHCP IP allocation and virtual workloads. A multitier application can be provisioned and consumed as pre-configured virtual appliances containing VMs, Operating Systems, images and other media with a click of a button. This enables IT standardisation, simplified troubleshooting, patching and change management.

Metering: Nebula delivers cost transparency and accountability that help IT leaders to understand and optimise the costs of their virtual Data Centre's infrastructure required to seamlessly support business services. Easy and generous pricing on both reservation and allocation Models;

- Simplified management and hosting of all services in Tier 3, ISO, PCI DSS compliant facilities in Oman
- Support of a wide range of changing business objectives
- Greater flexibility in new solutions design
- Acceleration of time to market
- Improved cost efficiency, quality of service and business agility
- Maintain security and control with policy-based user controls
- Reduce costs by efficiently delivering resources as virtual Data Centres to increase consolidation and simplify management
- Full suite of additional managed security services features
- Additional Veeam Backup and DR to 2nd Data Centre (More than 500km away)
- 99.98% Uptime commitment
- 24 x 7 x 365 Support

Source: Oman Data Park

Service Models

Nebula services are offered in 3 cost-efficient service models that are made with your organisation in mind. Offered as Infrastructure as a Service (IaaS), Platform as a Service (PaaS) and Software as a Service (SaaS); each of them can be availed as a fully self-served or ODP managed option to run the Nebula services.

FIGURE 5 Nebula Service models

IaaS	PaaS	SaaS
Applications	Applications	Applications
Data	Data	Data
O/S	O/S	O/S
Virtualisation	Virtualisation	Virtualisation
Storage	Storage	Storage
Network	Network	Network
Servers	Servers	Servers
Data Centre	Data Centre	Data Centre

Managed by the Organisation

Managed by ODP

Source: Oman Data Park

Source: Oman Data Park

Deployment Models

Nebula - Private Cloud (aka Nebula Stack)

A cloud infrastructure that is designed for exclusive use by a single organisation comprising of multiple consumers (e.g. Different business units within a company). It may be owned, managed, and operated by the organisation or their designated third party, or even combination of both; and it may exist on or off premises with pay per provision of Virtual Machine (VM) model by Oman Data Park. The service offered includes of the following;

- **Physical Layer**

The lowest layer of the solution is the Physical Layer, sometimes referred to as the 'core', which consists of three main components, Compute, Network and Storage. Inside the compute component sit the x86 based servers that run the Management, Edge and tenant compute workloads. There is some guidance around the capabilities required to run this architecture. All components must be supported on the Virtualisation Hardware Compatibility

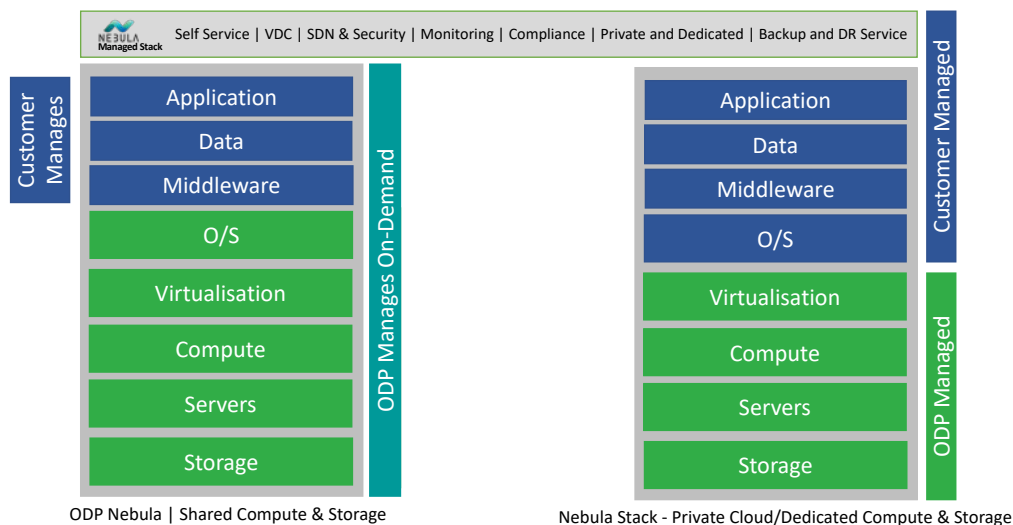
- **Virtual Infrastructure Layer**

Sitting on the Physical Layer infrastructure is the Virtual Infrastructure Layer. Within the Virtual Infrastructure Layer, access to the physical underlying infrastructure is controlled and allocated to the management and tenant workloads. The Virtual Infrastructure Layer consists primarily of the physical host's hypervisor and the control of these hypervisors. The management workloads consist of elements in the virtual management layer itself, along with elements in the Cloud Management Layer, Service Management, Business Continuity and Security areas

- **Service Management**

When building any type of IT infrastructure, portfolio and operations management play a key role in continued day-to-day service delivery. The Service Management area of this architecture mainly focuses on operations management that consist of monitoring, alerting and log management

FIGURE 6 Nebula private cloud (aka Nebula Stack) overview



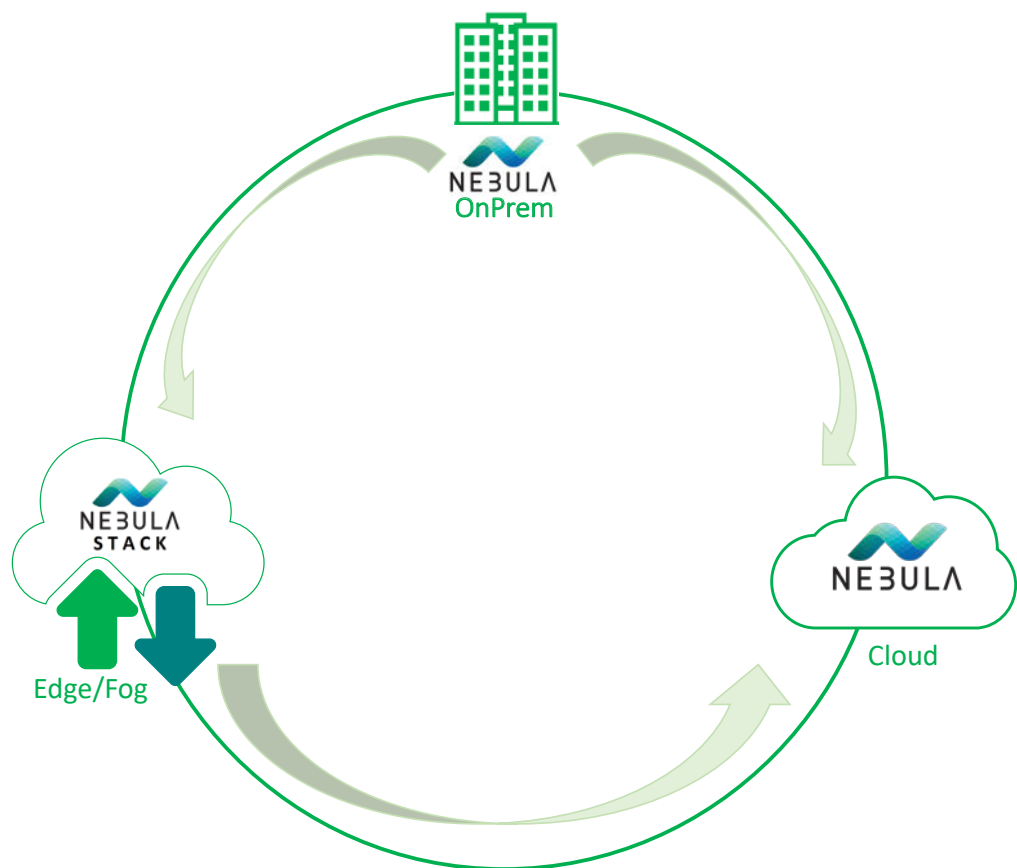
Source: Oman Data Park

Nebula - Community Cloud

A VDCaaS that is provisioned for exclusive use by a specific community of consumers from organisations that have shared concerns such as security or policy requirements, and/or compliance considerations. Enforced with required compliances, certifications as well as BCP and DRP, this service is extremely beneficial for the Banking and Finance Sector, Hospitality sector and even the Healthcare sector where the applicable SAP Stack or Oracle Stack are enabled to offer Managed and Self-Service IaaS, PaaS and SaaS are based on a peer-to-peer community cloud.

The Nebula Community Cloud is designed for agile organisations from the afore mentioned key sectors to align with their long-term business goals. The service enables such organisations the ability to have innovative products and services thus allowing them to use and apply new technologies to do things better, faster and cheaper, which then serves their customer.

FIGURE 7 Nebula community cloud



Source: Oman Data Park

Nebula - Public Cloud (Shared Cloud)

This VDCaaS is provisioned for open shared use by the general business community to manage and operate the resources that is assigned to a specific customer/organisation by ODP. The service is offered via two of ODP's Data Centres in KOM and Duqm with three types of billing models, Pay as you Go, Reservation and Allocation as detailed below;

	Flex Model	Allocation Pool Model	Pay-As-You-Go Model	Reservation Pool Model
Elastic	Based on the Organisation VDC configuration.	No	Yes	No
vCPU Speed	If a VM CPU limit is not defined in a VDC compute policy, vCPU speed might impact the VM CPU limit within the VDC.	Not Applicable	Impacts VM CPU Limit	Not Applicable
Resource Pool CPU Limit	Organisation VDC CPU limit apportioned based on the number of VMs in the resource pool.	Organisation VDC CPU allocation	Unlimited	Organisation VDC CPU allocation
Resource Pool CPU Reservation	Organisation VDC CPU reservation is apportioned based on the number of vCPUs in the resource pool. Organisation VDC CPU reservation equals the organisation VDC CPU allocation times the CPU guarantee.	Organisation VDC CPU allocation times the CPU guarantee	None, expandable	Organisation VDC CPU allocation
Resource Pool Memory Limit	Organisation VDC memory limit is apportioned based on the number of VMs in the resource pool.	Organisation VDC RAM allocation	Unlimited	Organisation VDC RAM allocation
Resource Pool Memory Reservation	Organisation VDC RAM reservation is apportioned based on the number of VMs in the resource pool. The organisation VDC RAM reservation equals the organisation VDC RAM allocation times the RAM guarantee.	Organisation VDC RAM allocation times the RAM guarantee	None, expandable	Organisation VDC RAM allocation
VM CPU Limit	Based on the VDC Compute policy of the VM.	Unlimited	vCPU speed times the number of vCPUs	Custom
VM CPU Reservation	Based on the VDC Compute policy of the VM.	Not Applicable	Equals the CPU speed times the vCPU speed, times the number of vCPUs.	Custom
VM RAM Limit	Based on the VDC Compute policy of the VM.	Unlimited	vRAM	Custom
VM RAM Reservation	Based on the VDC Compute policy of the VM.	Equals vRAM times RAM guarantee plus RAM overhead.	Equals vRAM times RAM guarantee plus RAM overhead.	Custom

Nebula - Hybrid cloud

A VDCaaS offering that is a composition of two or more distinct cloud infrastructures (private, community, or public) which remain as unique entities and allow organisations to adopt workload mobility across clouds with consistency in application development, cost optimisation and agility.

Nebula - Edge/Fog Compute

A VDCaaS based computing solution that is transforming organisations to adopt with flexibility and lower total costs. Together with the high service availability from ODP, this solution offers cloud capabilities to be distributed across the network to and form an edge cloud, which places computing resources where the traffic is at the edge of the customer network.

Source: Oman Data Park

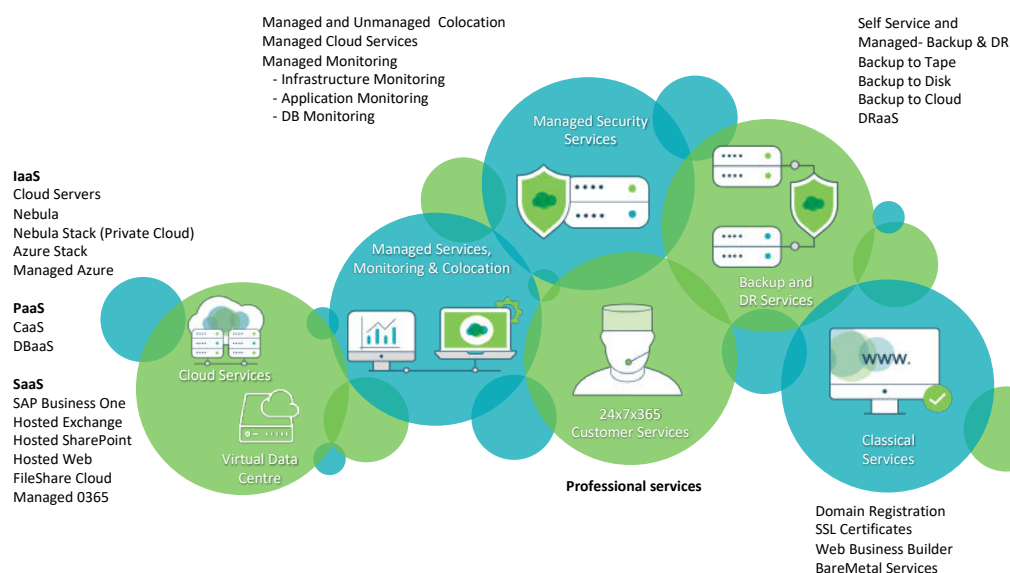
Why Nebula from Oman Data Park?

Findings from Gartner state that, "...with the rise of cloud computing, traditional enterprise data centers are adapting and evolving."¹ Agility and resiliency have become corner stones of the data centric world we live in. It is for these reasons that we come to you as a total solutions provider where we aim to take care of your IT challenges and free your time and resources to focus on your core business.

7 Reasons why you should avail Nebula services from us:

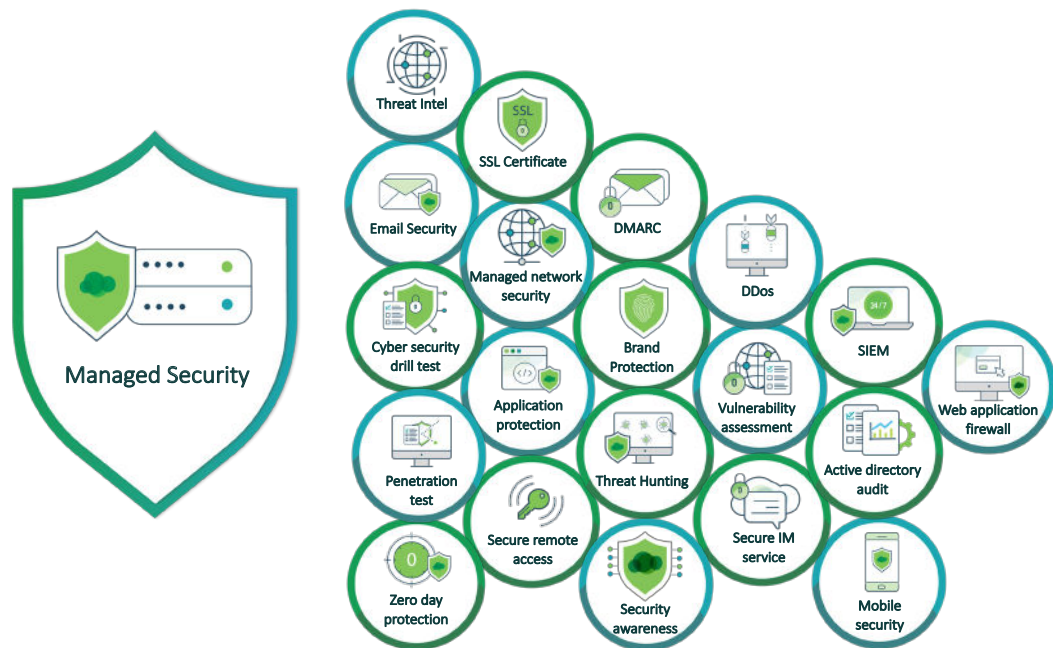
- 1) The first Managed Services Provider (MSP) offering Managed IT, Hosting, Cloud Services, and Security Services in Oman with over 7 years of hands on experience
- 2) The first MSP to be certified with payment industry's PCI DSS certified in Oman
- 3) The first MSP to successfully roll out Virtual Data Centre Services (Nebula) in Oman
- 4) The only MSP with a dedicated Cyber Security Centre in Oman
- 5) Availability of on-demand Managed Security and Managed Support Services (see figures 8 and 9)
- 6) Availability of dedicated, internationally certified, 24x7 SOC and NOC teams with ample local experience
- 7) Availability of full cloud consultancy services from design to deployment

FIGURE 8 Our products and services



Source: Oman Data Park

¹ Gartner Inc., The Future of Enterprise Data Centers — What's Next, 24 April 2019, G00384249

FIGURE 9 Our cyber security services

Source: Oman Data Park

Source: Oman Data Park

The Future of Enterprise Data Centers — What's Next

With the rise of cloud computing, traditional enterprise data centers are adapting and evolving. Here, we examine the key trends shaping the future of enterprise data centers and helping infrastructure and operations leaders make informed decisions about on-premises infrastructure architectures.

Key Findings

- Hybrid IT has become mainstream, and future IT infrastructures will not be limited to a single environment, such as on-premises, cloud, edge, colocation or managed hosting.
- Enterprise data center infrastructures are becoming increasingly business-driven, simplified, rationalized and standardized.
- As technology becomes more intelligent, automated, software-defined and modernized, data center resiliency will improve.

Recommendations

Infrastructure and operations leaders responsible for building and sustaining dependable infrastructure should:

- Expand I&O skill sets, practices and procedures to accommodate unbiased, hybrid IT operations and develop a hybrid IT workload placement strategy to maximize business value.
- Create an asset inventory of infrastructure products, people, processes and providers across the IT project portfolio to start the process of simplifying, standardizing and rationalizing the enterprise data center.
- Select and design infrastructure that is adaptable to the resilience requirements of digital business systems by establishing planning principles that account for the changing nature of infrastructure resilience debt.

Strategic Planning Assumptions

By 2025, the number of micro data centers will quadruple, due to technological advances, such as 5G, new batteries, hyperconverged

infrastructure (HCI) and various software-defined systems (SDx).

By 2025, enterprise data centers will have five times more computational capacity per physical area (square feet) than today.

Analysis

For more than 50 years, enterprise data centers have been responsible for storing and processing critical business information. These multidisciplinary technical environments have evolved gradually and conservatively during that time. However, traditional data centers are now feeling the impact of disruption from the cloud, edge computing, advances in colocation and hosting services. In addition, advances in the areas of power, cooling, telecommunications, artificial intelligence (AI), operations, hardware and software are transforming enterprise data centers as never before.

Traditional on-premises data center models must evolve to play a role in modern enterprise information management. How can infrastructure and operations (I&O) leaders anticipate the data center of the future and best position their organizations to thrive in the new environment? This research explains the trends shaping the evolution of enterprise data centers and actions that I&O leaders must take to prepare for these future states.


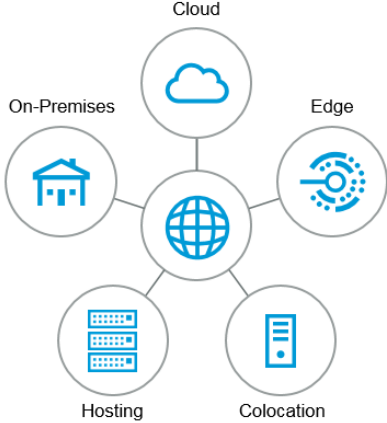
The key trends shaping the future of enterprise data centers are shown in Figure 1.

Data Centers Will Be Distributed, as Hybrid IT Becomes Standard

In response to the disruptive impact of cloud services, many organizations have adopted a “cloud first” strategy. However, not all applications and workloads benefit from the cloud.

The future of IT organizations lies in acting as a type of service broker as part of a broader strategy, which Gartner calls “hybrid IT.” Most organizations have already accepted this model as the standard for their future state. In line with this trend, enterprise data centers will become increasingly distributed, with applications and

FIGURE 10 Trends Shaping the Future of Enterprise Data Centers**Enterprise Data Centers**

Past	Future
 <p>On-Premises On-Premises</p> <p>Primary Site Secondary Site/DR</p>	 <p>Cloud</p> <p>On-Premises Edge</p> <p>Hosting Colocation</p>
Centralized/On-Premises	Distributed/Hybrid IT
Internally Complex	Simplified, Standardized and Rationalized
Manual	Intelligent, Software-Defined and Automated
Tier-Level Design	Always Available/Services-Defined
Large, Sparse and Horizontal	Smaller, Denser and Vertical
Inefficient and Costly	Efficient and Cost-Effective
Slow to Adapt	Agile and Flexible
Interconnected	Multiconnected
Conventional	Greener and Sustainable
Unregulated	Regulated

Source: Gartner (April 2019)
ID: 384249

workloads located where they have the best fit and can deliver the best possible business outcomes.

In addition, new infrastructure models continue to emerge. An era of edge and on-premises computing solutions is expanding infrastructure options and shaping the future of enterprise data centers. These new solutions include the following:

- Modular micro/edge enterprise data center models and cloud radio access network (C-RAN) edge solutions

- On-premises cloud services options, such as Amazon Web Services (AWS) Outposts, Microsoft Azure Stack and Google GKE On-Prem
- Consumption-based purchasing models for on-premises
- Colocation interconnection options

Technologies and areas to watch:

- Colocation services with machine learning algorithms, Open Compute Project (OCP) compatibility, cloud interconnection, and

Internet of Things (IoT) fabric/platforms options

- Edge computing in IoT
- Nano/micro modular data centers
- Multicloud solutions
- On-premises cloud services — for example, AWS Outposts, Azure Stack and Google's GKE On-Prem
- Consumption-based models — for example, HPE GreenLake Flex Capacity
- New telecom options — for example, 5G and low earth orbit (LEO) satellites

Recommended actions:

- Develop a hybrid IT workload placement strategy to maximize business value by incorporating an optimal combination of IT infrastructure and services options, including on-premises, cloud, edge, colocation and hosting services.
- Prioritize initiatives to build an I&O team with strong technical and decision-making skills. Hybrid IT delivery leads to multisource projects in which data center infrastructure must interoperate with a dissimilar service provider, cloud and edge infrastructures, adding portfolio complexity, with a variety of infrastructure choices and sorting options.
- Build skill sets for modern data center environments by developing I&O team skills in a wide variety of tools and applications. Hybrid IT delivery leads to multisource projects in which data center infrastructure must interoperate with a dissimilar service provider, cloud and edge infrastructures, adding portfolio complexity, with a variety of infrastructure and sorting options.

Simplified, Standardized and Rationalized

The evolution of data center infrastructures starts with simplification. The goal is to stay relevant and adapt to a rapidly changing world in which the cloud is growing increasingly pervasive. Data center infrastructures are changing from predominantly complex or proprietary systems to repeatable and predictable, standardized around commercial off-the-shelf (COTS) infrastructures. In addition, fast-paced adoption of new advances with systems such as hyperconvergence, software-defined and composable infrastructures is adding resources for standardization,

rationalization and consolidation initiatives. To increase rationalization, nonstandard workloads and applications will stay on-premises or move to hosted off-premises. As applications become standard, they will move to the cloud.

Technologies and areas to watch:

- Software-defined infrastructure (SDI) and HCI
- Composable, fabric-based infrastructure
- Intelligent infrastructure
- Next-generation hardware and software
- API management platform as a service (PaaS)
- Integration platform as a service (iPaaS)
- Serverless infrastructure.

Recommended actions:

- Start the simplification, standardization and rationalization process by creating an asset inventory of infrastructure products, people, processes and providers across the IT project portfolio. This will enable decision making around rationalizing, renovating, replacing, relocating or retiring assets and workloads.
- Establish a basis for the placement of workloads by constructing a priority matrix for the application portfolio that delineates standard versus nonstandard applications and determines placement — on-premises, off-premises or in the cloud.
- Map two stages of new technology adoption for tactical and specific uses and scale, and then to a more-strategic business process and service framework. Create a leadership committee with representation of architectural design, business process, organizational development, resource management and vendor relationships.

Intelligent, Software-Defined and Automated

AI technologies play an important role in I&O, providing benefits such as reduced mean time to response (MTTR), faster root cause analysis (RCA) and increased I&O productivity. AI technologies enable I&O teams to minimize low-value repetitive tasks and engage in higher-productivity/value-oriented actions. In Gartner's I&O Leaders Survey, I&O leaders indicated plans to work with business leaders to implement AI and machine learning technologies, such as predictive and prescriptive analytics and deep

learning. This will improve business productivity and help the business transition into a zone of productivity necessary for digital-product-driven organizations.

Technologies and areas to watch:

- Persistent/in-memory computing (IMC)
- New coprocessors embedded into standardized systems
- Hyperconverged, software-defined and composable intelligent infrastructure

Recommended actions:

Embark on a journey toward driving intelligent automation. This involves managing and driving AI capabilities that are embedded by infrastructure vendors, in addition to reusing artificial intelligence for operations (AIOps) capabilities to drive end-to-end (from digital product to infrastructure) automation. The pervasive use of AI and machine learning in data centers is making enterprise data centers intelligent, software-defined and automated by:

- Monitoring and managing efficiencies, assets and risks
- Transforming IT operations with AIOps
- Introducing many other innovations

Resilient and Service-Defined

As enterprise data centers become more intelligent, automated, software-defined and modernized by new technology, their resiliency will improve. However, a hybrid IT infrastructure may continue to present new challenges in the years to come. Due to the nascence of the infrastructure options, failover and fallback capability, high availability and disaster recovery methods may not yet have been established in many cases. In addition, existing backup and disaster recovery practices, tools and procedures may no longer be compatible and might need to be replaced. Options for hybrid IT services to support cloud-based failover are limited. Also, significant amounts of third-party independent software vendor (ISV) solutions that are deployed for on-premises infrastructure are not supported in hybrid cloud offerings. These rely on their internal services for high availability, backup and disaster recovery

Technologies and areas to watch:

- Infrastructure automation tools
- AIOps, disaster recovery as a service (DRaaS), and network performance monitoring and diagnostic (NPMD) tools
- New backup methods — for example, techniques that allow block-level, incremental-forever backup with virtual, synthetic full processing and add global deduplication for additional efficiency
- Scale-out distributed file/object storage systems
- Public cloud object storage

Recommended actions:

- Select and design infrastructure that is adaptable to the resilience requirements of digital business systems by establishing planning principles that account for the changing nature of infrastructure resilience debt.
- Instill a culture of continuous resilience improvement throughout delivery teams by emphasizing, governing and rewarding behavior that promotes resilience, such as ownership, collaboration and transparency.
- Reduce risk and enable innovation by simplifying and segmenting the network.
- Invest in and expand the use of automation to manage the complexity of decentralized and distributed systems.

Smaller, Denser and More Vertical

Enterprise data centers are becoming increasingly small, dense and vertical. For example, five years ago, enterprise data centers were frequently designed with average energy densities as high as 5 kW/rack. Today, new designs are often built with averages higher than 8 kW/rack.

The increasing redistribution of workloads to cloud, colocation and edge means less physical space is required in data centers. Increased virtualization, integrated systems, HCI options and advanced solid-state array (SSA) storage require less physical space, but similar amounts of, if not more, energy.

Technologies and areas to watch:

- Liquid cooling — direct to chip, rack and submerged
- OCP
- Open19 and Open Data Center Committee (ODCC) standards
- New persistent memories, high-performance computing (HPC) and HPC edge infrastructures

Recommended actions:

- Strive for vertical density by ensuring optimal compute capacity per kilowatt.
- Increase flexibility and reduce upfront capital costs by adopting multiple power zones.
- Maximize cooling energy efficiencies by employing modern liquid cooling solutions.

Efficient and Cost-Effective

Data centers are complex environments that are often the primary targets for cost-optimization initiatives. Improving data center efficiency has long been the mantra of I&O leaders focused on infrastructure modernization. Compounding the issue, the complexity of business-driven environments and demands from an increasing number of business areas are growing faster than most organizations' IT budgets. As a result, organizations across the world have developed, adopted and improved numerous technologies for improving data center efficiency.

Technologies and areas to watch:

- Data center infrastructure management (DCIM)
- Distributed digital infrastructure management (DDIM)
- New uninterruptible power source (UPS) systems — for example, with lithium-ion and zinc
- New modular power and cooling options
- Software-defined and composable intelligent infrastructures

Recommended actions:

- Enable efficiency improvements by collaborating with the facilities team to

identify and act on opportunities to optimize efficiency. Use outside expertise if you do not have the internal knowledge, skills or resources.

- Simplify efficiency initiatives by focusing initial efforts on techniques that are easier to implement and offer higher rewards, such as managing temperature properly or eliminating unnecessary cooling equipment.
- Establish a long-term focus on efficiency by creating a data center efficiency program that sets realistic and defensible metrics.

Agile and Flexible

Enterprise data center infrastructures require multiple adaptive modes of IT. Some are based on core IT transactions and systems of record. Others are based on rapidly evolving systems of innovation and engagement.

Although organizations are looking to implement continuous delivery, they have been slow to implement the basic building blocks required to achieve that goal. Only 38% of respondents in a Gartner Agile and DevOps survey said they have already implemented DevOps, and even fewer had implemented continuous delivery.¹ Many of those same respondents had no plans to implement many of the basic building blocks necessary to achieve that goal, such as test-driven development (TDD), automated acceptance testing and continuous integration.

Continuous delivery and deployment practices advocate the complete automation of the delivery pipeline — from the point where developers commit their code to the actual release of the software application to the user. In continuous delivery scenarios, stop points allow decision makers to determine when to move forward. With continuous deployment, there are no stop points. Code moves directly from the developer's commit, through the development life cycle to the production servers, with no human action required.

Technologies and areas to watch:

- AIOps platforms
- Application release orchestration (ARA)
- IT workload automation
- Continuous configuration automation (CCA) tools

Recommended actions:

- Create an I&O agility vision that optimizes I&O interactions and transactions by assessing current I&O capabilities to spot potential agility roadblocks and opportunities for improvement.
- Reduce “transaction friction” by implementing I&O agility improvements in small steps.
- Sustain and scale your momentum by establishing a mindset within I&O in which improving I&O agility is “business as usual.”

Multiconnected

Network connectivity is one of the most critical elements of hybrid IT. In the precloud era, enterprise wide-area networks (WANs) were optimized for workloads running in the data center. Internet access was often centralized and internet-bound traffic had to traverse the enterprise WAN and go all the way to the data center to reach the internet. Multiprotocol Label Switching (MPLS) was king. When critical workloads started moving to the cloud, the latency created by this traffic backhauling became unacceptable. The enterprise WAN needed to be readjusted. Organizations are developing network initiatives, such as using colocation and cloud interconnects, adopting software-defined WAN (SD-WAN), software-defined networking (SDN) and APIs for implementing a multiconnected environment.

Technologies and areas to watch:

- Cloud interconnect options
- SDN
- Network automation
- Network orchestration
- Intent-based networking systems (IBNS)

Recommended actions:

- Ensure that the networking function can fulfill current and future requirements for digital business, IoT and cloud use cases by creating a catalog of standard network services that are offered to the rest of IT and the business.

- Explore the cloud interconnect options, including data center to the cloud, interregional within a cloud provider and multicloud connectivity in the same way you use classical data center interconnects.
- When you have more than one carrier and cloud provider, reduce latency to cloud providers by implementing cloud interconnect in a colocation space.

Greener and Sustainable

Because data centers are energy-intensive, energy consumption is one of their biggest environmental issues. A green data center gleans the maximum amount of production from the minimum amount of materials and energy, without compromising performance, resilience or security.

A green approach requires an end-to-end integrated view that includes the configuration of the building, energy efficiency, waste management, asset management, capacity management, technology architecture, support services, energy sources and operations.

Aligned with the United Nations 2030 Agenda for Sustainable Development, future data center infrastructures will be increasingly greener and sustainable, because sustainability and profitability are no longer seen as competing interests.² In business performance reporting, the boundary between these objectives is disappearing. Investor, regulator and shareholder demand has driven 78% of the Global 250 to integrate corporate responsibility information into their financial reports. This represents an increase from 65% in 2015.

Technologies and areas to watch:

- Smart batteries
- Microgrid and smartgrid management
- Renewable energy generation — for example, solar, wind and fuel cells
- New battery technologies

Recommended actions:

- Establish an environmental impact baseline for your data center by reporting on the environmental impacts, such as carbon emissions and water consumption, of data center infrastructure.

- Pursue ambitious resource-conservation goals by creating focused collaborative environmental initiatives with cloud, colocation, edge and hosting service providers.

Regulated by Governments

Enterprise data centers are becoming increasingly regulated by governments due to the growing focus on digital ethics, privacy and risk. Several regulatory controls have direct implications for data center infrastructures.

SEC Rule 17a-4: This outlines requirements for data retention, indexing and accessibility for companies that deal in the trade or brokering of financial securities.

The U.S. Department of Defense (DoD): DoD requires all of its contractors to adhere to the NIST Special Publication (SP) 800-171 standard. The purpose of this regulation is to “protect controlled unclassified information in nonfederal information systems and organizations.” In other words, DoD will not share sensitive information with contractors that do not comply with the level of security defined by the 800-171 standard.

Health Insurance Portability and Accountability Act (HIPAA) of 1996: This is a U.S. standard for electronic-healthcare transactions and employees and providers. Data governance is needed to protect against harmful breaches. The healthcare industry poses interesting challenges, because 80% of data is unstructured doctor notes, X-ray and MRI images, medical device sensor data, and lab results.

NIST Special Publication 800-53: This is a catalog of security controls spanning U.S. federal information systems. Its Risk Management Framework covers areas such as access control and business continuity/disaster recoverability. The regulation applies to all organizations and all systems, not only information systems.

European Union (EU) General Data Protection Regulation (GDPR): The GDPR strengthens data security and protections for all EU subjects, whether they live within the EU or anywhere else in the world. The GDPR mandates stiff financial penalties for violations.

Technologies and areas to watch:

- Advanced automation and analytics technologies applied to compliance and regulatory controls
- Integrated risk management

Recommended actions:

- Champion the role that technology can play in regulatory compliance programs by demonstrating how architectures and product configurations can help prevent violations.
- Implement compliance measures by performing a technology gap analysis to assess existing controls and identify areas where these controls are not proportional to the identified risk.
- Plan for a continuous effort to ensure regulatory compliance by assessing the flexibility and scalability of current controls to determine their ability to adapt to changes.

Evidence

¹ I&O Leaders Survey: This research was conducted via an online survey from 15 June 2018 through 26 June 2018 among members of the Gartner Research Circle, a Gartner-managed panel composed of IT or IT-business professionals. In total, 96 members participated and were business end users with an IT or IT-business focus as a primary role. Qualified participants are responsible for or influence IT I&O decisions and are aware of how I&O engages with the rest of the company. The survey was developed collaboratively by a team of Gartner analysts, and was reviewed, tested and administered by Gartner’s Research Data and Analytics team.

² United Nations: Transforming Our World: The 2030 Agenda for Sustainable Development.

Source: Gartner Research Note G00384249, Henrique Cecci,
24 April 2019

About Oman Data Park S.A.O.C.

Established in 2011, Oman Data Park (ODP) is the Sultanate's premier IT Managed Services provider offering superior Managed Data Centre Services and Cloud Services utilising our locally hosted Tier 3 certified Data Centres. With a vision to transform the future, where ICT services will be available on demand, we serve over 500 local and international corporates ranging from large, mid-tier to small companies. Whether it's a Government, Corporate or an SME entity operating in Oman or internationally, we are fully equipped to serve them with cost effective and secure IT services offering, and lead the customer's business into the future while they comfortably focus on their core business activities.

The winner of Best Digital Data Centre in the Middle East at the Telecom World Middle East Awards 2019 as well as the Best Managed Security Services Provider (MSSP) Award 2019, We operate Oman's only Virtual Data Centre – Nebula. Our newly commissioned Cyber Security Centre and the newly launched Professional Services as a Service (PSaaS) are all a part of our Opex based models offering economical pay-as-you-grow models that facilitate Infrastructure as a service (IaaS), Network as a Service (NaaS), Data Centre as a Service (DCaaS), Disaster Recovery as a Service (DRaaS), as well as Application as a Service (AaaS).



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