

# SD-WAN

## GCloud 11 Service Definition document

### Lot 1 - Hosting

Crown  
Commercial  
Service  
Supplier

RM1045, RM3804  
& RM1557

 **HEALTH &  
SOCIAL CARE  
NETWORK**

RM3825 ACCESS SERVICE FRAMEWORK



HM Government | G-Cloud



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## SD-WAN Service Overview

The architecture we propose for our customers focuses on facilitating your plans to move to a more IaaS/SaaS based environment. Our design brings key service benefits such as increased bandwidth flexibility, improved service insight, total control of applications and automation on data services. Exponential-e believes that by deploying a performant core network inclusive of detailed monitoring, and intelligent routing capabilities creating a flat network, our customers will better adapt to its current and future organisations requirements.

Exponential-e's core design principle is to deliver a Software Defined Network (SD-WAN), comprising of access bearers and managed SD-WAN edge devices across a low latency any-to-any site network connectivity. Our SD-WAN has inbuilt advanced Application Aware Routing (AAR) and sophisticated analytics offering centralised bandwidth control across the network.

Sophisticated analytics comes with historic and near real time performance data that helps your IT administrators view and manage the health of the WAN, identify and address service issues and to capitalise upon new opportunities to meet your organisation's needs.

AAR is the intelligent forwarding of application traffic across the SD-WAN ensuring that pre-defined, per-application performance metrics, or Key Performance Indicators (KPIs) are consistently achieved. AAR enables Exponential-e utilise backup network connections in an active/active mode where traffic is routed across all connection making full use of bandwidth.

We will start by bringing the customer site/s into the Exponential-e Software Defined Network (SDN). The SDN is overlaying on our Next Generation MPLS network. Our SDN/MPLS core network is built on a dense wave division multiplexing (DWDM) technology capable of up to 2Tbps of core capacity.

## Benefits of SD-WAN

- ✓ **Directly programmable:** Network control is directly programmable because it is decoupled from forwarding functions
- ✓ **Agile:** Abstracting control from forwarding lets administrators dynamically adjust network-wide traffic flow to meet changing needs
- ✓ **Centrally managed:** Network intelligence is (logically) centralised in software-based SDN controllers that maintain a global view of the network, which appears to applications and policy engines as a single, logical switch
- ✓ **Programmatically configured:** SDN lets Network Managers configure, manage, secure, and optimise network resources very quickly via dynamic, automated SDN programs, which they can write themselves because the programs do not depend on proprietary software
- ✓ **Open standards-based and vendor-neutral:** When implemented through open standards, SDN simplifies network design and operation because instructions are provided by SDN controllers instead of multiple, vendor-specific devices and protocols.

## The Technical Design Explained

Exponential-e's network solution consists of the following components:

- ✓ **SD-WAN:** Exponential-e will deploy an SD-WAN network at all customer sites with intelligent Nuage Networks devices
- ✓ **Internet:** We will provide local internet access to all sites where local break-out is required from the Exponential-e core network
- ✓ **Data Centres:** We will deploy a single Fibre access circuit for any data centre locations supporting data and local internet services, terminated into managed Nuage device
- ✓ **Main Sites:** We will deploy fully diverse fibre access circuits (for primary and secondary connections) in each of the main sites if requested by the customer, using BT resilient option (R02). Subject to site surveys, this will guarantee that dual entry points, dual fibre paths and dual PoPs diversity is maintained throughout the term of the contract. Each fibre access circuit will support private and local internet services and will be terminated into a separate managed Nuage device
- ✓ **Branch Sites:** We will deploy a single fibre access circuit in each of the requested locations, supporting private and local internet services, terminating into a managed Nuage device.

## Benefits of Our SD-WAN Service vs MPLS Network

Our standard MPLS service encompasses many benefits including:

- ✓ Visibility and reporting of your network
- ✓ Prioritisation of any critical Applications
- ✓ Highly skilled Exponential-e technicians supporting your service 24x7x365 (co-located 1st, 2nd and 3rd Line and Service Management), resulting in higher first time fix rate and faster resolution.

In addition to the above our SD-WAN service also brings some key additional benefits:

- ✓ **More Efficient Use of Bandwidth** – Our underlying Core network coupled with our SD-WAN overlay service allows you to combine, from any given site connection, secure direct access to public Cloud applications via the Internet, with private connectivity to Data Centre-hosted applications. No need for local firewalls, nor multiple circuits per site. This in turn allows you to reduce your bandwidth requirements into your Data Centre locations
- ✓ **Optimised End User Experience** - Whether you are accessing your in-house or 3rd party applications, your network traffic flows are optimised end-to-end with intelligent routing and application-aware quality of service, reducing latency and improving your end user experience. This will result in fewer end user calls into your internal IT Service Desk
- ✓ **Faster Configuration Changes** - Network device configuration changes including VLAN configurations and IP addressing scheme changes are carried out centrally and uploaded to each device in a safer, quicker, and in an automated way



- ✓ **More Agile Load Balancing** - for critical sites that have resilient circuits, we can better control traffic flow load balancing based on more parameters other than latency or bandwidth utilisation
- ✓ **Best of Both Worlds** - We have one of the best business-only network coverages in the UK (with multiple international Points of Presence in Europe and US). The benefit of using SD-WAN is that we can uniformly overlay our solution over our multi-service network, combining the benefits of a private network with the agility of a software-based central control pane.
  - Reduced WAN traffic
  - Traffic routing on the fastest available paths between any two points
  - Better quality of service (QoS) for high-priority applications
  - Simplified administration for remote and branch offices
  - Ability to leverage low-cost and flexible Internet and 4G network connections as well as private WAN links
  - Visibility into WAN paths to troubleshoot performance issues more quickly.
- ✓ Whilst SD-WAN facilitates centralised control for customers, we provide a flexible model whereby you can choose the level of support you require (i.e. Service Management, MAC provisioning, Design and Change Management). We understand that this may change over time, and therefore can tier as required.

## Nuage Network Security

The Nuage Network Services Gateway (NSG) is capable of more than just border security with an embedded stateful firewall built into every NSG device. The NSG's security is fully manageable through the SD-WAN portal utilising the Virtual Network Security (VNS) and Virtualised Services Directory (VSD). With the Nuage Networks VNS solution and its VSD policy-based manager, management and monitoring of the wide area environment can be simplified. The VSD can create policies for application traffic at multiple levels and these policies can be grouped together into templates. The templates can be deployed automatically when an application changes (e.g. if a critical application is relocated to the disaster recovery data centre location) or a new branch is added.

Policies can be split into four key types:

- ✓ Application policies
- ✓ Branch policies
- ✓ Security policies
- ✓ Network policies

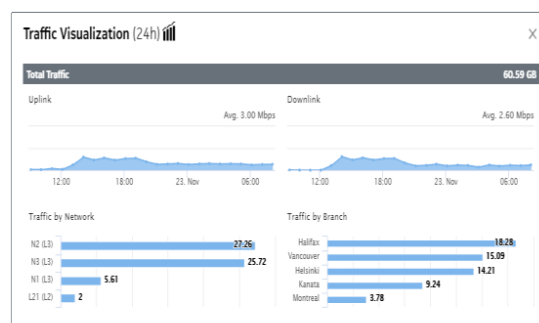
## Monitoring and Reporting

Our solution will be supported by the Exponential-e 24x7x365 Service Desk for incident management and trouble ticketing. Exponential-e will provide customers with proactive 24x7x365 monitoring of all sites. Various specialist tools allow our Service Desk technicians to identify, ring-fence, fix problems swiftly and efficiently. Using the SD-WAN customer portal, customers will be able to gain constant online access to statistics relating to real-time performance of the Wide Area Network.

Service Reports can be viewed to see Bandwidth Throughput, SLA Reports, Availability Latency, and Packet Loss and Jitter through the SD-WAN customer portal.

### Network Traffic

- ✓ The network traffic pattern is an indicator of under, or over-utilised resources as per the designed capacity and the configured limits.
- ✓ With Nuage SD-WAN Portal the network traffic pattern can be visualised as 'Bar and Trend' line charts for quick viewing and also computed KPIs such as: average, peak, 95th percentile and volume for analysis of the traffic pattern
- ✓ The traffic pattern visuals are available at the Enterprise level, L3 Domain (VPN) level, and at the branch (CPE) level

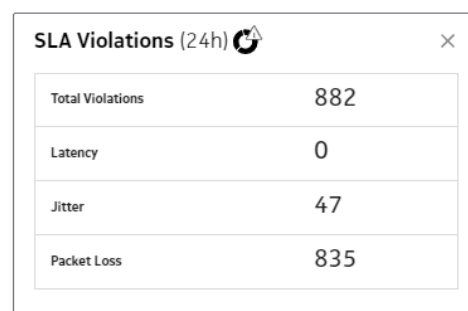


### Network Performance

- ✓ With continuous network probes running across critical paths, IT administrators can quickly visualise and analyse the performance pattern with trend line charts in the SD-WAN portal

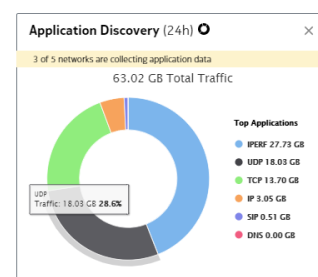
### Application Performance

- ✓ Nuage VNS offers Application Aware Routing (AAR) using SLA and policy based driver or a mixture of both
- ✓ With Nuage SD-WAN Portal, an enterprise user can visualise the traffic pattern (trend line charts) of individual applications
- ✓ The application level visualisations include application performance and violations dashboard at the Enterprise level, L3 VPN level, and at a site level



### Application Discovery

- ✓ In addition to AAR, Nuage VNS also offers visualisation of discovered application as they application data traversed through the Nuage platform regardless of AAR is enabled or not
- ✓ With Nuage SD-WAN Portal, an enterprise user can visualise the applications discovered



## Quality of Service (QoS)

Our proposed SD-WAN solution enables our customers to reserve a proportion of their total bandwidth for Voice traffic and additional three class of services for prioritising data, as per your requirements.

On ingress to the SD-WAN CPE, traffic can be policed, but on egress (access or network side) the traffic is shaped. The egress QoS feature uses a Hierarchical Token Bucket (HTB) scheduler to shape customer traffic. The scheduler includes a parent queue with four child queues. Bandwidth is allocated to the child queues based on Strict Priority (SP) and Weighted Round Robin (WRR) queuing methods. The queuing method used for each child queue does not change if the available bandwidth falls below the Committed Information Rate (CIR) of the parent queue.

1. Q1: strict priority
2. Q2-4: weighted round robin

The QoS algorithm allows you to assign low latency and delay-sensitive traffic to the priority queue (Q1) for guaranteed throughput without starving the lower priority queues (Q2-4) during times of network congestion.

During network congestion, bandwidth is distributed in the following order:

1. Bandwidth is allocated to Q1 up to the configured CIR value
2. Bandwidth is distributed among Q2, Q3, and Q4 using WRR up to their configured CIR values. The CIR values are used to determine the weight
3. Bandwidth is allocated to Q1 up to the configured PIR value
4. Bandwidth is distributed among Q2, Q3, and Q4 using WRR up to their configured PIR values. The CIR values are used to determine the weight.

## Demarcation

The WAN Service Demarcation Point (SDP) is the point up to which Exponential-e's service obligations apply and the WAN Service Level Agreement covers. The customer-facing Ethernet port(s) on the managed Nokia NSG SD-WAN device is the SDP.

## Proof of Concept

We recommend that customers consider the merits of a Proof of Concept in order to demonstrate the day-to-day operational aspects of the SDN system in action.

As an edge device, there's very little in terms of packet processing that needs to be tested in an SD-WAN node. But that doesn't mean SD-WAN node testing isn't important and we want our customers to have absolute confidence ahead of any full roll out. Hence our POC will help reduce the risk associated with deployment allowing us to address any issues in a controlled environment.

## Path Selection

One of the primary benefits of SD-WAN is being able to split traffic between expensive, dedicated links and lower-cost internet VPNs. Being able to differentiate mission-critical and latency- or jitter-sensitive traffic from less important or less time-sensitive traffic is key to success, this isn't always easy to accomplish. Each vendor has proprietary algorithms to determine which traffic should go over which link. These algorithms will be tested during your POC to ensure they work as expected.

## Scalability

As you have a large network, scalability will be an important consideration - will the network be hub and spoke, or full mesh? Full-mesh networks will require a more robust SD-WAN solution.

## Failover

SD-WAN offers failover capabilities in the event of a link outage.

Detecting a link that is completely down is easy. But other than a wire cut or hardware failure, most network outages are highly dynamic, with frequent momentary pauses or a high level of packet drops. This presents a more challenging decision of when to failover traffic from one link to another and determine when it is safe to switch back, as with network brownouts.

Different products handle failover differently. Failover is an important use case, testing needs to recreate not only the hard outage case, but also momentary outages, periods of excessive congestion, and a range of packet loss rates. This is important in order to understand what to expect from your system and to optimise any tuneable parameters to your specific application needs.

## Application Performance

We expect the SD-WAN system to also provide application acceleration, so the applications must be tested under real-world network conditions to understand the end-user experience and determine which SD-WAN product will work best for your network conditions.

Application acceleration technology is being integrated into some SD-WAN products, while traditional WAN optimisation devices are adding SD-WAN or hybrid WAN features. Application acceleration benefits in particular are highly dependent on the interplay between application, acceleration technique, and network conditions, particularly bandwidth, latency, jitter, and loss.

## Usability Testing

Usability testing is important with SD-WAN. It is critical to choose a product that works well for your particular needs and tune the parameters to optimise performance for your particular network. Simulate a multi-site deployment in the POC and then see what degree of management and control the SD-WAN gives you. Test the usability of tasks you will conduct during the course of the day, such as adding or removing users, changing application parameters, installing new SD-WAN locations, and reconfiguring nodes in existing locations.

We can adjust settings on the existing MPLS network to get an objective sense of what happens if we reduce your reliance on MPLS, since you can effectively switch it on and off without a problem. Testing is to be done on the real network or using a WAN emulator to reproduce real-world conditions. Either way, our customers' network, applications and end-user requirements are different from anyone else's.



## Working with Exponential-e

### Introduction

Founded in 2002, we are an award-winning, privately owned British Cloud and Connectivity provider. The majority owner, CEO and founder of the company - Lee Wade - is still at the helm of Exponential-e and demonstrates the same passion for our customers, service innovation and business as he did at our inception. We pride ourselves on delivering super-fast, low latency Connectivity, flexible and resilient Cloud solutions Unified Communications, Cyber Security and world-class IT Services. Organisations from all sectors of the economy run critical services underpinned by our technological innovations. We deliver leading-edge solutions to over 2,200 customers in every vertical sector.

### Our Network

Exponential-e's own Cloud infrastructure is fully integrated with our 100 Gigabit Carrier-Class Ethernet Network, utilising premium grade enterprise compute, and is supported by our UK based 24x7x365 Customer Service Desk to deliver a non-stop compute platform to you and your end users.

What differentiates us from the competition is how we utilise our own network to deliver multiple services over one connection, with 100% Network visibility and control, and the cost efficiencies this provides our customers. Our fusion of complementary technologies, a carrier-class network and Cloud infrastructure, means we can deliver enterprise applications at super-fast, low latency, with an end-to-end SLA, for a superior end-user experience.



### Our Accreditations

We support the security and compliance standards of the Public Sector by embedding our compliance certifications into our Business Management Systems. These include:

- ✓ **ISO27001** - Information Security
- ✓ **CSA Star** - Cloud Security
- ✓ **Cyber Essentials Plus**
- ✓ **PCI-DSS**
- ✓ **(HSCN)** Health Social & Care Network Stage 2 Compliance

- ✓ **CAS(T)** accreditation
- ✓ **ISO9001** - Quality Management
- ✓ **ISO20000-1** - Service Management
- ✓ **BS10012** – Personal Information (GDPR)
- ✓ **ISO22301** - Business Continuity
- ✓ **ISO50001** - Energy Management
- ✓ **ISO14001** - Environmental Management

Our certifications are fully audited every three years by BSI, NCC Group & NHS Digital, supplemented by six monthly continuing assessment audits to ensure continuing compliance. The following preventive are undertaken actions to ensure we maintain our certifications & accreditations;

- ✓ 12 month Audit Schedule
- ✓ Monthly Internal Audits in line with our audit schedule
- ✓ Six monthly external Audits
- ✓ Live Net Promoter Score on our Website
- ✓ All Engineers undertake BPSS vetting by a government approved vendor
- ✓ Corrective and Preventive Actions – CAPA
- ✓ Control of Documents and Records
- ✓ Companywide Risk Assessment
- ✓ Annual review of policies, procedures and documents
- ✓ Internal & External PEN (ITHC) Network Test by a ‘Check’ or “Crest” approved vendor
- ✓ Annual off site Business Continuity Test
- ✓ Management reviews (Management Meeting, Service Review, Quality Review, Business Continuity, Security Review and Operation Review)



## Our Promise

Our brand promise is to ‘Constantly exceed expectations with innovation and service’. In order to achieve this, we promise to deliver the following:

- ✓ **Customer Service Excellence:** Our first priority we never compromise on, this culture spans across every department and is championed by every board member
- ✓ **Trusted Supplier:** A reliable and fully owned carrier-class network, with pro-active support from our 24x7x365, fault find and fix Service Desk, and verified financial stability inspire customers’ confidence in us
- ✓ **Technical Capability:** Working within eight international ISO and British Standards, we design, manage and support customers’ complex, bespoke network, Cloud and Voice requirements

- ✓ **Applied Innovation:** Ensuring customers' businesses remain at the leading edge with a dynamic approach to investment, R&D and innovation, and consistently delivering industry firsts.

Our network has undergone a rigorous security assessment and has achieved PCI-DSS compliance to ensure top security standards. We design, deliver, manage and support communications solutions, both simple and complex, to international ISO management standards: 9001, 22301, 14001, 5001, 27001, 20000 and BS 10012.

By the start of FY2018, our turnover had reached approximately £115 million and ongoing recruitment activity meant that we had over 500 employees. Our success is driven by the quality of service we provide and is underpinned by investments in people and infrastructure that enable us to deliver on our brand promise.

## Exponential-e's Approach

Our approach is based on a partnership philosophy, ensuring we deliver high quality, competitive services. In keeping with this, our technology solutions provide cost-effective connectivity, future-proof networking and uncompromising customer support. Our approach is designed so that there are no hidden extras from you. From the initial point of contact, including technical consultancy, project management and on-going customer support, we are entirely transparent about our work and the costs involved. To maximise the value for money customers receive, we constantly challenge the performance of the service through 24x7x365 monitoring and management via the Exponential-e Service Desk, feeding back at monthly service reviews that constantly benchmark your expectations. During these reviews, we propose and implement continuous improvement targets for service levels and cost efficiency. On award of any contract, we analyse the service required and explore how we will improve the services year-on-year.

## Thought Leadership and Applied Innovation

We have an entire team devoted to seeking out new products, features and enhancements. We pride ourselves on our ability to generate, identify, and deploy the latest technologies. Our commitment to innovation has seen us develop pioneering new products and services for our customers and deliver all manner of industry firsts.. We will constantly keep you informed of new technologies that ensure you remain current and knowledgeable as to innovative solutions and best practices. The most effective means of doing that is during our regular Service Management review meetings; the reviews will take place on a monthly or quarterly basis, or upon request. These sessions are used to understand your requirements, address any current service issues, and for our team to update you on new market trends or technologies our researchers have identified.

You will have the opportunity to attend regular events that provide an opportunity to speak with our subject matter specialists and to exchange ideas and experiences with other Exponential-e customers. We are firmly committed to listening and collaborating with our customers, and partners, in order to deliver innovative technical solutions that drive tangible business benefits.

We organise industry focused and private seminar events at exclusive venues, such as the Ritz and Emirates Stadium. We invite key speakers to present, as well as our in-house technical experts and evangelists, and look at topics including 'Demystifying SD-WAN' These events are excellent networking opportunities which present you with a chance to speak with like-minded individuals in an informal environment and gain real technical knowledge and insight from our team of experts.

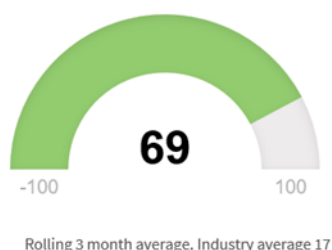
Details of our events can be found on our website, <http://www.exponential-e.com/about/events>, where you can register.

You will also be sent updates from our marketing department, highlighting new features or services available in the market. New products, features or services that we feel are well suited to our customer's infrastructure, or will benefit their IT environment, will be brought to their attention. Initially, many of our customers adopt our WAN solution and are often keen to complement this service with our Cloud, IT and Voice services.

## Meeting our Brand Promise

For over 17 years we have focused on building trusting relationships with our customers by placing service excellence at the heart of our operations. Key to our success is the development and sustainment of effective working partnerships through regular service review meetings, proactive management and - most importantly - continually seeking to improve the services which will be delivered.

In order to ensure that we are continuously improving, we benchmark customer satisfaction which provides us with the analysis to improve. Measuring our customer satisfaction is achieved through our Net Promoter Score and our Voice of the Customer Programme.



<https://www.exponential-e.com/about/customer-service-promise>

Our current 3 monthly rolling NPS score is more than double the UK Industry average.

Our Voice of the Customer Programme gives you the opportunity to provide real-time feedback by simply clicking on one of four icons on each Exponential-e employee's email-signature (Gold- Excellent, Green- Good, Amber- Could have been better, Red- Poor).

These awards are all testament to our solutions and achievements in innovation. Details of our other awards can be found on our website:

<https://www.exponential-e.com/about/our-accreditations-awards>

Meeting our brand promise through customer service excellence is embedded into our culture; anytime our customers recognise our people doing well, we reward this throughout the business. At Exponential-e, we're committed to service excellence and are empowering our people to deliver it.

## Our Security Capabilities

### Security assurance

Our services are designed, built and optimised with clear alignment to the 14 CESG Cloud Security Principles that UK Public Sector organisations use when assessing cloud hosted solutions for information assurance compliance.

The Exponential-e cloud benefits from extensive independent validation via certifications ranging from international standards e.g. ISO9001, ISO27001 and ISO20000 to UK public sector specific standards such as CAS(T) and HSCN Stage 2 certification.

The Exponential-e Cloud Platforms are subject to regular, extensive IT Security Health Check (ITSHC) CHECK Tests by independent, CESG-approved assessors to ensure that our customers have confidence in the physical and technical security controls which have been implemented to protect their valuable data assets. Platforms are suitable for all data classified at OFFICIAL under the Government Security Classification Policy (GSCP)

All customer data is stored in Exponential-e's two secure UK data centres with SC-cleared UK staff. Customer identifiable data does not leave the UK.

### Connectivity

Our UK Data Centres have resilient connections to secure UK government networks such as HSCN Assured as well as large scale, DDoS protected internet connectivity. We also offer the ability for customers to present their own connections (such as direct connectivity into your MPLS, or inexpensive point to point connections via leased lines) and the Secure Remote Access solution to allow security assured VPN access to the Elevated OFFICIAL platform.