

# **Cisco Desktop as a Service Solution with Desktone**

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The CVD program consists of systems and solutions designed, tested, and documented to facilitate faster, more reliable, and more predictable customer deployments. For more information visit http://www.cisco.com/go/designzone.

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Cisco Desktop as a Service Solution with Desktone

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## **1** Preface

## Introduction

The Cisco Desktop as a Service (DaaS) Solution with Desktone enables service providers to offer desktops as a service to their customers. The Cisco DaaS Solution with Desktone is built to be highly scalable and supports multi-tenancy.

Cisco DaaS Solution with Desktone delivers desktops as a service on a common infrastructure. This common infrastructure is hosted in service provider data centers. Microsoft Windows 7 is the operating system of choice for the virtual desktops and is available in persistent and non- persistent flavors. The Cisco DaaS Solution with Desktone is built by combining data center, network, and security technologies from Cisco and desktop virtualization technologies from our ecosystem partners.

Cisco DaaS Solution with Desktone accomplishes complete separation between customers from desktops in the data center, through the data center network, across the wide area network, and down to the customer network. Customer visibility is restricted to only their virtual desktops. However, service providers have insight into how resources as a whole are utilized by different customers.

The pod-based approach adopted for the Cisco DaaS Solution with Desktone enables flexibility in growth based on business needs without requiring a redesign of the data center. This approach ultimately lowers operational costs for the service provider. The pod as a logical unit supports multiple customers at different scale on a common infrastructure.

Network services deliver exceptional user experience for a large number of users without requiring additional resources to be deployed on the customer end. Security policies are enforced between the customer's network and the virtual desktops in the service provider's data center.

Cisco DaaS Solution with Desktone has been tested end-to-end to confirm that all the different components interoperate. With Cisco DaaS Solution with Desktone, service providers are now able to build a multi-tenant desktop as a service solution faster and at reduced risk than ever before.

## **Target Audience**

This document is intended for, but not limited to, solution architects and engineers involved in planning and designing Cisco DaaS Solution with Desktone. This document assumes the reader has an understanding of the following:

- Cisco Virtualized Multiservice Data Center
- Cisco Unified Computing System
- Cisco Nexus Switches
- Cisco Catalyst Switches and Service Modules
- Cisco Aggregation Services Router
- Cisco Adaptive Security Appliance
- MPLS VPN
- VMware vSphere
- Desktone
- NFS Storage
- Microsoft Windows 7 Operating System

## 2 Cisco DaaS Solution with Desktone Overview

This section describes the capabilities of the different products and solutions that are part of the Cisco DaaS Solution with Desktone reference architecture and how these elements are integrated to deliver a scalable, flexible and secure multi-tenant solution for service providers.



Figure 1 System Overview

The building blocks of the Cisco DaaS Solution with Desktone are:

- Virtualized Multiservice Data Center
- Wide Area Network
- Security
- Multi-Tenant Connection Broker

## **Virtualized Multiservice Data Center**

The Cisco Virtualized Multiservice Data Center (VMDC) Version 2.2 is the platform used for Cisco DaaS Solution with Desktone. The platform is ideal for service providers as it is designed for cloud based offerings and provides a multi-tenant infrastructure on which any service can be delivered. The modular architecture is highly scalable and adapts easily to the changing business needs of the service provider. The design has been validated by end-to-end system level testing and offered as part of Cisco Validated Design Program.

The first building block in the Cisco VMDC architecture is an integrated compute stack (ICS) based on Cisco Unified Computing System (UCS).

Compact pod design is the one chosen for Cisco DaaS Solution with Desktone. It uses centralized service node architecture on a collapsed aggregation/core with top-of-rack access.

Multiple ICS blocks are connected through the network infrastructure to form a pod. New pods are built and added to the data center for additional capacity, thereby making the entire solution scalable.

### Figure 2 VMDC Pod



VMDC Network is organized into core, aggregation and access layers similar to a campus network design.

The primary function of the core is to provide high performance Layer 3 switching for IP traffic.

The aggregation layer provides connectivity for the access layer switches in the server farm and aggregates them into a smaller number of interfaces to be connected into the core layer. Services are introduced into data flows at the aggregation layer.

With Cisco DaaS Solution with Desktone using the compact pod design, the core and aggregation layers are collapsed into one.

The access layer provides connectivity for server farm end nodes. Quality of Service (QoS) markings are done on the display protocol traffic at the access layer of the VMDC network and prioritized in the data center network.

The WAN Edge of the service provider's data center provides network traffic isolation between different customers as they come into the data center from the WAN.

### Figure 3 Cisco VMDC Network Topology



## Wide Area Network

The WAN is the primary method of delivery of virtual desktops to customers. A VPN connection extends the customer network into the data center of the service provider enabling seamless access of virtual desktop for users in the customer premises.

MPLS VPN is one of the VPN technologies supported in Cisco DaaS Solution on Desktone. With MPLS VPN, the traffic separation is built directly into the network without tunneling or encryption. Unique VPN route forwarding (VRFs) at the Provider Edge routers separates the traffic for every customer and allows overlapping IP addresses to exist. A customer's visibility is restricted to their network traffic only.

Based on the Service Level Agreement between the customer and WAN provider, the customer traffic of interest that are marked with appropriate Quality of Service markings is prioritized over the WAN, delivering an enhanced user experience.

## Security

Cisco ASA Service Module (SM) is deployed on the Data Service Node, Catalyst 6500 to provide firewall functionality between the customer physical network and the virtual environment hosted by the service provider. The Cisco ASA SM supports multiple contexts, each of which is assigned to a tenant. The context will give every tenant a dedicated firewall to configure specific security policies that they desire.

## **Multi-Tenant Connection Broker**

The Desktone platform supports connections to virtual desktops over multiple display protocols like Microsoft Remote Desktop Protocol (RDP), VMware PC over IP (PCoIP) from different customers. PCoIP was the one used in the study. The platform authenticates and connects users from different customers to the right desktops in the data center. The IT administrator of customers gets to view only their own desktops. The service provider is the only one who has the visibility on how the resources are used by different customers in the data center.

## **Cisco DaaS Solution with Desktone Components**

Function	Product
Compute	Cisco UCS 2.1(1a)
Hypervisor	VMware vSphere 5.1
Storage	NFS Storage
	iSCSI/FC for SAN boot (optional)
Access Layer	Cisco Nexus 5548UP 5.2(1) N1 (2a)
Core/Aggregation Layer	Cisco Nexus 7009 6.1 (2)
WAN Edge	Cisco ASR 9000 4.2.0
Data Center Service Node	Cisco Catalyst 6506 12.2(33) SXJ1

### Table 1 Cisco DaaS Solution on Desktone Components

Function	Product
Compute	Cisco UCS 2.1(1a)
Network Services	Cisco ASA SM 8.5(1)
Connection Broker	Desktone 5.3.2

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## **3 Design Considerations**

Cisco DaaS Solution with Desktone has been designed with the following objectives in mind.

- Tenant Separation
- High Availability

## **Tenant Separation**

Desktops are deployed by enterprises in-house on dedicated infrastructure. To consume desktops on shared infrastructure, customers must be certain that their corporate information is secure and isolated end-to-end. Secure tenant separation is done at the following levels:

- Compute
- Network
- Network Services
- Storage
- Desktop



### Compute

A separate blade server is assigned for the Desktone Platform management software. This host runs Desktone service provider appliances and tenant appliances for every customer.

Blade servers are dedicated as a whole to every tenant. This is done to comply with Microsoft licensing agreement. Microsoft Virtual Desktop Access license prohibits running Windows 7 virtual desktops for different customers on the same host. This makes sure that there is complete separation of compute between different customers. Dedicated hosts are maintained even in times of hardware crashes when virtual desktops are moved between hosts.

### Network

A logically separate network infrastructure is created for every customer. The separation is done at both Layer 2 and Layer 3 using VLAN and VRF respectively.

Layer 3 VPN provides separate links for customers to connect into the service provider data center. VRF at the WAN edge of the data center provides path isolation of customer traffic at Layer 3. A separate routing table is used to make forwarding decisions for every customer's traffic. A separate routing table helps ensure support for overlapping IP address range of customers on a shared network.

Separation at Layer 2 is done using VLANs. A minimum of one VLAN is assigned to each customer. All virtual desktops and virtual machines that belong to a customer reside on the customer's assigned VLAN. The VLAN ensures that customer's traffic is logically isolated from one another as it traverses different devices in the service provider data center.



### Figure 5 Network Separation in Desktone view

The Desktone management appliances are located in different networks depending on the application type. The Service Provider Appliance and Resource Manager Appliances reside on the service provider network. The Tenant Appliances reside in the tenant network and cannot be accessed from any other network. There is a backbone link local network which is used for different Desktone Appliances to talk to each other. The management network is used for the blade servers and storage appliances.



### Figure 6 Desktone Service Grid

## **Network Services**

Cisco ASA Service Module deployed on the Data Service Node, Catalyst 6500 is partitioned into multiple virtual firewalls, known as security contexts. The customer's security policies are configured and stored in the tenant configuration file.

### Storage

Storage is managed by the VMware vCenter for Desktone. All storage options supported by vCenter are supported storage options for virtual desktops. If NFS is chosen as a storage option, file shares are created for every customer and also one for the Desktone platform. If FC is chosen, one or more Logical Unit Number (LUN) needs to be created for each customer and one for the Desktone platform.

The Desktone platform needs a file share/LUN to host the template used in creation of new tenant appliances on the Desktone platform. This file share/LUN is mounted on the hosts assigned to the Desktone platform.

The virtual desktops for each customer are stored in their corresponding file share/LUN. The file share/LUN of each customer is mounted on the hosts reserved for the customer as VMware datastore. No other host must have access to the datastore of the customer.

## Desktop

The Desktone Platform manages all incoming connections to the virtual desktops. Based on the user and to which customer the user belongs to, the Desktone Platform connects the user to the right desktop over the preferred display protocol.

The service provider appliance is administered using the Service Center web based Graphical User Interface. The service center portal gives an overview of all the customers sharing the common data center. This portal is also used to manage the system resources for different customers. The service provider appliance should be installed first as it is the foundation for installing rest of the Desktone appliances.

A separate enterprise portal called Enterprise Center is powered by the customer's tenant appliance. The Enterprise Center is only accessible from the corresponding customer's network. This portal restricts visibility to only the desktops the customer owns.

There are two Resource Manager Appliances in a high available environment to manage the resources used for the tenants a whole.



### Figure 7 Desktone Components

## **High Availability**

High Availability (HA) is a mandatory requirement of any hosted or cloud-based service offerings. For a service to be adopted widely by businesses, service providers need to provide Service Level Assurance (SLA) to their business customers. To meet such SLA, the service provider needs to base their offering on a highly available infrastructure.

VMDC was chosen as platform of choice for Cisco DaaS Solution on Desktone because it can provide redundancy at different levels like Compute, Network and Storage. Redundancy is provided end-to-end all the way from the collapsed core/aggregation, access, compute, and storage layers.

### Compute



Cisco Unified Computing System is a fully redundant system. The network adapter is connected to both the fabric planes in active-active node utilizing the full bandwidth. The Fabric Interconnect Uplinks connects to the access layer switches to provide redundant paths for all the virtual machines hosted on the blade server. The Fabric Interconnects should always be deployed in pairs for redundancy and high availability.

As per VMDC recommendation, configure the Cisco UCS Fabric Interconnect uplinks in End Host Mode. In End Host mode, you get the following:

- Uplinks are fully utilized
- ٠ Uplinks can be connected to multiple access switches providing redundancy
- Spanning Tree Protocol is not required

Cisco Unified Computing System provides different system class of service to implement quality of service including:

- System classes that specify the global configuration for certain types of traffic across the entire system
- QoS policies that assign system classes for individual vNICs
- Flow control policies that determine how uplink Ethernet ports handle pause frames.

Note

Time sensitive applications have to adhere to a strict QOS for optimal performance.

Systems Class is the global operation where entire system interfaces have defined QoS rules.

By default system has Best Effort Class and FCoE Class.

Note

Best effort is equivalent in MQC terminology as "match any"

- FCoE is special Class define for FCoE traffic. In MQC terminology "match cos 3"
- System class allowed with 4 more users define class with following configurable rules.
  - CoS to Class Map
  - Weight: Bandwidth \_
  - Per class MTU \_
  - Property of Class (Drop v/s no drop)
- Max MTU per Class allowed is 9216.
- Through Cisco Unified Computing System, we can map one CoS value to particular class.
- Apart from FCoE class there can be only one more class can be configured as no-drop property.
- Weight can be configured based on 0 to 10 numbers. Internally system will calculate the bandwidth based on following equation (there will be rounding off the number).

```
(Weight of the given priority * 100)
\blacktriangleright % b/w shared of given Class =
                                             Sum of weights of all priority
```

Cisco Unified Computing System defines user class names as follows:

- Platinum
- Gold •
- Silver •
- Bronze

#### Table 2 Map between Cisco Unified Computing System and the NXOS

Cisco UCS Names	NXOS Names
Best effort	Class-default
FC	Class-fc
Platinum	Class-Platinum
Gold	Class-Gold
Silver	Class-Silver
Bronze	Class-Bronze

Table 3 Class to CoS Map by default in Cisco Unified Computing System

Cisco UCS Class Names	Cisco UCS Default Class Value
Best effort	Match any
Fc	3
Platinum	5

Cisco UCS Class Names	Cisco UCS Default Class Value
Gold	4
Silver	2
Bronze	1

Table 4 Default Weight in Cisco Unified Computing System

Cisco UCS Class Names	Weight
Best effort	5
Fc	5

### Network

### Figure 9

### Redundant Network Layers



Virtual Port Channel (vPC) helps ensure high availability at Layer 2 in the data center. All available paths are utilized to deliver maximum bandwidth to the hosts. Two upstream Nexus switches act as one logical node delivering both hardware redundancy and load balancing.

Host StandBy Router Protocol (HSRP) provides hardware redundancy and high availability at Layer 3 by having two routers act as a single virtual router with shared IP address and MAC address. The shared address enables hosts to always have an active router to forward packets.

### **Network Services**

Cisco ASA Service Module is deployed on the 2 Catalyst 6500 switches for redundancy. It supports high-speed failover between modules in separate chassis. Both Active-Active and Active-Standby failover is supported.

## Storage

As per VMDC recommendation, it is required to have hardware redundancy for storage devices.

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## Desktop

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The Desktone platform is installed on two separate blade servers. On each blade server, one instance of Service Provider Appliance, Tenant Appliances and Resource Manager Appliances are installed. One instance is the primary and the other is the secondary. Both primary and secondary instances of the appliances work in active mode. So, either of the appliances can crash with no service interruption. The same holds true if the whole blade server hosting the Desktone appliances were to crash.

When desktop hosts crash, the desktops can be moved over to a new host and the desktops would be available for users. It is recommended to have at least one spare host per tenant to handle blade crashes. This host needs to be on the VLAN assigned to the tenant. It then needs to be assigned to the Tenant Resource Manager to be available for hosting desktops. If and when the crash happens, the desktops need to be migrated to the new host.

## **4 Solution Validation**

This section details the configuration and tuning that was performed on the individual components to produce a complete, validated solution.

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Figure 10 Cisco DaaS Solution on Desktone Topology

## **Configuring the Cisco Unified Computing System**

## To configure the Cisco Unified Computing System, perform the following steps:

**Step 1** Bring up the Cisco 6248UP Fabric Interconnect (FI) and from a serial console connection set the IP address, gateway, and the hostname of the primary FI.

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**Step 2** Bring up the second fabric interconnect after connecting the dual cables between them. The second FI automatically recognizes the primary and asks if you want to be part of the cluster, answer yes and set the IP address, gateway and the hostname.



When Step 2 is completed all access to the FI may be performed remotely. You will also configure the virtual IP address to connect to the FI; you need a total of three IP address to bring it online. You can also wire up the chassis to the FI, using 1, 2, 4 or 8 links per IO Module, depending on your application bandwidth requirement. In this study, four links were connected to each module.

Step 3 Connect using your favorite browser to the Virtual IP address and launch the Cisco UCS Manager. The Java based Cisco UCS Manager enables you to do everything that you could do from the CLI. The GUI methodology is highlighted here.

### Step 4 Check the firmware on the system and see if it is current. Visit http://software.cisco.com/download/release.html?mdfid=283612660&softwareid=283655658&release =2.0(4d)&relind=AVAILABLE&rellifecycle=&reltype=latest to download the most current Cisco UCS Infrastructure and Cisco UCS Manager software. Use the UCS Manager Equipment tab in the left pane, then the Firmware Management tab in the right pane and Packages sub-tab to view the packages on the system. Use the Download Tasks tab to download needed software to the FI.



The firmware release used in this paper is 2.1(1a).

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- Step 5 Configure and enable the server ports on the FI. These are the ports that will connect the chassis to the FIs.

Configure and enable uplink Ethernet ports Step 6

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Step 7 On the LAN tab in the Navigator pane, configure the required Port Channels and Uplink Interfaces on both Fabric Interconnects

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- **Step 8** Expand the Chassis node in the left pane and click on each chassis in the left pane.
- **Step 9** Click Acknowledge Chassis in the right pane to bring the chassis online and enable blade discovery.



Step 10 From the Admin tab in the left pane, to configure logging, users and authentication, key management, communications, statistics, time zone and NTP services, and licensing. Time zone Management (including NTP time source(s)) and uploading your license files are critical steps in the process.



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Step 11On the LAN tab, expand Pools, IP Pools. Right click on IP Pool ext-mgmt. Configuring your<br/>Management IP Pool (which provides IP based access to the KVM of each UCS Blade Server).

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**Step 12** From the LAN tab in the navigator, under the Pools node, create a MAC address pool of sufficient size for the environment.

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**Step 13** From the LAN tab in the navigator pane, configure the VLANs for the environment. You need one VLAN for Service Provider network, one for Link-Local Network and one for each tenant.



In this study, a separate VLAN is used for storage.



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- 35 Qitt Pahoes	All and the second s			
B Threshold Palicies	Instruct Destine (2-UR Local	Dealthine 12-Link Local	Ô	
The set is a set of the set of th	Network VIGes5-MF5-Netityp	VIGes5-MF5-twolve	0	
All Tanuada All A	Interiorit VIGaa5-SP-Impervisor INDM?	VIDed-SP-mpervaur-MDMT	0	
A tub Organizations	- Network ViGea5-SP-3rtra	Video SP bits	0	
and see the second	Induced VIGeoS-SP-vMotore	VIGea5-SP-vMidsei	Ø	
	-C Network VIGes5-T3-VM	ViGad-TS-VM	0	
	MV-C1-DadOrV VIOLAD	VIGA6-12-VM	0	
	MV-CT-CasD/V Aroutal Im	VIGNG-T3-VM	ė.	÷
	Metwork VIGes5-E4-VM	Video 14 VM	0	2
	Televisit Victoria This VM	Victoria Physics		

**Step 16** From the LAN tab in the navigator pane, under the policies node configure the vNIC templates to be used in the Service Profiles.

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Step 17 Create vNIC templates for both fabrics and select the VLANs to be supported, MTU size and QoS policy.

	erties		
ý VLANs	Name:	VNIC-A	
	Description:		
	Fabric ID:	Fabric A	Fabric B 🗸 Enable Fallover
		Target	
		[7] Adapter	
		VM 👽	
	Template Type:	<ul> <li>Initial Templ</li> </ul>	ate <ul> <li>Updating Template</li> </ul>
	MTU:	9000	
-We	iming		
Mak	e sure that the MTU has the	same value in the	QoS System Class
com	esponding to the Egress prio	rity of the select	to gos Policy.
Polici	rs -		
	MAC Pool:	default	<b>•</b>
	QoS Policy:	Platinum	
		dafa it	<u> </u>
	Network Control Policy:	VERBORE	
	Network Control Policy: Pin Group:	<not set=""></not>	-
	Network Control Policy: Pin Group: Stats Threshold Policy:	<not set=""> default</not>	•
Dyna	Network Control Policy: Pin Group: Stats Threshold Policy: nic vNIC Connection Policy:	<pre>cnot set&gt; default <not set=""></not></pre>	•

**Step 18** New in Cisco UCS Manager 2.1(1a) is a method to set Host Firmware Package polices that can be set by package version across the Cisco UCS domain rather than by server model.



You can create specific packages for different models or for specific purposes.

Faulament Servers LAW CAM JUN Admin	Host Firmware Packages
Equipment Servers DAV SAV VM Admin	速 🖃 🕰 Filter 🗢 Export 😸 Print
Filter: Policies	Name
± =	n S 2115
Policies Adapter Policies Store Pol	31182

Step 19 Create a BIOS policy under Servers -> Policies -> BIOS Policies for the Cisco UCS B200 M3 blade servers.



**Step 20** Choose the highlighted settings for Processor.





Create BIOS Policy		×
Unified C	omputing System Ma	nager
Create BIOS Policy	Intel Directed IO	0
1. √ <u>Main</u>		
3. √ <u>Intel Directed IO</u> 4. □RAS Memory	VT For Directed IO: Odisabled Ogenabled	Platform Default
5. Serial Port	Interrupt Remap: 🔘 disabled 🕥 enabled 🥥	Platform Default
7. D <u>PCI Configuration</u>	Coherency Support: Odisabled Oenabled O	Platform Default
8. Boot Options 9. Server Management	ATS Support: Odisabled O enabled O	Platform Default
	Pass Through DMA Support: Odisabled Oenabled O	Platform Default

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**Step 22** Choose the following Memory settings:

Create BIOS Policy		X
Unified C	omputing System Manager	
Create BIOS Policy	RAS Memory	0
2. √ <u>Processor</u> 3. √ <u>Intel Directed IO</u> 4. √ <u>RAS Memory</u> 5. <u>Serial Port</u> 6. <u>USB</u> 7. <u>PCI Configuration</u> 8. <u>Boot Options</u> 9. <u>Server Management</u>	Memory RAS Config: maximum-performance  NUMA: disabled enabled  Platform Default UV DDR Mode: power-saving-mode  Platform Default	]

**Step 23** Keep the default settings for the other options and click Finish.

**Step 24** Create a service profile template using the pools, templates, and policies configured above.



**Step 25** For the Identify Service Profile Template, enter a unique name, select the type Updating Template, and click Next.

Create Service Profile Tem	plate	23
Unified C	Computing System Manager	
Create Service Profile Template  Videntify, Service Profile Template  Distrage  S. Storage  S. JuliCAHBA Placement  C. Maintenance Policy  S. Server Assignment  Distributional Policies	Identify Service Profile Template         You must enter a name for the service profile template and specify the template type. You can also specify how a UUID will assigned to this template and enter a description.         Name:       VXtass-8200-ESX         The template will be created in the following organization. Its name must be unique within this organization.         Where:       org-root         The template will be created in the following organization. Its name must be unique within this organization.         Type:       Initial Template         UDD       UUID Assignment:         default(120/128)       Image: Color	Ø Il be
	The UUID will be assigned from the selected pool. The available/total UUIDs are displayed after the pool name.	

Step 26 For the Networking option, select Expert and click Add in the adapters window.

Create Service Profile Template  1. ✓ Identify Service Profile Template 2. ✓ Hetworking 3. □ Storage 4. □ Zoning 5. □ VHIC/VHBA Placement 6. □ Server Root Order 7. □ Maintenance Policy 8. □ Server Xostignment 9. □ Operational Policy	Networking Optionally sp	cify LAN configuration information.					
	Dynamic vNIC Connection Policy: Select a Policy to use (no Dynamic vNIC Policy by defa • 🖬 Create Dynamic vNIC Connection						
	How v Click Add to spec	would you like to configure LAN	connectivity? Simple Bup er should use to connect to the LAN	ert 🔿 No vNICs 🔿 Use Conne	ctivity Policy		
<ul> <li>Operational Policies</li> </ul>							
<ul> <li>Operational Policies</li> </ul>	Name	MAC Address	Fabric ID	Native VLAN	8		
<ul> <li>Gigerational Policies</li> </ul>	Name	MAC Address	Fabric ID	Native VLAN	<b>B</b> 4 4		
<ul> <li>Operational Poincies</li> </ul>	Name Click <b>Add</b> to spec	MAC Address	Febric ID Delete 🖬 Add 📓 Modify eserver should use.	Native VLAN	<b>B</b>		
× G uperational Poincies	Name Click <b>Add</b> to spec	MAC Address fly one or more ISCSI VNICs that the Overlay vNIC Name	Fabric ID Deleter C Add Modify e server should use. ISCS1 Adapter Policy	Native VLAN MAC Address	E (		
<ul> <li>Operational Poinces</li> </ul>	Name Click Add to spec	MAC Address MAC Address fy one or more ISCSI vNICs that the Overlay vNIC Name	Febric ID Delete Add Modify eserver should use. ISCSI Adapter Policy	Native VLAN MAC Address	B		
× G uperational Folicies	Name Click <b>Add</b> to spec Name	MAC Address fly one or more ISCSI wBCs that the Overlay vkBC Name	Fabric ID	Native VLAN MAC Address	4 × 8		



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Create vNIC	
Create vNIC	0
Name: eth0	
Use WIIC Template:	
vNIC Template: vNIC-A	
Adapter Performance Profile	
Adapter Policy: VMWare Create Ethernet Adapter Policy	

Create Service Profile Template 1. √Stentify Service Profile	Storage Optionally specify disk policies and SAN configuration information.			
Institut 9 Valanden 9 Valand	select a local data configuration policy. Incol Starge (Select Local Starge Policy In our selection), the selected, the sheft all Local Starge configuration Selection of the server profile. If the server profile is the server profile. New woodd you lake to configure SMI connecticiently? If single III Dept. 2 (SelEEMI ) Use Correctivity Policy. The server sensorable with this service profile is final be corrected to a starge area network.			

**Step 28** Select No vHBAs option since SAN is not used in this study.





Create Service Profile Template	vNIC/vHBA Placer	ment vHBAs are placed on phy	sical network adapters		0
1. √ Identify Service Profile Template     2. √ Identifie     3. √ Starson     4. √ Zaning     5. √ ydl(ZyhthA Placement     6. □ Server Bool Order     7. □ Stantenance Policy	VHC2/VHEA Placement specifies ho in a server hardware configuration i Select Placement: Let System i	v NBCs and VBBAs are placed of ndependent way.	n physical network adapters	(mezzanine)	
9. Operational Policies	System will perform automatic	placement of vNICs and vHEAs	based on PCI order.	-	
	Name	Address	Order	æ	
	- VNIC eth1	Derived	1	^	

**Step 30** Accept Default placement and click Next.

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## **Step 31** Select default boot policy.

Service Profile Template	Server Boot Orde Optionally specify the b	r oot policy for this s	senvice profile template.			•
V Mentify Service Profile     Iemplate     Vetworking     Vetworking     Vetworking     Votional     Votional     Votional     Votional     Society     Socie	elect a boot policy. Boot Policy: default N Descri Reboot on Boot Order Ch Enforce vHIC/VHBA/ISCS1 h	▼ Iame: default ption: ange: Yes Iame: No	Create Boot Policy			
	WARRINGS: The type (primary/seconda The effective order of boot # Enforce vHIC/vHBA/IS # it is not selected, the vHJ Boot Order (→ □) (▲, Filter → Export	ry) does not indica devices within the ICSI Name is selec Cs/VHBAs/ISCSI and t ice Print	te a boot order presence. same device class (LAN/Storage/ ted and the vHC/vHEA/SCSI does e selected if they exist, otherwise i	SCSI) is determined i not exist, a config e the vNIC/VHBA/ISCSI	by PCIe bus scan rror will be report with the lowest P	order. ed. Cle bus scan or
	WARDINGS: The type (primary/seconds The effective order of boot # Enforce wIIC/WIBA/S # it is not selected, the vio Boot Order 	ry) does not indica devices within the ICSI Name is selec Cs/VHBAs/ISCSI and t @ Print Order	te a boot order presence. same device class (LAN/Storage// ted and the vHIC/HBA/ISCSI does e selected if they exist, otherwise i	SCST) is determined inot exist, a config e the vNIC/VHBA/ISCST	by PCIe bus scan rror will be report with the lowest Pr Lun ID	order. ed. Cle bus scan or
	WARDINGS: The type (primary/seconds The effective order of boot if Enforce vHIC/vHIBA/B if it is not selected, the vHI Boot Order boot Order Name Bootov	ry) does not indica devices within the ICSI Name is selec Cs/VHBAs/ISCSI and t Cs Print Order	te a boot order presence. same device class (CAN/Storage/) ted and the VILC/VHBA/SCSI does e selected if they exist, otherwise ( vNIC/VHBA/SCSI VIDC	SCSI) is determined i not exist, a config e i he vHIC/vHBA/iSCSI Type	by PCIe bus scan rror will be report with the lowest Pr Lun ID	order. ed. Cle bus scan or WWN
	WARKINGS: The type (primary/second The effective order of boot if Enforce wHC/HRA/HS if it is not selected, the vH2 Boot Order 	ry) does not indica devices within the ICSI Mame is selec CSI/VHBAS/ISCSI and t CSI Print Order 1 2	te a boot order presence, seme device class (CAN/Storage/) ted and the vitac/vital/vitac/Storage e selected if they exist, otherwise i vitac/vital/storage/	SCST) is determined i not exist, a config e he vNIC/VHBA/ISCST Type	by PCIe bus scan rror will be report with the lowest Pr Lun ID	order. ed. Cle bus scan or WWN
	WARDENGS: The type (primary)seconds The effective order of boot if Enforce WRIC/VHBA/E if it is not selected, the v40 Boot Order 	ry) does not indica devices within the ICSI Name is selec Cs/VHBAs/ISCSI are Cs/VHBAs/ISCSI are Cs/VHBAS/ISC	te a boot order presence. same device class (LAN/Storage// ted and the vitaC/VHB//SCSI does e selected if they exist, otherwise t vitaC/VHBA/SCSI vitaC	SCSI) is determined inot exist, a config e the vHIC/VHBA/ISCSI Type	by PCIe bus scan rror will be report with the lowest Pr Lun ID	order. ed. Ele bus scan or WWN
	WARKINGS: The type (primary)seconds The type (primary)seconds the effective order of boot if Enforce wRIC/vH8A/Y if it not selected, the vRD Boot Order Name Roppy Boot Order Storage Storage Coal Disk	ry) does not indica devices within the ICST Name is selec Cs/vH8Aa/ISCST an t Cs Print Order 1 2 3	te a boot order presence, seme device class (CAN/Storage/i ted and the victor/vitBA/ISCS1 dees e selected if they exist, otherwise i vitBC/vitBA/ISCS1 vitBC	SCST) is determined inot exist, a config e the vNIC/VHBA/ISCST Type	by PCIe bus scan rror will be report with the lowest Pr Lun ID	order. ed. Cle bus scan or WWN
	WARKINGS: The type (primary)seconds The effective order of boot if Enforce WRIC/VHRA/F if it is not selected, the vk0 Boot Order Color Order Name Floppy Co-ROM Corrage Co-ROM Co-ROM Co-ROM	ry) does not indica devices within the ICSI Name is selec Cs/VHBAs//SCSI and t Cs Print 0rder 1 2 3 4	te a boot order presence. same device class (LAN/Storage/) ted and the vitaC/VHBA/SCSI does e selected if they cost, otherwise t vHIC/VHBA/SCSI vHC	SCST) is determined not exist, a config e the vNIC/VHBA/ISCST Type	by PCIe bus scan - rror will be report with the lowest P Lun ID	order. ed. Cle bus scen or WWN
	WARDENGS: The type (primary/seconds The type (primary/seconds The force wellCytelsA/F af it is not selected, the vio Boot Order well & Filter ● Experi Name CD-ROM Storage Local Disk	ry) does not indica devices within the ICSI Name is selec Cs/HBAs/ISCSI and t Cs Print Order 1 2 3 3	te a boot order presence. same device class (LAN/Storage// ted and the vHLC/vHBJ/SCSI does e selected if they exist, otherwise t vHDC/vHBA/SCSI vHDC	SCSI) is determined int exist, a config e the vHIC/VHBA/ISCSI Type	by PCIe bus scen rror will be report with the lowest Pr Lun ID	order. ed. Cle but

Unified (	Computing System Manager	
Create Service Profile Template 1. √Udentify Group Profile Template 2. √Stocase 3. √debrechtna 4. √ndChrift & Flocenaric 5. √Generational Collect 6. √HaintCenarice Policy 7. □ Generational Policies	Maintenance Policy     Select a maintenance policy to include with this service profile or create a new maintenance policy     Select (no policy used by defa)     The service profile will immediately reboot when disruptive     changes are applied.	961
	<prev next=""> Finish Cancel</prev>	301

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**Step 32** A Maintenance policy was not used in this study. Click Next to continue.

**Step 33** For the Server Assignment option select default pool created or create a new server pool. Select Host Firmware package to be applied and click Next.

Unified Computing System Manager         Create Service Firstle Template         1       ' Methods Service Transfer         2       ' Methods Service Transfer         3       ' Methods Service Transfer         4       ' Methods Service Transfer         4       ' Methods Service Transfer         4       ' Methods Service Transfer         5       ' Methods Service Transfer         6       ' Methods Service Transfer         7       ' Methods Service Transfer         8       ' Methods Service Transfer         9       ' Methods Service Methodservice Transfer	Create Service Profile Tem	plate	_ X _
Server Frontier Template  Server Assignment  Server Assignment  Server Assignment  Server Assignment  Server Assignment  Server Pool for this server pool f	Unified C	Computing System Manager	
Firmware Management (8305, Disk Controller, Adapter)      You select a host firmware poly for this service profile, the profile will update the firmware on the server that it is associated with.      Otherwise the system uses the firmware already installed on the associated server.      Host Firmware; 2.1.18	reete Service Froffe Templete  1. √ <u>Identify Service Proffe</u> 2. √ <u>Hetoroking</u> 3. √ Storage 4. √ Zonag 5. √ <u>MitCAHBA Florement</u> 6. √ <u>Service BootOnder</u> 7. √ <u>Mentenance Dolloc</u> 0. √ <u>Servicer Assignment</u> 9. ↓ <u>Operational Policies</u>	Server Assignment Optionally specify a server pool for this service profile template. You can select a server pool you want to associate with this service profile template. Pool Assignment: Assign Later Create Server Pool Select the power state to be applied when this profile is associated with the server. Up Down The service profile template is not automatically associated with a server, Either select a server from the last or associate the service profile manually later.	•
		Immware Management (BIOS, Disk Controller, Adapter)         If you select a host firmware policy for this service profile, the profile will update the firmware on the server that it is associated with.         Otherwise the system uses the firmware already installed on the associated server.         Host Firmware:       2.1.1a         If create Host Firmware Package	



**Step 34** Choose the BIOS policy created and click Finish to complete the Service Profile Template.

**Step 35** Create a Service Profile from Template.

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Filter: Service Profile Templa	Actions	Properties	
-	Create Service Profiles From Template	Name: VXIaa5-8200-ES0	
Service Profile Templates     ∴ for the service Template VOIDES-8200-ESX0     ←     GCS1 VOICs	Create a Clone	Description: UUED: Derived from pool (default) Power State: 1: Up Type: Updating Template	
	Change Maintenance Policy	Associated Server Pool	O
Service Template VXBaaS-8200-E5X0-4NICs	Hill Charge UUD	Haintenance Policy	0
B-4 WRAS		Management IP Address	0

**Step 36** Provide a Naming Prefix and the number of service profiles to be created from the template.

A Create Service Profiles From Ter	mplate 🛛 📉
Create Service Profiles	From Template
Naming Prefix: VXIaas-1B	
Number: 6	
	OK Cancel

filter: Al 🔹	fault Sammary	Properties	
Servers Servers Profes Server Profes Solution Profes	Status Overal Status: 1 Ok Status Obelais	WARNING This service profile is not modifiable because it is bound to the service profile template VXILasS #200 1530. To modify this service profile, please upbling it from the template. Nome: VXILasS #88 User Label: Description:	
⊕ 3 V/bacf-92 ↓. A. Sub-Organizations ⊕ 5 service Profile Templates ⊕ 10 Profile ⊕ 40 Schedules € Schedules	Shadown Server	UID: Index264-dwb11ic1-0000-0000000000 UUD Pool: default UUD Pool Indexec: organization good default Ausocated Server: rejuthanse: (Index: ) Server Index Erendes: (Index: Bable State	
	Starte Charles	Template Instance: org-root/in-VXIaeS-8200-ESX	
	Aname Service Profile	Hanagement IP Address	
	Create a Cone Create a Service Proble Templote	Maintenance Policy C	
	Disassociate Service Profile		
	Change Service Profile Association		

**Step 37** Service profiles are assigned to the servers.

## Installing and Configuring VMware vSphere

### Install VMware ESXi

ESXi was installed from the Cisco UCS Manager (UCSM) KVM console using a ESXi 5.1 ISO image downloaded from the VMware site.

The IP address, hostname, and NTP server were configured using Direct Console ESXi Interface accessed from Cisco UCS Manager KVM console.

See the following VMware documentation for details about configuring network settings:

http://pubs.vmware.com/vsphere-50/topic/com.vmware.vsphere.install.doc\_50/GUID-26F3BC88-DAD 8-43E7-9EA0-160054954506.html.

### Install and Configure VMware vCenter

A Cisco UCS B200 M3 blade server was used to host the virtual machines used for SP management including Microsoft Active Directory, DNS, DHCP server, etc., and also for hosting the vCenters used for Desktone environment.

To manage hypervisors and virtual machines on hosts reserved for Desktone Appliances, a dedicated vCenter server instance was installed on a Windows 2008R2 virtual machine.

An identical vCenter server was dedicated for managing the hypervisors and desktops for all tenants.

VMware vCenter Server			
OS:	Windows 2008 R2	Service Pack:	
CPU:	4vCPUs	RAM:	16GB
Disk:	80GB	Network:	1x10Gbps

Table 5 vCenter Server Configuration

To support vCenter instance, one Microsoft SQL Server 2008 R2 was created to host vCenter database.

It is recommended to utilize fault tolerance at the SQL Server level, refer to Microsoft documentation about configuring SQL Server clusters:

http://msdn.microsoft.com/en-us/library/ms189134(v=sql.105).aspx

To install and configure vCenter, perform the following steps:

Step 1 Install the Microsoft® SQL Server® 2008 R2 Native Client for ODBC connections

(http://www.microsoft.com/en-us/download/details.aspx?id=16978 look for Native Client for your architecture)

**Step 2** Create a System DSN (control panel, administrative tools, Data Sources ODBC) and connect to your vCenter-SQL server.



- **Step 3** Install vCenter server package and connect to the database.
- **Step 4** Connect your vSphere client to vCenter and create a datacenter.
- Step 5 Create a self-signed certificate. (http://kb.vmware.com/selfservice/microsites/search.do?language=en\_US&cmd=displayKC&externalI d=1021514).

## **Install Licenses**

- **Step 1** Connect to vCenter using vSphere client.
- **Step 2** Go to Home --> Administration --> Licensing and click Manage vSphere Licenses.



**Step 3** Add License keys for vCenter and Hosts and click Next.

Manage vopnere uk	enses	
Add License Keys If you have re	cently purchased, upgraded, combined, or split keys, add them to your inven	tory now.
Add License Keys Assian Licenses	Enter new vSphere loense keys (one per line):	
Remove License Key Confirm Changes	^ ←	_
	v	
	Enter optional label for new license keys:	
	Add License Keys	
	1	

- **Step 4** Enter the license key and add an optional label.
- **Step 5** Repeat the above-mentioned procedure to create another instance of vCenter; one for Desktone appliances and another one for tenant desktops.

## VMware vSphere Network Configuration for Desktone Appliances

The VLANs for service provider network is added in vSwitch of the vCenter reserved for Desktone appliances.

A separate VLAN is used for Desktone Platform management traffic. It is a non-routable subnet with a link-local address. A link-local address is an IP address used only for communications within a link (segment of a local network) or a point-to-point connection to which a host is connected. Routers do not forward packets with link-local addresses. The address block 169.254.1.0 through 169.254.254.255 is reserved for link-local addressing in Internet Protocol Version 4. You cannot choose addresses outside this range.



If you have more than one data center, the link-local address space must be unique (non- overlapping) across data centers.

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The configured VLANs must be the same across all management hosts.

- VLAN 864 for Service Provider Network
- VLAN 980 for Link Local
- VLAN 844 for Storage

View:	vSphere Standard Switch	vSphere	Distributed Swi	tch	
Netwo	orking				
Consta			Demoue	Drope	rtipe
Standa	to Switch: VSwitch0		Physical Adapte	e Piope	i ues.
O VN	1-864-Infra	0	- Winico	10000 F	ull (
8 31	virtual machine(s)   VLAN ID:	864	wmnic1	10000 F	ull (
DT	-SP3-SP-A	8+			
AU	gustaSP3Template20130305	8			
DT	-SP3-TRM-A	8+			
Vir	tual Machine Port Group				
P W	1-980-DT-LL	9-			
8 61	virtual machine(s)   VLAN ID:	980			
DT	-SP3-SP-A	<b>3</b> +			
DT	-SP3-T1-A	- 61-			
AU	gustaSP3Template20130305	8			
DT	-SP3-T2-A	- 63-			
DT	-SP3-TRM-A	8+			
DT	-SP3-T3-A	8+			
-VM	tkernel Port				
O AX	laaS-NFS	2			
VIII	k3:10.8.44.113   VLAN ID:	844			

#### Figure 11

## VMware vSphere Network Configuration for Desktone Tenant Appliances

The tenant VLANs and the VLAN for storage are added to the vSwitch of the vCenter reserved for tenant desktops. Tenant 1 was used for this study. The VLAN assigned for Tenant 1 is 711.

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#### View: vSphere Standard Switch vSphere Distributed Switch Networking Remove... Properties... Standard Switch: vSwitch0 Virtual Machine Port Group Physical Adapters C T4-VM-741 0-🛛 🐯 vmnic2 20000 Full 💭 VLAN ID: 741 🕳 🖽 vmnic0 20000 Full 💭 Virtual Machine Port Group 7 T3-VM-731 0 VLAN ID: 731 Virtual Machine Port Group C T2-VM-721 0 VLAN ID: 721 Virtual Nachine Port Group 0 VM Network VMkernel Port HVXI-Hypervisor-MGMT 0 vmk0: 10.8.67.42 | VLAN ID: 867 Virtual Nachine Port Group C T1-VM-711 0 ISS virtual machine(s) | VLAN ID: 711 VNkernel Port P HVXI-NFS 0 301204 vmk3:10.8.44.42 | VLAN ID:844

#### Figure 12 vSwitch for Tenant hosts

## **Creating the Golden Image**

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Before defining a virtual machine as your gold template you need to create your template. A new OS installation is strongly recommended, which should be customized to VDI best practices.

For details about Windows 7 VDI best practices, see http://www.vmware.com/files/pdf/VMware-View-OptimizationGuideWindows7-EN.pdf



32bit Windows 7 OS with 1 vCPU, 1.5GB RAM, 24GB HDD, and one 10GB vNIC were used for testing.

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## Steps to Customize the Golden Image Virtual Machine

Step 1	Install VMware tools on Windows 7 VM.
Step 2	Verify NIC settings. Confirm the adapter type is VMXNET3.
Step 3	Set the power option to High Performance.
Step 4	Enable Administrator account and RDP access.
Step 5	Right-click Computer and select Manage.
Step 6	Select Local Users and Groups> Users.
Step 7	Right click the Administrator user and select Properties.
Step 8	From the General tab, uncheck Account is disabled.


Step 9 From the Member Of tab, confirm Administrator is a member of "Remote Desktop Users"

**Step 10** Set the Administrator password.

	2 🗊		
Computer Management (Local	Name	Full Name	Description
a is system loois	Administrator		Built-in account for administering
I ask Scheduler     I ask Scheduler     I ask Scheduler	Guest Win7-Ten	Set Password	Built-in account for guest access t
<ul> <li>Shared Folders</li> <li>Eccal Users and Groups</li> <li>Users</li> <li>Groups</li> <li>Performance</li> <li>Perice Manager</li> </ul>	win/-Ten	All Tasks	
		Delete	
		Rename	
		Properties	
A 😫 Storage		Help	

- **Step 11** Apply PCoIP GPO (.adm file) and configure protocol settings.
- **Step 12** Confirm the Windows firewall is disabled.

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- Step 13 Confirm the Windows Updates are current and then disable Windows Updates.
- **Step 14** Log in as Administrator and remove all other accounts on the virtual machine.

## Installing the Desktone DaaS Agent.

**Step 1** Copy the DaaSAgent\_5.3.1.msi installer file onto the Windows 7 VM and double- click to start the Install.

Step 2 Click Next.



**Step 3** Select a specific path for installation or leave it as default. Click Next.

Select Installation Folder				
This is the folder where DaaS	Agent will be in	stalled.		<u> </u>
To install in this folder, dick "N "Browse".	lext". To install	to a differen	t folder, enter	it below or click
Eolder: C:\Program Files\DaaS Agent\	8			Browse
Eolder: [C:  Program Files  DaaS Agent				Browse
Eolder: [C:\Program Files\DaaS Agent\				Browse

Step 4 Click Next.



Step 5 Click Finish.



# Note

The DHCP option code 74 needs to be configured with the tenant appliance IP addresses. This will be utilized by the DaaS Agent to register the virtual desktop to the tenant appliance.

## Installing the VMware View Agent

- **Step 1** Copy the VMware-viewagent-5.2.0-987719.exe file onto the Windows 7 virtual machine.
- Step 2 Click Next.

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**Step 3** Accept the User License Agreement. Click Next.



#### Step 4 Click Next.



#### Step 5 Click Install.





**Step 6** Click Finish. A pop-up will then display and prompt a reboot.

## Installing the VMWare View Agent Connect

- **Step 1** Copy the VMware-viewagent-direct-connection-5.2.0-987719.exe installer file to Windows 7 Golden virtual machine.
- Step 2 Click Next.

I



Step 3 Accept the End User License Agreement. Click Next.



Step 4	Click Next.		
		WMware View Agent Direct-Connection Plugin Setup	<b>•</b> ×
		Configuration Information Please specify port information	R
		VMware View Agent Direct-Connection Plugin requires that a firewall exception order to accept remote connections on the specified TCP port number. If Wind enabled, the installer can automatically add this for you.	is added in ows Firewall is
	Listen for HTTPS connections on the following TCP port:		
		Configure Windows Firewall automatically	
		Back	Cancel

#### Step 5 Click Install.



01219

Step 6 Click Finish.



<u>Note</u>

Golden virtual machine must exist on the same datastore and VLAN where the desktops would reside.

Repeat the steps outlined in section Creating the Golden Image for preparing the Windows 7 golden image for other tenants.

# Installing and Configuring Desktone

Building a Desktone environment requires the installation of the following components:

- Desktone Service Provider Appliances
- Desktone Resource Manager Appliances
- Desktone Tenant Appliances

#### Installing Desktone Primary Service Provider Appliance

Download the following required files for installation.



Use the worksheets from Desktone to make sure you capture all the required information before you begin the installation.

#### Table 6

File Contents	File Names
Appliance template	AugustaSP3Template20130305.ova
5.3 debians	dt-platform-5_3_0.deb and dt-aux-1_1_0.deb
Patch	Dt-platform-5_3_0_patch_1.tgz,
Dt-platform-5_3_0_patch_2.tgz	

Note

On both management hosts, add the Service Provider datastore. Be sure to use the same name on each host.

Step 1

From the vSphere Client for Service Provider, click on File, Select File and select Deploy OVF Template to deploy the first copy of the ova file.



This ova file becomes the first Service Provider appliance.

**Step 2** Click Browse and select AugustaSP3Template.ova file

Source	
Select the source lo	3000.
Source OVF Template Details Name and Location (8) Host / Custer Resource Pool Disk Format	Deploy from a file or URL
Ready to Complete	Desktone Instaler/AugustaSP3Template.ova
	Enter a URL to download and install the OVF package from the Internet, or specify a location accessible from your

1

**Step 4** Review the OVF template details and click Next.

OVF Template Details Verfy OVF template	detais.		
Source OVF Template Details Name and Location	Product:	AugustaSP3Template20130305	Ĩ
Host / Cluster Version: Resource Pool Disk Format Vendor: Ready to Complete Publisher:	Version:		
	Vendor:		
	Publisher:	No certificate present	
	Download size:	1.9 G8	
	Size on disk:	3.0 G8 (thin provisioned) 20.0 G8 (thick provisioned)	
	Description:	Master Augusta SP3 Template - DT-2300 Self signed cert, DT-2936 sshd change, remove .bash_history - 3/5/2013 by BH	301223

**Step 5** Select a Name and the data center for Service Provider Appliance.

Note Do not use any special characters for the name.

Name and Location Specify a name a	nd location for the deployed template	
Source OVF Template Details Name and Location B Host / Cluster Resource Pool Disk Format Ready to Complete	Name: ServiceProvider1]  The name can contain up to 80 characters and it must be unique within the inventory foider. Inventory Location:  Overter-SP.vdilab-xs.local Desktone	

**Step 6** Select the host where the virtual machine will reside on and click Next.





7 Deploy the Desktone Service Provider Appliance to local storage on one of the two management hosts.



- By default, the Desktone Platform will clone out management appliances on the local disk (through a localdatastore). This is considered a best practice. However, if desired, it is possible to use shared storage for management appliances.
- If using shared storage for management appliances on vCenter, there are a few guidelines:
- Any shared storage (NFS, iSCSI, or FC) can be used.
- Datastores must be manually created on each of the management hosts. The datastore name must be identical (case sensitive) on each management host.

Where do you v	vant to store the virtu	al machine file	\$?						
ITCE Template Details	Select a destination	storage for t	he virtual ma	chine files:		1 🗚			
t / Cluster	Name	Drive Tv	Canacity	Provisio	Free	Tune	Thin Provision	Arress	
Format	Boot_Lun3	Non-SSD	4.00 GB	674.00	3.34 GB	VMFSS	Supported	Single ho	
work Mapping	Local_Disk	Non-SSD	552.75 GB	89.42	465.53	VMFS5	Supported	Single ho	
.,	E LUN1	Non-SSD	484.75 GB	25.51	459.24	VMFS5	Supported	Multiple	
	EL LUN2	Non-SSD	484.75 GB	81.23	403.52	VMFS5	Supported	Multiple	

**Step 8** Select Thin Provision.

ſ

Step 9	Click Next.		
	💋 Deploy OVF Template		Rev Serves, 5.1.6, PROFES
	<b>Disk Format</b> In which format d	o you want to store the v	rirtual disks?
	Source OVF Template Details Name and Location Host / Cluster Storage	Datastore: Available space (GB):	Local_Disk108 465.5
	Disk Format Network Mapping Ready to Complete	C Thick Provision Lazy	/ Zeroed

**Step 10** Select the service provider network as the destination for the first source network; Virtual Machine Network and Link Local for the second source network, Dev Network.

C Thick Provision Eager Zeroed

Thin Provision

ø

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Network Mapping What networks si	hould the deployed template use?			
SUFCE VF Template Details ame and Location	Map the networks used in this OV	F template to networks in your invento	у	
ost / Ouster	Source Networks	Destination Networks		
<u>Xaqe</u> k Format	Virtual Machine Network	VM Network	-	
twork Mapping ady to Complete	DEV Backbone	Linked_Local		
	Description:			
	The Virtual Machine Network net	work		

**Step 11** Review the deployment settings and select the check box to power on the virtual machine after deployment



**Step 13** Repeat the steps 1-12 to deploy the second copy of the ova file, which becomes the template for all subsequent Desktone management appliances. For the template, do not check the box to power on after deployment.



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The name of the template must be unique across all datacenters.

### **Configuring the Network on Desktone Primary Service Provider Appliance**

Step 1	From the vSphere Client open a console for Desktone Primary Service Provider Appliance.
Step 2	Logon using the default credentials:
	• Username: desktone
	• Password: Desktone1
Step 3	Begin the bootstrap process by executing the following command:
	sudo /usr/local/desktone/scripts/bootstrap.sh Enter password for Desktone: Desktone1
	desktone@template:~\$ sudo /usr/local/desktone/scripts/bootstrap.sh [sudo] password for desktone:
0	

**Step 4** The bootstrap script prompts you to enter the network information.



The host reboots after entering the network information. Because the node is not configured until the reboot completes, disregard any error messages displayed on the console.

1

Field	Sample Value	Notes
Existing multi datacenter setup	No	Select "No" to install the first datacenter
Datacenter Name	Desktone	Use Location Name if you have multiple DCs
IP for Eth1 (backbone)	169.254.1.10	For the Backbone network (must be a link-local address)
Enter netmask CIDR format 0-32	24	Use /22 for large number of tenants
Enter Ip for eth0 (SP)	10.29.132.119	For the SP network
Enter netmask CIDR format 0-32	24	For the SP network
Enter Gateway	10.29.132.1	For the SP network
Enter hostname	Sp1.vdilab-xs.local	
Enter nameserver	10.29.132.30	
Enter NTP servers	Ntp.ubuntu.com	
Is this an HA Service Provider appliance setup?	Yes	
Enter the floating IP address	10.29.132.120	
Enter psql password	XYZabc123	This alters the psql passwords for admin, master, slave and slony user.
Appliance password	Password123	The user-defined password for Service Provider appliances in this datacenter. Any Service Provider appliances accessible by ssh requires this custom password.
Does this configuration Look correct?	Yes or No	Review the information applied and select Yes or No.

Is this Service Provider appliance part of an existing multi Data Center setup? If this is the first Data Center, answer no. Answer yes or no: no Enter Data Center Name: Desktone Enter IP for eth1 (backbone): 169.254.1.10 Enter netmask CIDR format 0-32: 24 Enter IP for eth0 (SP): 10.29.132.119 Enter netmask CIDR format 0-32: 24 Enter Gateway: 10.29.132.1 Enter hostname: Sp1.udilab-xs.local Enter nameserver: 10.29.132.30 Enter NTP servers (if no more NTP servers, press <RETURN>) If you press enter for the first NIP server, [ntp.ubuntu.com] will be configured Is this an HA Service Provider appliance setup?: Answer yes or no: yes Enter the floating IP address:

After reboot put the latest dt-platform package in the directory: /data/repo/ Does this configuration look correct? Data Center Name: Desktone Hostname: Sp1.vdilab-xs.local eth1 IP: 169.254.1.10 eth1 Netmask: 255.255.255.0 Backbone IP Block: 169.254.1.0/24 eth0 IP: 10.29.132.119 eth0 Netmask: 255.255.255.0 eth0 CIDR: 24 Gateway: 10.29.132.1 HA Transit Server IP: 169.254.1.11 loating IP: 10.29.132.120 Data Center UID: 256a98db-ed4e-4604-9dfe-b388a5913e31 Nameserver: 10.29.132.30 Data Center Master: True Multi Data Center: False NTP Server 1: ntp.ubuntu.com VMGR UID: 09b83774-cabf-4250-aa01-d55102950da0 Answer yes or no: yes

Step 5 After rebooting, login with the configured username/password: desktone/Password123

**Step 6** Copy the following files to the /tmp directory on the service provider appliance.

10.29.132.120

I

```
dt-platform-5_3_0.deb
```

```
dt-aux-1_1_0.deb
```

**Step 7** ssh into the service provider appliance using login credentials. Move the files copied to /tmp directory into the /data/repo directory on the appliance using the commands:

```
sudo mv /tmp/dt-platform-5_3_0.deb /data/repo
sudo mv /tmp/dt-aux-1_1_0.deb /data/repo
```



**Step 8** Run the bootstrap script a second time to install the Desktone software:

sudo /usr/local/desktone/scripts/bootstrap.sh

Note

It might take up to five minutes for the appliance to start after the reboot. Because the node is not configured until the reboot cycle completes, you can disregard any error messages displayed on the console.



#### **Configuring the Desktone Primary Service Provider Appliance**

- **Step 1** Browse to the Desktone service provider portal by entering the URL or IP address: https://<IP address of service provider appliance>/service
- **Step 2** Enter the information from the service provider Active Directory and click Save.

# <u>Note</u>

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The first time, browsing the service center, you will be prompted for Domain Bind and Group Info.

Save successful. Proceed https://10.29.132.119/serv	with the other tabs or save this URL and enter it in a new browser if you wish to edit the other tabs later: iceiconfighteEditDomaimFlow.action?ticket=fQdGcEQFckxUfANJeA==	
🕈 Domain Bind 🖉 Gr	oup Info	
* Name	vollab-xs	
* Domain Suffix	vellab-xs.local	
* Protocol	For example, mycompany.com	
* Port	636	
Domain Controller IPs	10.29.132.30 Preferred domain controller P list with comma separation	
* Context	dc=vdilab-xs,dc=local	
* Domain Bind Account DN	cn=administrator, cn=users	
Password	Distinguished name of admin user for this domain. For example, cn+administrator,cn+users	
* Password verify	Password for user named above.	



**Step 3** Enter a username, password and domain based on the Active Directory information on the service center login page.

**Step 4** Enter the IP address or FQDN for vCenter hosting primary Service Provider Appliance, username and password and click Discover Server.



**Step 5** Enter the memory over allocation ratio for each discovered host.

Note

If the server is too small to accommodate the ratios, you may be prompted to re-configure them. Click Save to set the ratios.

		Momony Overalle	cation			Current Head MM
Memory Installed		Ratio 😧	cauon	Total VM Mem	ory	Memory
255 GB		1.0		255 GB	1	4 GB
CPUs Installed		Virtual to Physica Ratio 🕡	al CPU	Total VM CPU	Count	Current Used VM CPU Count
16		10.0	=	160	1	2
Adjust the resourc	e rati	os above as need	led, ther	n click the Save	button.	
Adjust the resourc	e rati	os above as need	led, ther	n click the Save	button.	

- **Step 6** Repeat step 5 for the other ESXi host.
- **Step 7** After setting the ratios, the Service Center displays a pop-up listing the virtual machines on your host or in your vCenter Data Center.

**Step 8** Select the Desktone appliance template to be used for cloning additional management appliances.

Your mana	igement server has been discovered
Select the v	irtual machine to be used as the appliance template:
<b>)</b>	AugustaSP3Template20130305 ServiceProvider1
	Save

- **Step 9** Go to service grid --> resources. In the Resource Managers panel on the left, click the IP address of the resource manager.
- **Step 10** From the General tab, in the Name field, double-click on the IP address of the resource manager. Change the name to a user-friendly name and click OK.

desktone: Service Center	tenants service grid a	ppliances configuration	administrator logout   help
Resources     Resources     Select data center to view     Desktone	×		
Resource Managers	General Hosts	Desktop Managers Storage System	
Resource Managers	Name		
Internitie	Hostname	169.254.1.10	
	UUID	09b83774-cabf-4250-aa01-d55102950da0	
	Data Center	Desktone (Edg)	

- **Step 11** Apply the patches for the base image of service provider appliance by clicking appliances --> software update.
- **Step 12** Browse to the patches to be applied and click on Upload.

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desktone <sup>.</sup> Service Center	tenants	service grid	appliances	configuration	Administrate logout h
Software Updates					
Software updates are available from t appliances and will be available for in	the Desktone Partne Istaliation. Select th	r Portal and can be a name of an upda	e uploaded here te from the list be	for installation. Once uploaded, t flow to install it.	the update is replicated to the service provider
Update File (*.tgz): Choose File n	o file selected				
	U	pload			
Available Updates					
2 items found, displaying all items.					
Name			Version	Size	Replicated
di-platform-5-3-0-patch-1			5.3.1	2059 KB	2/2
d-platform-5-3-0-patch-2			5.3.2	16258 KB	2/2
DaaS® - Desktops as a Service® - pow	ered by 🖞 desktoner	© 2007-2013 Deski	one, Inc. All rights n	served   <u>Version</u>   <u>Legal</u>   Lio	ense   Support

**Step 13** SSH into the service provider appliance using login credentials and execute the following commands:

```
cd /data/repo
sudo dpkg -i dt-platform-5_3_0_patch_1.deb
sudo dpkg -i dt-platform-5_3_0_patch_2.deb
sudo service dtService restart
```

### Installing the Desktone Secondary Service Provider Appliance

```
Step 1
             Go to Service grid --> data center and click Edit.
                                                                                                                                         administrator
           desktone Service Center
                                                                                      configuration
                                                 tenants
                                                                         appliances
                                                            service grid
           Data Centers
           Filter by Name
                                                         Search
           One item found
                                                                                                                         Desktop
Managers
                                                                                                                Resource
           A Name
                                   Friendly Name
                                                          Description
                                                                                          VMs
                                                                                                     Hosts
                                                                                                                Managers
           Desktone
                                   Desktone
                                                          Desktone
                                                                                                   7
                                                                                                             2
                                                                                                                       2
                                                                                                                                  2
                                                                                                                                                       301243
                                                                                                                                 Export to 🗟 🗐 🧧
```

**Step 2** Verify the displayed information and click Add Appliances.

Edit Data Center	×					
* Name	Desktone					
Friendly Name	Desktone					
Description	Desktone 169.254.1.12					
Auto assigned RMgr						
NTP Server	[ntp.ubuntu.com]					
Subnet Mask	255.255.255.0					
IP Address Block	169.254.1.0/24					
Network ID Type	vlan					
Network ID	132					
Backbone Network Type	vlan					
Backbone Network ID	55					
DNS Server	10.29.132.30					
Gateway	10.29.132.1					
	Save Add Appliances Cancel					

**Step 3** Select Service Provider Appliance from the Appliances and enter values for the fields to create the Appliance.

Name	SP2	Friendly Name	SP2	
IP Address	10.29.132.121	* Start Date	05/20/2013	8
		Start Time	00:00	3013(

# Note

Reservation will create a virtual machine for the second service provider appliance for High Availability, customize and install. This screen is accessible by navigating to Appliances --> Reservations and clicking the details on the appropriate reservation. From here, you can check the status of the SP2 appliance.

<u>892</u>	cloneVM	100				co	mpleted			succ	essful	
<u>5P2</u>	customize	100				co	mpleted			succ	essful	
<u>P2</u>	install	100				co	mpleted			succ	essful	
desktone   Service	Center tenants	service grid	applances	configuration	m			administrato logout i he	nr Po			
Fiber by Name:	Tenant Select		Data Center	Select 💌			í	Search				
reendly Name	Name	S <sup>1</sup> / <sub>4</sub> rvice P	rovider Tenant	Template RM	gr Desktop Mgr	Primary	Organization Primary	Bata Center	Tenant	State	Version	-
ServiceProvider1	ServiceProvider1	\$ ×		· ×		*	~	Desidone	Service Provider	installed	5.3.1	Actions
AugustaGP3Template20130305	AugustaSP37emplate20130305	<b>4</b> -		×		*		Desidone	Service Provider	Reserved	5.3.0	
92	SP2	1 ×		. <b>v</b>	·	-	-	Desitone	Service Provider	Installed	5.3.1	Actions

## Installing the Desktone Tenant Resource Manager Appliances



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In the service center console, select service grid --> data centers.

desktone   s	iervice Center ter	ants service grid	appliances	configuration				adm	logout   he
🖏 Data Centers		l>							
Filter by Name		Search							
One item found	Friendly Name	Description		VMs	Hosts	Resource	Desktop Managers		
Desktone	Desitone	Desktone		0		1 1		Edit	
							Ex	port to 🔍	8 8

Step 2	Click Add	Appliances.
--------	-----------	-------------

Edit Data Center		*
* Name	Desktone	^
Friendly Name	Desktone	
Description	Desktone	
Auto assigned RMgr		
NTP Server	[ntp.ubuntu.com]	
Subnet Mask	255.255.255.0	
IP Address Block	169.254.1.0/24	=
Network ID Type	vlan	
Network ID	132	
Backbone Network Type	vlan	
Backbone Network ID	55	
DNS Server	10.29.132.30	
Gateway	10.29.132.1	-
	Save Add Appliances Ca	ncel

1

**Step 3** Select the Appliance Type as Resource Manager and fill in the appropriate information in the value field for Primary and Secondary appliance and new reservation fields.

desktone   Servic	e Center tenants	service grid	appliances	configuration	administrator logout   hel
Appliance Install					
Appliance					
Туре					
Primary Appliance			New Re	eservation	
* Name	RMGR1		* Friend	ly Name	
<ul> <li>IP Address</li> </ul>			* Start [	Date	
Secondary Appliance			Start T	lime	00.00
Name	RMGR2			N	
IP Address				45	
Create Appliance	Cancel				
					2

Step 4 From the general tab, in the name field double-click on the IP address and change the name for the Resource Manager. For example, TenantRMGR and click OK. You can do this by going to the Service Center console, select Service grid --> resources. In the Resource Managers panel select the IP address for the newly created resource manager.

desktone Servic	e Center	tenants service grid	appliances configuration	administrator logout help
Resources				
Select data center to view	Desktone			
Resource Manager	rs	General Hosts	Desktop Managers Storage Systems	
Resource Manag	ers	Name	169 254 1.12	
· · · · · · · · · · · · · · · · · · ·		Hostname	ResourceMgr1	
		UUID	a942b088-21b0-4ad7-a7eb-9bdeb6d042ff	
		Data Center	Desktone ( <u>Edit</u> )	

Step 5

Select the Tenant Resource Manager as the default for the Datacenter.

NoteIt is very important to verify that the default Resource Manager for the Datacenter is the Tenant<br/>Resource Manager, not the Service Provider Resource Manager.

#### **Adding Desktop Models**

**Step 1** Desktop Model is used to create multiple desktops of a certain configuration and priced accordingly. Tenants can then choose from the available desktop models.

desktone"   Service Center	tenants service gr	id appliances	configuration	administrator logout   help
Desktop Models				
+ Add desktop model				
Name:	Te	tModel1		
Session Based	۲	vo 🛇 Yes <del>←</del>		
Desktop Type:	Se	ectable 💌 <del>Con</del>		
Memory:		мв	-	
Number of CPUs		<del>~</del>		0
Cancel Add desktop mod	el			30125

**Step 2** Add Desktop Model by going into the Service Center console, Select Configuration --> Desktop Models and click Add Desktop Model.

#### Installing the Desktone Tenant Appliances

desktone"   Service Center	tenants service grid appliances configuration	administrato logout   hel
Tonante.	C browse tenants	
G rendens	🖡 register a tenant	
register a tenant	a poley	
Filter by Search for tenant	Show 25 💽 results 🗹 Show only active tenants Search 5	
Nothing found to display		

**Step 2** From the General Info tab, enter the required fields of Tenant Name, Administrator Name, and Database Password.

1

desktone <sup>,</sup>   service	Center tenants service	grid appliances configura	tion	administrato logout i hel
Register a tenant				
General Info	General Info			
	Tenant Name	TenantA	-	
letworks	Administrator Name		<u> </u>	
Custom Fields	Database Password	<u>→</u>	Password must be at least 4 characters long	
	Administrator Phone	1		
	Administrator Email			
	Technical contact name			
	Technical contact phone			
	Technical contact email			
	CRM System URL			
	Technical Support URL			
	Style Sheet URL			
	License File URL			
	Business Support URL			
Save and Create Annilar	cae Save and Einich Later	Cancel		

**Step 3** Enter the Network Information.

# <u>Note</u>

• Network ID is an install time decision and cannot be changed after the tenant has been installed. Additional networks can be added to a tenant at any time. The first network added would be the default for the tenant and also the network that the tenant appliances will reside on.

desktone <sup>.</sup>	Service Cente	r tenants servi	ce grid appliances	configuration	administrato logout i hel
😼 Register a te	enant				
Seneral Info		Networks			
Vetworke		Add the tenant information All fields are required if	for the required data ce you want to create ap	nters below so appliances and desktops opliances now.	can be added.
termoine	- Chry	Data Center	Desktone 💌	Add	
Custom Fields	0				
		Desktone	Remove		
		* Network ID	53	-	
		* Network ID Type	VLAN 💌	_	
		* Gateway	10.10.53.1	<u> </u>	
		* DNS Server	10.10.53.30	<u> </u>	
		* Subnet Mask	255.255.255.0	<u> </u>	
		Default	~		
Save and Crea	te Appliances	Save and Finish Later	Cancel		

**Step 4** From the Custom Fields tab, enter any site-specific information you want to maintain. These are freeform text fields with no data validation; the content is optional.

desktone   Service Cent	er tenants ser	vice grid appliances	configuration	administrator koput i help
🕼 Register a tenant				
General Info	Custom Fields			
Networks	Custom Field 1 Custom Field 2	II		
Custom Fields	Custom Field 3 Custom Field 4			
	Custom Field 5 Custom Field 6			
Save and Create Appliances	Save and Finish Later	Cancel		01254

#### **Step 5** Click Save and Create Appliances.

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Step 6 From the Tenant Install page, enter the values for the tenant Appliances and click Create Appliances.

desktone   service	Center tenants se	rvice grid appliances configuration	administrator logout   help
🛙 Tenant Install			
Data Center	Desktone		
Primary Appliance		Schedule Install	
* Name	TenantA1 🔶	* Start Date	05/22/2013
IP Address	10.10.53.31 🔶	Start Time	00:00
Secondary Appliance			ormat(HH:MM) 00:00-23:59 GMT use 00:00 for "now"
* Name	TenantA2	-	
* IP Address	10.10.53.32 🔸	_	
Floating IP Address			
10.10.53.33			
Create Appliances	Cancel		

**Step 7** To monitor the status of the tenant appliances being created, go to the service center console, Select Appliances --> Reservations and click on details to the view the reservation of interest.

1

desktone <sup>,</sup> Se	rvice Center	tenants	service grid ap	pliances configuratio	n		administrator logout help
Reservations							
er by Name:		Tenant TenantA	Start	Date End D	ate		Search
tem found							
ne	Life	State State	Result Desc.	Start Date	% Comp	leted Action	
antA - Install - Deskt	tone com	success	м	May 22, 2013 12:00:00 /	AM UTC 100	Reschedule	details
desktope	Service Center	tessate	constru orid	and house	tion		administrato
C GENELONE 1		tenants	service gno	applances configura	uon		logout   he
2 Tasks							
0 Idsks							
tems found, display	ring all items.						
Appliance	Type	% Completed		Life State	State	Description	
TenantA1	cione/VM	100		completed	successful		
- And Market							
TenantA1	customize	100		completed	successful		
TenantA1	install	100		completed	successful		
TenantA2	cione/M	100		completed	successful		
TenantA2	customize	100		completed	successful		
Tenenta?	install	100		completed	successful		
20080606							



### **Assigning Hosts to Individual Tenants**

- **Step 1** Assign a host by clicking Add host. Do this by going to the service center console, Select service grid --> resources.
- **Step 2** From the left side of the screen select Hosts.
- Step 3 Click Add Host.
- **Step 4** Enter the IP address or FQDN for vCenter created for Tenant Desktop Hosts and credentials.

desktone <sup>,</sup> Service	e Center	tenants service grid appliances	configuration	administrat logout h
Select data center to view	Desktone			
Resource Manager	5	General Add Host		
Desktop Managers     Hosts     Hosts		Enter the DNS name or IP addres Then choose a resource manager resources.	s of each host, along with the appropriate usernam that this host can use to communicate with its virt	ne and password. tualization
<ul> <li>Ø 10.29.132.117</li> <li>Ø 10.29.132.118</li> </ul>	ו	IP Address / Hostname	10.29.132.118	
		Username	administrator	
		Password		
		Resource Manager	ResourceMgr-Tenant	
		Add Host		

Resources	ectorite grai appearces		logo
ect data center to view Desktone	×		
Resource Managers	General Tenants Dataste	re Config	
Desktop Managers			
Hosts	Host role	Active	
Hoste	Host purpose	Desitop	
· Ø 10.29.132.117	000	10.29.122.007	
B Ø 10.29.132.118	Type	Virtual Center	
In 10.29,132,107	Status	connected	
D 10.29.132.110	CPU Count	16	
	Total Memory (GB)	255 08	
	Shared	No	
	Virtual to Physical CPU Ratio		
	Memory Overallocation Ratio		
	Total VM CPU Count		
R	Current Used VM CPU Count		
	Total VM Memory (08)	0.0 08	
	Current Used VM Memory (GB)	0.0 QB	
	Version	5.1.0 VMware ES0 5.1.0 build-838463	

Step 5 Edit the host by selecting the vCenter for Tenant desktop hosts.

Step 6 Change the memory overallocation ratio if required and click Save.

lemory Installed		Memory Overallo Ratio 😧	cation	Total VM Memory		Current Used VM Memory
255 GB	•	1.5	=	383 GB	1	24 GB
PUs Installed		Virtual to Physica Ratio 🕡	ICPU	Total VM CPU Cou	unt	Current Used VM CPU Count
6		10.0	=	160	1	14
djust the resource	e rati	os above as neede	d, ther	n click the Save bu	itton.	

This option only allows for ratios to be increased and may not be decreased after the inital setup.



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**Step 8** Assign a host to the Desktop Manager by clicking on Assign under Available Hosts from the Desktop Managers tab.

1

Besources	unanty saw	e gra	ggaartes compo	auon				logout
ect data center to view Desktone		۳						
Resource Managers	General	Hosts	Desktop Manager I	nstance	5			
Desktop Managers	Assigned	Hosts No	hine found to display.					
Desitop Managers ( <u>infresh</u> )     # TenantA 408E09E800 on     # TenantB 5A23351A55 on								
	Available	Hosts						
		Address		Type	Status	Version	Shared	Action
	Ø	10.29.132.1	18	Virtuel Center	Online	5.1.0	No	
Hosts								· ·

**Step 9** Select the hosts in the vCenter for this tenant.

Choose hosts for provisioning dea	sktops:	
7 10.29.132.107		
10.29.132.110		

**Step 10** Repeat steps 9 and 10 for the other hosts reserved for the tenant.

# **Assigning Quotas for Tenants**

Step 1

To assign a quota, go in the Service Center console -> tenants and edit the tenant.

e de	iktone" Service Center	tenants service grid	appliances co	nfiguration	n				administrati
🗍 Те	nants	1							
• regis	ter a tenant								
Filter t	y Search for tenant	Show 25 💌 r	esuits 🗹 Show on	y active tena	ints S	Search	59		
2 tems	lound, displaying all items.								
ы	Tenant Name	Admin Contact	52	2		9		0	Action
1001	TenantA	hardipat	٥	٥	4	1	2	~	Edit
1002	TenantB	amuthaiyan	0	0	3	1	2		Edit

Step 2

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2 Enter the values in the VM Quota column for respective Desktop Models and click Update.

# 

**Note** If the quota you entered in the VM Quota field is too large, the system will automatically reduce the quota to the largest possible quota.

esktone <sup>.</sup> Service Center	tenants	service grid	appliances	configuration			administr logout
Editing TenantA							
General Custom Fields	Quotas Re	mote Access	Appliances	Networks	Entitlements	Certificates	
enant Quota Summary View	1						
ata Center Desktone 💌							
esktop Model Quota							
o specify no quota, put a zer	o in the appropri	ate desktop m	odel row.				
lame	Тур	. ,	Memory	CPUs	Session Model	VM Quota	In Use
Vormal	sele	ctable :	2048	1	No	5 🔶	•
sity	sele	ctable :	2048	1	No	2	0
/Di-Model1	dyn	amic	1024	1	Yes	2	0
/DI-Model2	sele	ctable	1536	1	No	2	•
oposie							

**Step 3** Check the desired protocols for the tenant and click Update.

rotocol	Unlimited	Quota	In Use
DP	<b>→</b> ✓	0	3
GS		0	0
DX		0	0
INC .		0	0
x		0	0
ColP		0	3

### **Configuring Tenant Appliance**

- **Step 1** Browse to the Desktone Enterprise Center by entering the URL or IP address in a browser: https://<IP address of Tenant Appliance>/admin
- **Step 2** Enter the values under Domain Bind, Group Info and Domain Join Info when prompted and click Save.



Start typing the first sev	eral characters of the group distinguished name and then wait for suggestions to appear.	
Domain Bind 🖋	Group Info 🖉 Domain Join Info	
* Admin Groups	administrators.cn=builtin.dc=tenanta.dc=local Super Admin - Enterprise Admin Add Admin Group For example, CI+admins.ou-groups	
* User Groups	cn=users.cn=builtin,dc=tenanta,dc=loca	
	Add User Stroup For example, CN-myusers,ou-groups	

**Step 3** Enter the values under Group Info and click Save.

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desktone <sup>.</sup> Enterprise Cente	7	heb
Register a domain		111
In the Domain Join User field,	enter the login name of a user having unlimited privileges to join computers to this domain.	
🖌 Domain Bind 🖌 Grou	p Info 🛷 Domain Join Info	
Domain Join User	administrator	
Domain Join Password	Password for domain user.	
Domain Join Password Verify		
* Primary DNS server IP	10.10.53.30 P address of primary DNS server.	
Secondary DNS server IP	127 0.0.1 P address of secondary DNS server. Leave this blank if you do not have one.	
Save Clear		

**Step 5** Login into the Desktone Enterprise Center login screen again to continue the configuration.

# Adding the Golden Template into Desktone Tenant Portal

Step 1 Click on Pool Management -> Pattern Management and type in the Golden Windows 7 VM and click Reserve.

1

1

desktone   Enterprise Center	dashboard mapping pool	management configuration	n	administrator logout help
🚢 Pattern Management			Show Summary	
	Pattern Management	Console		
Win7_GI_Tenant8	1. Use the search box	to find a static desktop to convert	into a reserved desktop.	
<ul> <li>Gold Patterns</li> </ul>	<ol><li>Click the "Reserve" console.</li></ol>	button to move the desktop into th	ie pattern management	
	<ol> <li>Select your desktop and links to the consol</li> </ol>	by clicking on the name. You will e for configuring the new pattern.	be provided information	
	<ol> <li>When you are finish the "Convert to Gold Pa</li> </ol>	ned with the configuration, power o ttern" link to add the pattern to the	on the desitop and click system.	
L <sub>g</sub>	The below table summari converted to gold pattern	zes the number of virtual deskto s (including current gold patterns	ps allowed to be s).	
	Data Center	Desktops Reserved	Total Desktops Allowed	
	Desktone	0	2	

**Step 2** Click Convert to Gold Pattern.

Gold Patterns	IP Address:	10.10.54.34		
- Reserved Desktops	Power State	on	Operations 🖈	
	OS:	Windows7		
Win7_GI_TenantB	Storage Location:	[LUN2] Win7_GI_Tenant	B/Win7_GI_TenantB.vmx	
	Memory:	1536		
	CPUs:	1		
	Cpu Speed:			
	DaaS® agent status:	N/A		
	Command	Options		
	Unr     Cor <u>Cor</u> <u>Del</u>	reserve Desktop nnect via RDP (use nvert to gold pattern lete Desktop	local administrator credentials)	301270

**Step 3** Enter the values for the fields shown below and click Convert to Pattern.

Note Do not check the Override Licensing option if you want to use KMS.

License key:       • Time Zone:     (UTC-08:00) Pacific Time(US & Canada)       • Company Name:     TENANTB	
* Time Zone: (UTC-08:00) Pacific Time(US & Canada)	
Company TENANTB	
Password for local administrator: Administrator	
* Password: ••••••• 🔶	
* Password ••••••	

**Step 4** Verify the progress under Configuration -> Task and Events.

desktone Enterpri	ise Center	dashboard mapping pool management	configuration		administrator logout   help
		1			
asks and Events		-			
ter by Status: - Select -	• F	vools: •			
	_				
Converting	Win7_GI_Tena	IntB to gold pattern		100% Complete	~
Date	State	Description	% Completed		
Hay 24 2012 6 12 12 DH I	ITC prepared		0		
May 24, 2013 0.13.13 PM C	no hisbared		•		
May 24, 2013 6:13:14 PM L	JTC queued		0		
May 24, 2013 6:13:13 PM C May 24, 2013 6:13:14 PM C May 24, 2013 6:13:14 PM C	JTC queued		0		
May 24, 2013 6:13:14 PM U May 24, 2013 6:13:14 PM U May 24, 2013 6:13:14 PM U May 24, 2013 6:13:16 PM U	JTC queued JTC running JTC running	Called Resource Manager to convert pattern to template	0 0 10		
May 24, 2013 6:13:14 PM L May 24, 2013 6:13:14 PM L May 24, 2013 6:13:14 PM L May 24, 2013 6:13:16 PM L May 24, 2013 6:13:16 PM L	JTC queued JTC running JTC running JTC running	Called Resource Manager to convert pattern to template Sendic Element inventory to Fabric	0 0 10 15		
May 24, 2013 6:13:13 PM C May 24, 2013 6:13:14 PM L May 24, 2013 6:13:14 PM L May 24, 2013 6:13:16 PM L May 24, 2013 6:13:16 PM L May 24, 2013 6:13:20 PM L	JTC queued JTC running JTC running JTC running JTC running	Called Resource Manager to convert pattern to template Send& Element inventory to Fabric Seal message sent to VM, waiting for machine to shut down	0 0 10 15 25		

- **Step 5** Enable the Gold pattern by clicking Enable.
- Step 6 Click Update.

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Note

Reseal option is required only when the Golden Pattern virtual machine is powered on.

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desktone <sup>.</sup> Enterprise Center da	ishboard mapping	pool management	configuration	administrator logout help
Pattern Management			Show Summa	α a
Reserve	Gold Pattern -	Win7_GI_TenantB		
- Cald Batterna	Name:	Win7_GI_TenantB	Reseal	
Gold Patterns	Enable:	Yes CNo		
Win7 GI TenantB	Validity:	Ok		
	OS:	Windows7		
	Version:	1001		
	Seal date:	Fri May 24 18:14:20 UT	C 2013	
	Used in:			
	Data Centers :	Desitone (1 of 2 Used)	)	
	Notes:		10	
			<u></u>	
	Undate			
	and Si			
	Command Options			
	Consider dealder			
	Conventio deskiop			
	Backup Options			
Reserved Desktops	D			
	Current Bar	ised out of 2)		

#### Creating a Pool of Desktops in the Tenant Portal



**Step 2** Enter the values and click Customize Pool.

# Note

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There are two desktop types: Static and Dynamic. Static desktops are assigned to individual users and the same desktop is available to users at all times. Dynamic desktops are available to any user for the duration of their session.

Create New Pool			
ase fill in the Pool specificat	tions below.		
Data Center	Desktone 💌 🔶		
* Name	TenantB-DesktopPool	Pool Size	2
* Desktop Model		2 Remaini	ng
* Protocols:	RDP VNC RGS		
Desktop Type	Static		
* Gold Pattern	Win7_GI_TenantB		

**Step 3** Enter the values under Policies as applicable for each tenant and click Review Pool.

Provisioning	The provisioning policy defines all	the attributes required for provisioning new virtual desktops in this pool.	
Remote Applications	* VM name composition rule:	TenantB-VM + incremental number 1-12 character base name	
VM Configuration	Computer OU	ou=DesktoneVMs. This is an optional field	
Pool Configuration	Domain Join	C No @ Yes	
✔ Utilization	Domain	TENANTB	
Viser Experience	Assigned Groups	Assigned Groups	
Next>>		Add User Group Ad groups to assign to this pool. For example, cn+desktoneusers,ou+groups	
	N		

<b>SIED 4</b> UNCK CIEALE.	Step 4	Click Create	
----------------------------	--------	--------------	--

POOL CONFIGURATION		WINDOWS CONFIGURATION		
Name	TenantB-DesktopPool	VM name composition rule:	TenantB-VM	
Pool Type	Fixed size	Assigned Groups	1	
Pool Size	2	Domain Join	Yes	
Based On		Domain	TENANTB	
Gold Pattern	Win7_GI_TenantB	Run once script:		
Desktop Type	Static	Remote Applications	0	
Desktop Model	VDI-Model2			
Protocols	PColP RDP			
Default Protocol	None			
Computer OU				
Session Timeout for VM (in ms)	3600000			

**Step 5** You can monitor the task of new desktops being created under Pool Management --> Tasks and Events.

1

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Note

- Desktops will go through restart several times for customization steps like obtaining DHCP IP address, joining Domain, etc.,
- Two virtual displays with 128MB of video memory configuration are used by default when Desktone creates desktops for any desktop pool using PCoIP.

deskt	one:	Enterprise	Center	dashboard	mapping	pool management	configuration		administrato logout hel
Tasks	and E	vents						R	
itter by	Status:	- Select -	I TenantB	DesktopPool	-			36% Complete	ß
	Dat	e	State	Description	5	Completed			
May 29,	2013 6:5	57:23 PM UTC	prepared		0				
May 29,	2013 6:5	57:24 PM UTC	queued		0				
May 29,	2013 6:5	57:24 PM UTC	running		0				
May 29.	2013 6.5	57:33 PM UTC	running	Cloning out VM Tenar	tB-VM101' 0				
May 29,	2013 6:5	57:45 PM UTC	running		36				
	E	xpanding poo	I TenantB	DesktopPool				46% Complete	3
	Dat	e	State		Descripti	on	% Completed		
May 29,	2013 6:5	56:55 PM UTC	prepared				0		
May 29,	2013 6:5	57:04 PM UTC	queued				0		
May 29,	2013 6:5	57:14 PM UTC	running				0		
May 29,	2013 6:5	57:23 PM UTC	running	Cloning out VM Tenar	tB-VM100		0		
May 29,	2013 6:5	57:45 PM UTC	running				46		
May 29,	2013 6:5	58:02 PM UTC	running	Finished post clone of	ustomization, a	attempting to join the dom	ain 90		



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Figure 13 Desktops Created on a Tenant

# **5 Test Setup and Configuration**

For this project, a single Cisco UCS B200 M3 blade server in a single chassis for performance was used in testing.

# **Cisco UCS Test Configuration for Single Blade Scalability**

Figure 14

Cisco UCS B200 M3 Blade Server for Single Server Scalability

# Cisco UCS B200 M3 Blade Server Single Blade Test Result– 203 Users



#### Hardware Components:

- 2 X Cisco Nexus 7009
- 2 X Cisco Catalyst 6506 with ASA-SM
- 2 X Cisco ASR 9006
- 2 X Cisco Nexus 5548UP Access Switches
- 2 X Cisco UCS Fabric Interconnect 6248UPs
- 1 X Cisco UCS B200-M3 Virtual Desktop host:
  - 2 x E5-2690 @ 2.9 GHz CPUs
  - 256GB of memory (16 GB X 16 DIMMS @ 1666 MHz)
- 1 x VIC-1240 Converged Network Adapter/Blade
- 2 X Cisco UCS B series Desktone Management hosts with minimum of:
  - 2 x Intel Xeon 5680 @ 3.333 GHz CPUs
  - 96 GB of memory
  - 1 X Converged Network Adapter/Blade
- 1 X NFS System storage array:
  - 2 x Service Controllers
  - 2 x 10 GBe Ports per Controller
  - SSD/SAS drives to support atleast 25 IOPS per desktop

Boot – The ratio of Read/Write is 9:1 (approx)

Run – The ratio of Read/Write is 4:3 (approx)

#### **Detailed Windows Configuration**

- 215 Desktop Configuration: Windows 7 SP1 32 bit, 1vCPU, 1 GB of memory (1GB Reserved), 24 GB/VM, 2 virtual displays with 128MB of Video Memory.
- 155 Desktop Configuration: Windows 7 SP1 32 bit, 1vCPU, 1.5 GB of memory (1GB Reserved), 24 GB/VM, 2 virtual displays with 128MB of Video Memory.

### **Testing Methodology and Success Criteria**

All validation testing was conducted on-site within the Cisco RTP labs with joint support from Desktone. The test results focused on the entire process of the virtual desktop lifecycle by capturing metrics during the desktop boot-up, user logon and virtual desktop acquisition (also referred to as ramp-up,) user workload execution (also referred to as steady state), and user logoff for the Hosted VDI model under test.

Test metrics were gathered from the hypervisor, virtual desktop, storage, and load generation software to assess the overall success of an individual test cycle. Each test cycle was not considered passing unless all of the planned test users completed the ramp-up and steady state phases (described below) and unless all metrics were within the permissible thresholds as noted as success criteria.

Three successfully completed test cycles were conducted for this hardware configuration and the results were found to be relatively consistent from one test to the next.

### **Load Generation**

Within the test environment, load generators were utilized to put demand on the system to simulate multiple users accessing the Desktone 5.3.2 environment and executing a typical end-user workflow. To generate load within the environment, an auxiliary software application was required to generate the end user connection to the Desktone environment, to provide unique user credentials, to initiate the workload, and to evaluate the end user experience.

In the Hosted VDI test environment, session launchers were used to simulate multiple users making a direct connection to the Desktone 5.3.2 connection server through a VMware PCoIP protocol connection.

### User Workload Simulation – LoginVSI from Login Consultants

One of the most critical factors of validating a Desktone 5.3.2 deployment is identifying a real-world user workload that is easy for customers to replicate and standardized across platforms to allow customers to realistically test the impact of a variety of worker tasks. To accurately represent a real-world user workload, a third-party tool from Login Consultants was used throughout the Hosted VDI testing.

The tool has the benefit of taking measurements of the in-session response time, providing an objective way to measure the expected user experience for individual desktop throughout large scale testing, including login storms.

The Virtual Session Indexer (Login Consultants' Login VSI 3.6) methodology, designed for benchmarking Server Based Computing (SBC) and Virtual Desktop Infrastructure (VDI) environments is completely platform and protocol independent and hence allows customers to easily replicate the testing results in their environment.



In this testing, the tool was used to benchmark in a VDI environment only.

Login VSI calculates an index based on the amount of simultaneous sessions that can be run on a single machine.

Login VSI simulates a medium workload user (also known as knowledge worker) running generic applications such as: Microsoft Office 2007 or 2010, Internet Explorer 8 including a Flash video applet and Adobe Acrobat Reader (Note: For the purposes of this test, applications were installed locally).

Like real users, the scripted Login VSI session will leave multiple applications open at the same time. The medium workload is the default workload in Login VSI and was used for this testing. This workload emulated a medium knowledge working using Office, IE, printing and PDF viewing.

- Once a session has been started the medium workload will repeat every 12 minutes.
- During each loop the response time is measured every 2 minutes.
- The medium workload opens up to 5 apps simultaneously.
- The type rate is 160ms for each character.
- Approximately two minutes of idle time is included to simulate real-world users.

Each loop will open and use:

- Outlook 2007/2010, browse 10 messages.
- Internet Explorer, one instance is left open (BBC.co.uk), one instance is browsed to Wired.com, Lonelyplanet.com and gettheglass.com.
- 480 p Flash application.
- Word 2007/2010, one instance to measure response time, one instance to review and edit document.
- Bullzip PDF Printer & Acrobat Reader, the word document is printed and reviewed to PDF.
- Excel 2007/2010, a very large randomized sheet is opened.
- PowerPoint 2007/2010, a presentation is reviewed and edited.
- 7-zip: using the command line version the output of the session is zipped.

A graphical representation of the medium workload is shown below.



Figure 15 Graphical overview

You can obtain additional information on Login VSI from http://www.loginvsi.com.

# **Testing Procedure**

The following protocol was used for each test cycle in this study to insure consistent results.

### Pre-Test Setup for Single and Multi-Blade Testing

All virtual machines were shut down utilizing VMware vCenter. All Launchers for the test were also shut down from VMware vCenter. Then they were started until the required number of launchers was running with the Login VSI Agent at a "waiting for test to start" state.

### **Test Run Protocol**

To simulate severe, real-world environments, Cisco requires the log-on and start-work sequence, known as Ramp Up, to complete in thirty minutes. Additionally, Cisco requires all sessions started to become active within two minutes after the session is launched.

For each of the three consecutive runs on single blade (155 or 215 User) the process detailed below was followed:

- 1. Time 0:00:00 Start ESXtop Logging on VDI host blade used in test run.
- 2. Time 0:05 Power-on desktops with the Desktone Tenant Appliance.
- **3.** Time 0:35 All desktops started on a single blade.
- 4. Time 0:50 Start Login VSI 3.6 Test utilizing 11 Launchers.

- 5. Time 1:20 Launch desktop sessions.
- 6. Time 1:22 Desktop sessions become active.
- 7. Time 1:35 Login VSI Test Ends.
- 8. Time 1:50 Logoff desktop sessions.
- **9**. Time 2:00 Terminate all logging.

### **Success Criteria**

There were multiple metrics that were captured during each test run, but the success criteria for determining the maximum workload per blade maintaining acceptable end-user experience for a single test run was based on the key metric, VSI Max. The Login VSI Max evaluates the user response time during increasing user load and assesses the point at which end-user experience becomes unacceptable.

#### Login VSI Max

VSI Max represents the maximum number of users the environment can handle before serious performance degradation occurs. VSI Max is calculated based on the response times of individual users as indicated during the workload execution. The user response time has a threshold of 4000ms and all users response times are expected to be less than 4000ms in order to assume that the user interaction with the virtual desktop is at a functional level. VSI Max is reached when the response times reaches or exceeds 4000ms for 6 consecutive occurrences. If VSI Max is reached, that indicates the point at which the user experience has significantly degraded. The response time is generally an indicator of the host CPU resources, but this specific method of analyzing the user experience provides an objective method of comparison that can be aligned to host CPU performance.



In the prior version of Login VSI, the threshold for response time was 2000ms. The workloads and the analysis have been upgraded in Login VSI 3 to make the testing more aligned to real-world use. In the medium workload in Login VSI 3.0, a CPU intensive 480p flash movie is incorporated in each test loop. In general, the redesigned workload would result in an approximate 20% decrease in the number of users passing the test versus Login VSI 2.0 on the same server and storage hardware.

#### Calculating VSIMax

Typically the desktop workload is scripted in a 12-14 minute loop when a simulated Login VSI user is logged on. After the loop is finished it will restart automatically. Within each loop the response times of seven specific operations is measured in a regular interval: six times in within each loop. The response times if these seven operations are used to establish VSImax. The seven operations from which the response times are measured are:

- Copy new document from the document pool in the home drive
  - This operation will refresh a new document to be used for measuring the response time. This activity is mostly a file-system operation.
- Starting Microsoft Word with a document.
  - This operation will measure the responsiveness of the Operating System and the file system. Microsoft Word is started and loaded into memory; also the new document is automatically loaded into Microsoft Word. When the disk I/O is extensive or even saturated, this will impact the file open dialogue considerably.

- Starting the "File Open" dialogue.
  - This operation is handled for small part by Word and a large part by the operating system. The file open dialogue uses generic subsystems and interface components of the OS. The OS provides the contents of this dialogue.
- Starting Notepad.
  - This operation is handled by the OS (loading and initiating notepad.exe) and by the Notepad.exe itself through execution. This operation seems instant from an end-user's point of view.
- Starting the "Print" dialogue.
  - This operation is handled for a large part by the OS subsystems, as the print dialogue is provided by the OS. This dialogue loads the print-subsystem and the drivers of the selected printer. As a result, this dialogue is also dependent on disk performance.
- Starting the "Search and Replace" dialogue.
  - This operation is handled within the application completely; the presentation of the dialogue is almost instant. Serious bottlenecks on application level will impact the speed of this dialogue.
- Compress the document into a zip file with 7-zip command line.
  - This operation is handled by the command line version of 7-zip. The compression will very briefly spike CPU and disk I/O.

These measured operations with Login VSI do hit considerably different subsystems such as CPU (user and kernel), Memory, Disk, the OS in general, the application itself, print, GDI, etc. These operations are specifically short by nature. When such operations are consistently long: the system is saturated because of excessive queuing on any kind of resource. As a result, the average response times will then escalate. This effect is clearly visible to end-users. When such operations consistently consume multiple seconds the user will regard the system as slow and unresponsive.

With Login VSI 3.0 and later it is now possible to choose between 'VSImax Classic' and 'VSImax Dynamic' results analysis. For these tests, VSImax Dynamic analysis was utilized.

### VSIMax Dynamic

VSImax Dynamic is calculated when the response times are consistently above a certain threshold. However, this threshold is now dynamically calculated on the baseline response time of the test.

Five individual measurements are weighted to better support this approach:

- Copy new doc from the document pool in the home drive: 100%
- Microsoft Word with a document: 33.3%
- Starting the "File Open" dialogue: 100%
- Starting "Notepad": 300%
- Starting the "Print" dialogue: 200%
- Starting the "Search and Replace" dialogue: 400%
- Compress the document into a zip file with 7-zip command line 200%
- A sample of the VSImax Dynamic response time calculation is displayed below:

Activity (RowName)	Result (ms)	Weight (%)	Weighted Result (ms)
Refresh document (RFS)	160	100%	160
Start Word with new doc (LOAD)	1400	33.3%	467
File Open Dialogue (OPEN)	350	100%	350
Start Notepad (NOTEPAD)	50	300%	150
Print Dialogue (PRINT)	220	200%	440
Replace Dialogue (FIND)	10	400%	40
Zip documents (ZIP)	130	200%	230
	VSImax Dynamic Response Time		1837

#### Figure 16 VSIMax Dynamic Response Time

Then the average VSImax response time is calculated based on the amount of active Login VSI users logged on to the system. For this the average VSImax response times need to consistently higher than a dynamically calculated threshold.

To determine this dynamic threshold, first the average baseline response time is calculated. This is done by averaging the baseline response time of the first 15 Login VSI users on the system.

The formula for the dynamic threshold is: Avg. Baseline Response Time x 125% + 3000. As a result, when the baseline response time is 1800, the VSImax threshold will now be  $1800 \times 125\% + 3000 = 5250$ ms.

Especially when application virtualization is used, the baseline response time can wildly vary per vendor and streaming strategy. Therefore it is recommend to use VSImax Dynamic when comparisons are made with application virtualization or anti-virus agents. The resulting VSImax Dynamic scores are aligned again with saturation on a CPU, Memory or Disk level, also when the baseline response time are relatively high.

#### **Determining VSIMax**

The Login VSI analyzer will automatically identify the VSImax. In the example below the VSImax is 98. The analyzer will automatically determine "stuck sessions" and correct the final VSImax score.

- Vertical axis: Response Time in milliseconds
- Horizontal axis: Total Active Sessions



#### Figure 17 Sample Login VSI Analyzer Graphic Output

- Red line: Maximum Response (worst response time of an individual measurement within a single session)
- Orange line: Average Response Time within for each level of active sessions
- Blue line: the VSImax average.
- Green line: Minimum Response (best response time of an individual measurement within a single session)

In testing, the total number of users in the test run had to login, become active and run at least one test loop and log out automatically without reaching the VSI Max to be considered a success.



A technical issue was discovered with the VSIMax dynamic calculation in testing on Cisco UCS B200 M3 blade servers where the VSIMax Dynamic was not reached during extreme conditions. Working with Login Consultants, a methodology was devised to validate the testing without reaching VSIMax Dynamic until such time as a new calculation is available.

The Login VSI "pass" criteria, accepted by Login Consultants for this testing, is as follows:

- Cisco will run tests at a session count level that effectively utilizes the blade capacity measured by CPU utilization, Memory utilization, Storage utilization and Network utilization.
- Will utilize Login VSI to launch version 3.6 medium workloads, including flash.
- Number of Launched Sessions must equal Active Sessions within two minutes of the last session launched in a test.
- The Desktone Enterprise Center will be monitored throughout the steady state to insure that:
  - All running sessions report in use throughout the steady state
  - No sessions move to unregistered or agent not available state at any time during Steady State
- Within 20 minutes of the end of the test, all sessions on all Launchers must have logged out automatically and the Login VSI Agent must have shut down.
- The Cisco Validated Design will be published with the process recommended above and will note that VSIMax dynamic was not reached during testing due to a technical issue with the analyzer formula that calculates VSIMax.

# **6 VDI Test Results**

The purpose of this testing is to provide the data needed to validate Desktone 5.3.2 infrastructure in an end-to-end Cisco environment.

Server scalability based on desktops supported in a single server is very useful to determine the total number of servers needed for a deployment. Different CPU, memory, storage and network metrics can be used to estimate sizing guidelines for necessary data center components and overall deployment. The information contained in this section provides data points that a customer may reference in designing their own implementations. These validation results are an example of what is possible under the specific environment conditions outlined here, and do not represent the full characterization of Desktone 5.3.2 with VMware vSphere 5.1.

The results provided in this section are based on the testing done on a Cisco UCS B200 M3 blade server running ESXi 5.1 hypervisor managed by vCenter 5.1 to host Desktone automated pools with static assignment and provision Windows 7 SP1 full virtual desktops using a NFS storage system.

Two test sequences, each containing three consecutive test runs generating the same result, were performed to establish single server performance.

## Login VSIMax Score

One of the stress tests on a single blade server was conducted to establish the official Login VSI Max Score. Test results show that 215 Medium Workload (with flash) Windows 7 SP1 sessions on a single server achieved a Login VSI Max score of 203. The Login VSI score was achieved on three consecutive runs and is shown in Figure 18 below.



#### Figure 18 Login VSIMax Reached: 203 Users

# **Single Blade Maximum Recommended Workload**

This section details the results from the Desktone 5.3.2 Hosted VDI single blade server validation testing. The primary success criteria used to validate the overall success of the test cycle is an output chart from Login Consultants' VSI Analyzer Professional Edition, VSIMax Dynamic for the Medium workload (with Flash.)

Note

VSIMax Dynamic in testing was not reached due to a technical issue with the analyzer formula that calculates VSIMax. See section Determining VSIMax for a discussion of this issue.

A single server test using approximately 24% lower user density than prescribed by the Login VSI Max was executed to achieve a successful pass of the test with server hardware performance in a realistic range. The recommended maximum load for Desktone 5.3.2 Hosted Virtual Desktops on a Cisco UCS B200 M3 blade sever running the Login VSI Medium workload is 155 desktops given adequate storage capability and enough CPU resources. CPU utilization limit of 90% was a consideration to determine the maximum virtual machine density per blade.

Additionally, graphs detailing the CPU, Memory and network utilization during boot phase and peak session loads are also presented.

The charts below present the recommended maximum Login VSI Medium workload loading on a single blade server. The maximum recommended workload for Desktone 5.3.2 Windows 7 32-bit virtual desktops is 155 per B200 M3 blade server. This charts shows that the average and maximum application response times are below 1.5secs and 2.5secs respectively.



#### Figure 19 155 Desktone 5.3.2 Desktop Sessions on VMware ESXi 5.1 below 2500 ms

### **Boot Phase Performance Results**

The following graphs detail CPU, Memory, Disk and Network performance on a single Cisco UCS B200-M3 blade server during the boot phase collected by esxtop polling data every 10 secs.

The first two charts show the CPU and Core utilizations well below 35% during the boot phase.

The third chart is the memory utilization chart showing the memory allocated to the virtual desktops as they boot up. Because enough memory is available, 1.5GB of RAM was assigned to each VM. A 1GB memory reservation for each VM was configured to minimize or prevent the hypervisor from swapping.

Subsequent charts show the storage performance, in terms of read and write I/O load on the storage system generated by 155 VMs on a single server during the boot phase. The I/O Bandwidth data chart shows the network bandwidth utilization associated with the storage traffic.



Some of the charts are in Mbytes/sec instead of Mbits/sec. and can be a starting point for estimating the bandwidth needs in the data center.



Figure 20 155 Users Single Cisco UCS B200 M3 CPU Core Utilization - Boot Phase







Figure 23 155 Users Single Cisco UCS B200 M3 Cisco VIC1240 MLOM Network Adapter Mbps Receive/Transmit - Boot Phase





Figure 24 155 Users Single Cisco UCS B200 M3 NFS Read/Write IOPS - Boot Phase

Figure 25 155 Users Single Cisco UCS B200 M3 NFS Read/Write Latency - Boot Phase





Figure 26 155 Users Single Cisco UCS B200 M3 NFS MBps Read/Write - Boot Phase

## **Test Phase Performance Results**

The following graphs detail CPU, Memory, Disk and Network performance on the Single Cisco UCS B200-M3 blade servers during the test phase collected by esxtop polling data every 10 secs at the recommended maximum load of 155 Windows 7 virtual desktops.

The first charts show the Core utilizations of ~90% during the steady workload phase. The second chart shows the CPU utilization time of ~55% which indicates that the CPU resources were not overcommitted.

The third chart is the memory utilization chart showing the memory allocated to the virtual desktops during the entire workload. Because enough memory is available, 1.5GB of RAM was assigned to each virtual machine. A 1GB memory reservation for each virtual machine was configured to minimize or prevent the hypervisor from swapping.

The next few charts show storage and network performance, in terms of read and write I/O load on the network and the storage system generated 155 VMs on a single server during the entire workload. The I/O Bandwidth data chart shows the network bandwidth utilization associated with the storage traffic.

NOTE: Some of the charts are in Mbytes/sec instead of Mbits/sec. and can be a starting point for estimating the bandwidth needs in the data center.



Figure 27 155 Users Single Cisco UCS B200 M3 CPU Core Utilization - Test Phase







Figure 29 155 Users Single Cisco UCS B200 M3 NonKernel Memory - Test Phase







Figure 31 155 Users Single Cisco UCS B200 M3 NFS Read/Write IOPS - Test Phase









Figure 33 155 Users Single Cisco UCS B200 M3 NFS MBps Read/Write - Test Phase

# 7 Appendix

#### **Cisco Nexus 5548 configurations**

```
!Time: Sat Jun 1 11:53:31 2013
version 5.2(1)N1(2a)
hostname VXIaaS-N5K-1
no feature telnet
cfs eth distribute
feature udld
feature interface-vlan
feature lacp
feature vpc
feature lldp
feature fex
username admin password 5 $1$yZIj2hxG$uOooTIZcF1u4hbEkhFK1z. role network-admin
no password strength-check
banner motd #Nexus 5000 Switch
ip domain-lookup
ip access-list BULK-DATA
 10 permit tcp any eq 32111 any
ip access-list CALL-SIGNALING
 10 permit tcp any any eq 2748
  20 permit tcp any any eq 5060
  30 permit tcp any any eq 2000
ip access-list MULTIMEDIA-STREAMING
  10 permit tcp any eq 9427 any
ip access-list TRANSACTIONAL-DATA
  10 permit tcp any eq 3389 any
  20 permit udp any eq 50002 any
  30 permit tcp any eq 50002 any
  40 permit udp any eq 4172 any
  50 permit tcp any eq 4172 any
  60 permit tcp any eq 1494 any
class-map type qos class-fcoe
class-map type qos match-any BULK-DATA
 match access-group name BULK-DATA
class-map type qos match-any CALL-SIGNALING
 match access-group name CALL-SIGNALING
class-map type qos match-any TRANSACTIONAL-DATA
 match access-group name TRANSACTIONAL-DATA
class-map type qos match-any MULTIMEDIA-STREAMING
 match access-group name MULTIMEDIA-STREAMING
class-map type queuing BULK
class-map type queuing BULK-DATA
class-map type queuing class-fcoe
  match qos-group 1
class-map type queuing class-all-flood
 match qos-group 2
class-map type queuing class-ip-multicast
 match qos-group 2
policy-map type qos HVD-ACCESS-PORT
  class CALL-SIGNALING
   set dscp 24
  class MULTIMEDIA-STREAMING
   set dscp 26
  class TRANSACTIONAL-DATA
   set dscp 18
  class BULK-DATA
   set dscp 10
  class class-default
policy-map type queuing UPSTREAM-PORT
  class type queuing class-default
```

```
class-map type network-qos class-fcoe
 match qos-group 1
class-map type network-qos class-all-flood
 match gos-group 2
class-map type network-qos class-ip-multicast
 match qos-group 2
policy-map type network-qos jumbo
  class type network-qos class-fcoe
   pause no-drop
   mtu 2158
  class type network-qos class-default
   mtu 9216
   multicast-optimize
system qos
  service-policy type network-qos jumbo
policy-map type control-plane copp-system-policy-customized
  class copp-system-class-default
   police cir 2048 kbps bc 6400000 bytes
hardware profile tcam feature interface-qos limit 50
fex 110
 pinning max-links 1
  description "FEX0110"
  diagnostic bootup level complete
snmp-server user admin network-admin auth md5 0x5b310d304479611ca2ebf839f5c267d7 priv
0x5b310d304479611ca2ebf839f5c267d7 localizedkey
ntp server 10.8.79.254 prefer
vrf context management
  ip route 0.0.0.0/0 10.8.66.1
vlan configuration 731
  service-policy type qos input HVD-ACCESS-PORT
vlan 1
vlan 505
 name VXIaaS-DH-Machines
vlan 711
 name Tenant-1-VM-A
vlan 721
 name Tenant-2-VM-A
vlan 731
 name Tenant-3-VM-A
vlan 741
 name Tenant-4-VM-A
vlan 751
  name Tenant-5-VM-A
vlan 761
  name Tenant-6-VM-A
vlan 844
 name HVXI -NFS
vlan 864
 name VXIaaS-SP-Infra
vlan 865
 name VXIaaS-SP-DH
vlan 867
 name VXIaaS-SP-Hypervisor-MGMT
vlan 868
 name VXIaaS-SP-vMotion
vlan 941
 name Tenant-4-vWAAS
vlan 980
 name Desktone-L2-Link-Local
vpc domain 500
 peer-keepalive destination 10.8.66.9 source 10.8.66.8
port-profile default max-ports 512
interface Vlan1
```

```
interface port-channel1
  description VXIaaS-N5K VPC Peer
  switchport mode trunk
  switchport trunk allowed vlan
505,711,721,731,741,751,761,844,864-865,867-868,941,980
  spanning-tree port type network
  speed 10000
  vpc peer-link
interface port-channel55
  description VXIaaS-N7K Pair
  switchport mode trunk
  switchport trunk allowed vlan 711,721,731,741,751,761,844,864-865,867-868,941,980
  spanning-tree port type normal
  speed 10000
  vpc 55
interface port-channel60
  description vxiaas-n1010-a
  switchport mode trunk
  switchport trunk native vlan 867
  switchport trunk allowed vlan 711,867
  spanning-tree port type edge
interface port-channel65
  description vxiaas-n1010-b
  switchport mode trunk
  switchport trunk native vlan 867
  switchport trunk allowed vlan 711,867
  spanning-tree port type edge
interface port-channel100
  description VXIaaS-6100-1-a
  switchport mode trunk
  switchport trunk allowed vlan 711,721,731,741,751,761,844,864,867-868,941,980
  spanning-tree port type edge trunk
  spanning-tree bpdufilter enable
  speed 10000
  vpc 100
interface port-channel110
  switchport mode fex-fabric
  fex associate 110
  spanning-tree port type edge trunk
  vpc 110
interface port-channel150
  description VXIaaS-6100-2-a
  switchport mode trunk
  switchport trunk allowed vlan 711,721,731,741,751,761,844,864,867-868,980
  spanning-tree port type edge trunk
  spanning-tree bpdufilter enable
  speed 10000
  vpc 150
interface port-channel151
  description VXIaaS-6100-2-b
  switchport mode trunk
  switchport trunk allowed vlan 711,721,731,741,751,761,844,864,867-868,980
  spanning-tree port type edge trunk
  spanning-tree bpdufilter enable
  speed 10000
  vpc 151
interface port-channel200
  description VXIaaS-6100-1-b
  switchport mode trunk
  switchport trunk allowed vlan 711,721,731,741,751,761,844,864,867-868,941,980
  spanning-tree port type edge trunk
  spanning-tree bpdufilter enable
  speed 10000
  vpc 200
```

```
interface Ethernet1/1
  description VXIaaS-N5K-1
  switchport mode trunk
 switchport trunk allowed vlan
505,711,721,731,741,751,761,844,864-865,867-868,941,980
  channel-group 1 mode active
interface Ethernet1/2
  description VXIaaS-N5K-1
  switchport mode trunk
  switchport trunk allowed vlan
505,711,721,731,741,751,761,844,864-865,867-868,941,980
  channel-group 1 mode active
interface Ethernet1/3
  description VXIaaS-N5K-1
  switchport mode trunk
 switchport trunk allowed vlan
505,711,721,731,741,751,761,844,864-865,867-868,941,980
 channel-group 1 mode active
interface Ethernet1/4
  description VXIaaS-N5K-1
  switchport mode trunk
 switchport trunk allowed vlan
505,711,721,731,741,751,761,844,864-865,867-868,941,980
  channel-group 1 mode active
interface Ethernet1/5
interface Ethernet1/6
interface Ethernet1/7
interface Ethernet1/8
interface Ethernet1/9
interface Ethernet1/10
interface Ethernet1/11
interface Ethernet1/12
interface Ethernet1/13
 description VXIaaS-N7K
  switchport mode trunk
  switchport trunk allowed vlan 711,721,731,741,751,761,844,864-865,867-868,941,980
  channel-group 55 mode active
interface Ethernet1/14
  description VXIaaS-N7K
  switchport mode trunk
  switchport trunk allowed vlan 711,721,731,741,751,761,844,864-865,867-868,941,980
  channel-group 55 mode active
interface Ethernet1/15
interface Ethernet1/16
interface Ethernet1/17
interface Ethernet1/18
interface Ethernet1/19
interface Ethernet1/20
interface Ethernet1/21
interface Ethernet1/22
interface Ethernet1/23
interface Ethernet1/24
interface Ethernet1/25
 description VXIaaS-6100-2-a
  switchport mode trunk
  switchport trunk allowed vlan 711,721,731,741,751,761,844,864,867-868,980
  channel-group 150 mode active
interface Ethernet1/26
  description VXIaaS-6100-2-a
  switchport mode trunk
  switchport trunk allowed vlan 711,721,731,741,751,761,844,864,867-868,980
  channel-group 150 mode active
interface Ethernet1/27
  description VXIaaS-6100-2-b
```

```
switchport mode trunk
  switchport trunk allowed vlan 711,721,731,741,751,761,844,864,867-868,980
  channel-group 151 mode active
interface Ethernet1/28
  description VXIaaS-6100-2-b
  switchport mode trunk
  switchport trunk allowed vlan 711,721,731,741,751,761,844,864,867-868,980
  channel-group 151 mode active
interface Ethernet1/29
interface Ethernet1/30
interface Ethernet1/31
  description VXIaaS-6100-1-a
  switchport mode trunk
  switchport trunk allowed vlan 711,721,731,741,751,761,844,864,867-868,941,980
  channel-group 100 mode active
interface Ethernet1/32
  description VXIaaS-6100-1-b
  switchport mode trunk
  switchport trunk allowed vlan 711,721,731,741,751,761,844,864,867-868,941,980
  channel-group 200 mode active
interface Ethernet2/1
interface Ethernet2/2
interface Ethernet2/3
interface Ethernet2/4
interface Ethernet2/5
interface Ethernet2/6
interface Ethernet2/7
interface Ethernet2/8
interface Ethernet2/9
interface Ethernet2/10
interface Ethernet2/11
interface Ethernet2/12
interface Ethernet2/13
interface Ethernet2/14
interface Ethernet2/15
  switchport mode fex-fabric
  fex associate 110
  channel-group 110
interface Ethernet2/16
  switchport mode fex-fabric
  fex associate 110
  channel-group 110
interface mgmt0
  ip address 10.8.66.8/24
interface Ethernet110/1/1
  description vxiaas-n1010-a
  switchport mode trunk
  switchport trunk native vlan 867
  switchport trunk allowed vlan 711,867
  channel-group 60 mode active
interface Ethernet110/1/2
  description vxiaas-n1010-a
  switchport mode trunk
  switchport trunk native vlan 867
  switchport trunk allowed vlan 711,867
  channel-group 60 mode active
interface Ethernet110/1/3
  description vxiaas-n1010-a
  switchport mode trunk
  switchport trunk native vlan 867
  switchport trunk allowed vlan 711,867
  channel-group 60 mode active
interface Ethernet110/1/4
  description vxiaas-n1010-a
```

switchport mode trunk switchport trunk native vlan 867 switchport trunk allowed vlan 711,867 channel-group 60 mode active interface Ethernet110/1/5 description vxiaas-n1010-b switchport mode trunk switchport trunk native vlan 867 switchport trunk allowed vlan 711,867 channel-group 65 mode active interface Ethernet110/1/6 description vxiaas-n1010-b switchport mode trunk switchport trunk native vlan 867 switchport trunk allowed vlan 711,867 channel-group 65 mode active interface Ethernet110/1/7 description vxiaas-n1010-b switchport mode trunk switchport trunk native vlan 867 switchport trunk allowed vlan 711,867 channel-group 65 mode active interface Ethernet110/1/8 description vxiaas-n1010-b switchport mode trunk switchport trunk native vlan 867 switchport trunk allowed vlan 711,867 channel-group 65 mode active interface Ethernet110/1/9 interface Ethernet110/1/10 interface Ethernet110/1/11 interface Ethernet110/1/12 interface Ethernet110/1/13 interface Ethernet110/1/14 interface Ethernet110/1/15 interface Ethernet110/1/16 interface Ethernet110/1/17 interface Ethernet110/1/18 interface Ethernet110/1/19 interface Ethernet110/1/20 interface Ethernet110/1/21 interface Ethernet110/1/22 interface Ethernet110/1/23 interface Ethernet110/1/24 interface Ethernet110/1/25 interface Ethernet110/1/26 interface Ethernet110/1/27 interface Ethernet110/1/28 interface Ethernet110/1/29 interface Ethernet110/1/30 interface Ethernet110/1/31 interface Ethernet110/1/32 interface Ethernet110/1/33 interface Ethernet110/1/34 interface Ethernet110/1/35 interface Ethernet110/1/36 interface Ethernet110/1/37 interface Ethernet110/1/38 interface Ethernet110/1/39 interface Ethernet110/1/40 interface Ethernet110/1/41 interface Ethernet110/1/42 interface Ethernet110/1/43 interface Ethernet110/1/44

```
interface Ethernet110/1/45
interface Ethernet110/1/46
interface Ethernet110/1/47
interface Ethernet110/1/48
clock timezone EST -5 0
clock summer-time EDT 2 Sun Mar 2:00 1 Sun Nov 2:00 60
line console
    exec-timeout 0
line vty
boot kickstart bootflash:/n5000-uk9-kickstart.5.2.1.N1.2a.bin
boot system bootflash:/n5000-uk9.5.2.1.N1.2a.bin
```

```
!Time: Sat Jun 1 12:19:44 2013
version 5.2(1)N1(2a)
hostname VXIaaS-N5K-2
no feature telnet
cfs eth distribute
feature udld
feature interface-vlan
feature lacp
feature vpc
feature lldp
feature fex
username admin password 5 $1$vab55EyW$H21ygbp9047zkiTIjFkx60 role network-admin
no password strength-check
banner motd #Nexus 5000 Switch
ssh key rsa 2048
ip domain-lookup
ip access-list BULK-DATA
 10 permit tcp any any eq 2748
ip access-list CALL-SIGNALING
  10 permit tcp any any eq 2748
  20 permit tcp any any eq 5060
  30 permit tcp any any eq 2000
ip access-list MULTIMEDIA-STREAMING
  10 permit tcp any eq 9427 any
ip access-list TRANSACTIONAL-DATA
 10 permit tcp any eq 3389 any
  20 permit udp any eq 50002 any
  30 permit tcp any eq 50002 any
  40 permit udp any eq 4172 any
  50 permit tcp any eq 4172 any
  60 permit tcp any eq 1494 any
class-map type qos class-fcoe
class-map type gos match-any BULK-DATA
  match access-group name BULK-DATA
class-map type qos match-any CALL-SIGNALING
 match access-group name CALL-SIGNALING
class-map type qos match-any TRANSACTIONAL-DATA
 match access-group name TRANSACTIONAL-DATA
class-map type qos match-any MULTIMEDIA-STREAMING
 match access-group name MULTIMEDIA-STREAMING
class-map type queuing class-fcoe
 match qos-group 1
class-map type queuing class-all-flood
 match qos-group 2
class-map type queuing class-ip-multicast
 match gos-group 2
policy-map type gos HVD-ACCESS-PORT
  class CALL-SIGNALING
    set dscp 24
  class MULTIMEDIA-STREAMING
```

```
set dscp 26
  class TRANSACTIONAL-DATA
   set dscp 18
  class BULK-DATA
   set dscp 10
  class class-default
class-map type network-qos class-fcoe
 match qos-group 1
class-map type network-qos class-all-flood
  match qos-group 2
class-map type network-qos class-ip-multicast
 match qos-group 2
policy-map type network-qos jumbo
  class type network-qos class-fcoe
   pause no-drop
   mtu 2158
  class type network-qos class-default
   mtu 9216
   multicast-optimize
system qos
  service-policy type network-qos jumbo
policy-map type control-plane copp-system-policy-customized
  class copp-system-class-default
   police cir 2048 kbps bc 6400000 bytes
hardware profile tcam feature interface-qos limit 50
fex 110
 pinning max-links 1
  description "FEX0110"
  diagnostic bootup level complete
snmp-server user admin network-admin auth md5 0x5fad43c003bbc5cc41071a4c7ca92e5e priv
0x5fad43c003bbc5cc41071a4c7ca92e5e localizedkey
ntp server 10.8.79.254
vrf context management
  ip route 0.0.0.0/0 10.8.66.1
vlan configuration 731
  service-policy type qos input HVD-ACCESS-PORT
vlan 1
vlan 505
 name VXIaaS-DH-Machines
vlan 711
 name Tenant-1-VM-A
vlan 721
 name Tenant-2-VM-A
vlan 731
  name Tenant-3-VM-A
vlan 741
  name Tenant-4-VM-A
vlan 751
 name Tenant-5-VM-A
vlan 761
 name Tenant-6-VM-A
vlan 844
 name HVXI- NFS
vlan 864
 name VXIaaS-SP-Infra
vlan 865
 name VXIaaS-SP-DH
vlan 867
 name VXIaaS-SP-Hypervisor-MGMT
vlan 868
 name VXIaaS-SP-vMotion
vlan 941
  name Tenant-4-vWAAS
vlan 980
```

```
name Desktone-L2-Link-Local
vpc domain 500
 peer-keepalive destination 10.8.66.8 source 10.8.66.9
  auto-recoverv
port-profile default max-ports 512
interface Vlan1
interface port-channel1
  description VXIaaS-N5K VPC Peer
  switchport mode trunk
  switchport trunk allowed vlan
505,711,721,731,741,751,761,844,864-865,867-868,941,980
  spanning-tree port type network
  speed 10000
  vpc peer-link
interface port-channel55
  description VXiaaS-N7K Pair
  switchport mode trunk
  switchport trunk allowed vlan 711,721,731,741,751,761,844,864-865,867-868,941,980
  spanning-tree port type normal
  speed 10000
  vpc 55
interface port-channel60
  description vxiaas-n1010-a
  switchport mode trunk
  switchport trunk native vlan 867
  switchport trunk allowed vlan 711,867
  spanning-tree port type edge
interface port-channel65
  description vxiaas-n1010-b
  switchport mode trunk
  switchport trunk native vlan 867
  switchport trunk allowed vlan 711,867
  spanning-tree port type edge
interface port-channel100
  description VXIaaS-6100-1-a
  switchport mode trunk
  switchport trunk allowed vlan 711,721,731,741,751,761,844,864,867-868,941,980
  spanning-tree port type edge trunk
  spanning-tree bpdufilter enable
  speed 10000
  vpc 100
interface port-channel110
  switchport mode fex-fabric
  fex associate 110
  spanning-tree port type edge trunk
  vpc 110
interface port-channel150
  description VXIaaS-6100-2-a
  switchport mode trunk
  switchport trunk allowed vlan 711,721,731,741,751,761,844,864,867-868,980
  spanning-tree port type edge trunk
  spanning-tree bpdufilter enable
  speed 10000
  vpc 150
interface port-channel151
  description VXIaaS-6100-2-b
  switchport mode trunk
  switchport trunk allowed vlan 711,721,731,741,751,761,844,864,867-868,980
  spanning-tree port type edge trunk
  spanning-tree bpdufilter enable
  speed 10000
  vpc 151
interface port-channel200
  description VXIaaS-6100-1-b
```

```
switchport mode trunk
  switchport trunk allowed vlan 711,721,731,741,751,761,844,864,867-868,941,980
  spanning-tree port type edge trunk
  spanning-tree bpdufilter enable
  speed 10000
  vpc 200
interface Ethernet1/1
  description VXIaaS-N5K-1
  switchport mode trunk
  switchport trunk allowed vlan
505,711,721,731,741,751,761,844,864-865,867-868,941,980
  channel-group 1 mode active
interface Ethernet1/2
  description VXIaaS-N5K-1
  switchport mode trunk
 switchport trunk allowed vlan
505,711,721,731,741,751,761,844,864-865,867-868,941,980
  channel-group 1 mode active
interface Ethernet1/3
  description VXIaaS-N5K-1
  switchport mode trunk
  switchport trunk allowed vlan
505,711,721,731,741,751,761,844,864-865,867-868,941,980
  channel-group 1 mode active
interface Ethernet1/4
  description VXIaaS-N5K-1
  switchport mode trunk
  switchport trunk allowed vlan
505,711,721,731,741,751,761,844,864-865,867-868,941,980
  channel-group 1 mode active
interface Ethernet1/5
interface Ethernet1/6
interface Ethernet1/7
interface Ethernet1/8
interface Ethernet1/9
interface Ethernet1/10
interface Ethernet1/11
interface Ethernet1/12
interface Ethernet1/13
  description VXIaaS-N7K
  switchport mode trunk
  switchport trunk allowed vlan 711,721,731,741,751,761,844,864-865,867-868,941,980
  channel-group 55 mode active
interface Ethernet1/14
  description VXIaaS-N7K
  switchport mode trunk
  switchport trunk allowed vlan 711,721,731,741,751,761,844,864-865,867-868,941,980
  channel-group 55 mode active
interface Ethernet1/15
interface Ethernet1/16
interface Ethernet1/17
interface Ethernet1/18
interface Ethernet1/19
interface Ethernet1/20
interface Ethernet1/21
interface Ethernet1/22
interface Ethernet1/23
interface Ethernet1/24
interface Ethernet1/25
  description VXIaaS-6100-2-a
  switchport mode trunk
  switchport trunk allowed vlan 711,721,731,741,751,761,844,864,867-868,980
  channel-group 150 mode active
interface Ethernet1/26
```

```
description VXIaaS-6100-2-a
  switchport mode trunk
  switchport trunk allowed vlan 711,721,731,741,751,761,844,864,867-868,980
  channel-group 150 mode active
interface Ethernet1/27
  description VXIaaS-6100-2-b
  switchport mode trunk
  switchport trunk allowed vlan 711,721,731,741,751,761,844,864,867-868,980
  channel-group 151 mode active
interface Ethernet1/28
  description VXIaaS-6100-2-b
  switchport mode trunk
  switchport trunk allowed vlan 711,721,731,741,751,761,844,864,867-868,980
 channel-group 151 mode active
interface Ethernet1/29
interface Ethernet1/30
interface Ethernet1/31
  description VXIaaS-6100-1-a
  switchport mode trunk
  switchport trunk allowed vlan 711,721,731,741,751,761,844,864,867-868,941,980
  channel-group 100 mode active
interface Ethernet1/32
  description VXIaaS-6100-1-b
  switchport mode trunk
  switchport trunk allowed vlan 711,721,731,741,751,761,844,864,867-868,941,980
  channel-group 200 mode active
interface Ethernet2/1
interface Ethernet2/2
interface Ethernet2/3
interface Ethernet2/4
interface Ethernet2/5
interface Ethernet2/6
interface Ethernet2/7
interface Ethernet2/8
interface Ethernet2/9
interface Ethernet2/10
interface Ethernet2/11
interface Ethernet2/12
interface Ethernet2/13
interface Ethernet2/14
interface Ethernet2/15
  switchport mode fex-fabric
  fex associate 110
  channel-group 110
interface Ethernet2/16
  switchport mode fex-fabric
  fex associate 110
  channel-group 110
interface mgmt0
  ip address 10.8.66.9/24
interface Ethernet110/1/1
  description vxiaas-n1010-a
  switchport mode trunk
  switchport trunk native vlan 867
  switchport trunk allowed vlan 711,867
  channel-group 60 mode active
interface Ethernet110/1/2
  description vxiaas-n1010-a
  switchport mode trunk
  switchport trunk native vlan 867
  switchport trunk allowed vlan 711,867
  channel-group 60 mode active
interface Ethernet110/1/3
  description vxiaas-n1010-a
```

switchport mode trunk switchport trunk native vlan 867 switchport trunk allowed vlan 711,867 channel-group 60 mode active interface Ethernet110/1/4 description vxiaas-n1010-a switchport mode trunk switchport trunk native vlan 867 switchport trunk allowed vlan 711,867 channel-group 60 mode active interface Ethernet110/1/5 description vxiaas-n1010-b switchport mode trunk switchport trunk native vlan 867 switchport trunk allowed vlan 711,867 channel-group 65 mode active interface Ethernet110/1/6 description vxiaas-n1010-b switchport mode trunk switchport trunk native vlan 867 switchport trunk allowed vlan 711,867 channel-group 65 mode active interface Ethernet110/1/7 description vxiaas-n1010-b switchport mode trunk switchport trunk native vlan 867 switchport trunk allowed vlan 711,867 channel-group 65 mode active interface Ethernet110/1/8 description vxiaas-n1010-b switchport mode trunk switchport trunk native vlan 867 switchport trunk allowed vlan 711,867 channel-group 65 mode active interface Ethernet110/1/9 interface Ethernet110/1/10 interface Ethernet110/1/11 interface Ethernet110/1/12 interface Ethernet110/1/13 interface Ethernet110/1/14 interface Ethernet110/1/15 interface Ethernet110/1/16 interface Ethernet110/1/17 interface Ethernet110/1/18 interface Ethernet110/1/19 interface Ethernet110/1/20 interface Ethernet110/1/21 interface Ethernet110/1/22 interface Ethernet110/1/23 interface Ethernet110/1/24 interface Ethernet110/1/25 interface Ethernet110/1/26 interface Ethernet110/1/27 interface Ethernet110/1/28 interface Ethernet110/1/29 interface Ethernet110/1/30 interface Ethernet110/1/31 interface Ethernet110/1/32 interface Ethernet110/1/33 interface Ethernet110/1/34 interface Ethernet110/1/35 interface Ethernet110/1/36 interface Ethernet110/1/37 interface Ethernet110/1/38

```
interface Ethernet110/1/39
interface Ethernet110/1/40
interface Ethernet110/1/41
interface Ethernet110/1/42
interface Ethernet110/1/43
interface Ethernet110/1/44
interface Ethernet110/1/45
interface Ethernet110/1/46
interface Ethernet110/1/47
interface Ethernet110/1/48
clock timezone EST -5 0
clock summer-time EDT 2 Sun Mar 2:00 1 Sun Nov 2:00 60
line console
  exec-timeout 0
line vty
boot kickstart bootflash:/n5000-uk9-kickstart.5.2.1.N1.2a.bin
boot system bootflash:/n5000-uk9.5.2.1.N1.2a.bin
Cisco Nexus 7009 configurations:
!Time: Sat Jun 1 12:22:38 2013
version 6.1(2)
hostname VXIaaS-DC-N7K-1
vdc VXIaaS-DC-N7K-1 id 1
  limit-resource module-type f2
  allocate interface Ethernet4/1-48
  allocate interface Ethernet5/1-48
  limit-resource vlan minimum 16 maximum 4094
  limit-resource monitor-session minimum 0 maximum 2
  limit-resource monitor-session-erspan-dst minimum 0 maximum 23
 limit-resource vrf minimum 2 maximum 4096
 limit-resource port-channel minimum 0 maximum 768
  limit-resource u4route-mem minimum 96 maximum 96
 limit-resource u6route-mem minimum 24 maximum 24
  limit-resource m4route-mem minimum 58 maximum 58
  limit-resource m6route-mem minimum 8 maximum 8
  limit-resource monitor-session-inband-src minimum 0 maximum 1
feature telnet
cfs eth distribute
feature ospf
feature bgp
feature eigrp
feature interface-vlan
feature dot1x
feature hsrp
feature lacp
feature dhcp
feature vpc
feature wccp
logging level pixm 2
username admin password 5 $1$QAUkrln2$EgIAciPkN0CLqHbf7SmQf/ role network-admin
no password strength-check
ip domain-lookup
ip domain-name vxiaas.local
ip domain-list cisco.com
ip domain-list vxiaas.local
ip name-server 10.8.64.100
class-map type qos match-any VOICE
 match dscp 46
class-map type qos match-all BULK-DATA
 match dscp 10,12,14
class-map type qos match-any SCAVENGER
  match dscp 8
class-map type qos match-any CALL-SIGNALING
```

```
match dscp 24
class-map type qos match-any NETWORK-CONTROL
 match dscp 48
class-map type qos match-any TRANSACTIONAL-DATA
 match dscp 18,20,22
class-map type qos match-any MULTIMEDIA-STREAMING
 match dscp 26,28,30
class-map type qos match-any MULTIMEDIA-CONFERENCING
 match dscp 34,36,38
class-map type queuing match-any BROADCAST-VIDEO
policy-map type queuing VPN-EDGE
copp profile strict
snmp-server user admin network-admin auth md5 0xde4b54725e78b89933e0602c1a882917 priv
0xde4b54725e78b89933e0602c1a882917 localizedkey
rmon event 1 log trap public description FATAL(1) owner PMON@FATAL
rmon event 2 log trap public description CRITICAL(2) owner PMON@CRITICAL
rmon event 3 log trap public description ERROR(3) owner PMON@ERROR
rmon event 4 log trap public description WARNING(4) owner PMON@WARNING
rmon event 5 log trap public description INFORMATION(5) owner PMON@INFO
ntp server 10.8.79.254
vlan 1,711,721,731,741,751,761,844,864-868,941,980
vrf context GT-Out
vrf context T1-In
vrf context T1-Out
vrf context T2-In
vrf context T2-Out
vrf context T3-In
vrf context T3-Out
vrf context T4-In
vrf context T4-Out
 ip wccp 61
 ip wccp 62
vrf context T5-In
vrf context T5-Out
vrf context management
 ip route 0.0.0.0/0 10.8.66.1
vlan 711
 name Tenant-1-VM-A
vlan 721
 name Tenant-2-VM-A
vlan 731
 name Tenant-3-VM-A
vlan 741
 name Tenant-4-VM-A
vlan 751
  name Tenant-5-VM-A
vlan 761
  name Tenant-6-VM-A
vlan 844
  name HVXI-NFS
vlan 864
 name VXIaaS-SP-Infra
vlan 865
 name VXIaaS-SP-DH
vlan 866
 name VXIaaS-OOB-MGMT
vlan 867
 name VXIaaS-SP-Hypervisor-MGMT
vlan 868
 name VXIaaS-SP-vMotion
vlan 941
 name Tenant-4-vWAAS
vlan 980
  name Desktone-L2-Link-Local
```

```
spanning-tree vlan 711,721,731,741,751,761,864-868,980 priority 4096
ip prefix-list BGP-DIRECT seq 5 permit 10.8.0.0/16 le 30
ip prefix-list COMMON-SUM seg 5 permit 10.10.0.0/17
ip prefix-list EIGRP-BGP seq 5 permit 10.10.0.0/17
route-map BGP-DIRECT permit 10
 match ip address prefix-list BGP-DIRECT
route-map COMMON-SUM permit 10
 match ip address prefix-list COMMON-SUM
route-map EIGRP-BGP permit 10
 match ip address prefix-list EIGRP-BGP
service dhcp
ip dhcp relay
vpc domain 42
 peer-switch
 role priority 100
 peer-keepalive destination 10.8.66.22 source 10.8.66.21
 peer-gateway
  auto-recovery
  ip arp synchronize
interface Vlan1
interface Vlan711
  vrf member T1-In
 no ip redirects
  ip address 10.9.104.2/21
  ip ospf passive-interface
  ip router ospf VXIaaS area 0.0.0.20
 hsrp version 2
 hsrp 711
   priority 110
   ip 10.9.104.1
  ip dhcp relay address 10.9.10.150
  ip dhcp relay address 10.9.10.151
  description Tenant 1 VMs
 no shutdown
 mtu 9216
interface Vlan721
  vrf member T2-In
  no ip redirects
  ip address 10.9.112.2/21
  ip ospf passive-interface
  ip router ospf VXIaaS area 0.0.0.20
 hsrp version 2
 hsrp 721
   preempt
   priority 110
   ip 10.9.112.1
  ip dhcp relay address 10.9.20.150
  ip dhcp relay address 10.9.20.151
  description Tenant 2 VMs
 no shutdown
 mtu 9216
interface Vlan731
  vrf member T3-In
 no ip redirects
  ip address 10.9.120.2/21
  ip ospf passive-interface
  ip router ospf VXIaaS area 0.0.0.20
 hsrp version 2
 hsrp 731
   preempt
   priority 110
    ip 10.9.120.1
  ip dhcp relay address 10.9.30.150
```

```
ip dhcp relay address 10.9.30.151
  description Tenant 3 VMs
 no shutdown
 mtu 9216
interface Vlan741
 vrf member T4-In
 no ip redirects
 ip address 10.9.128.2/21
  ip ospf passive-interface
  ip router ospf VXIaaS area 0.0.0.20
 hsrp version 2
 hsrp 741
   preempt
   priority 110
   ip 10.9.128.1
  ip dhcp relay address 10.9.40.150
  ip dhcp relay address 10.9.40.151
  description Tenant 4 VMs
  no shutdown
 mtu 9216
interface Vlan751
 vrf member T5-In
 no ip redirects
  ip address 10.9.136.2/21
  ip ospf passive-interface
  ip router ospf VXIaaS area 0.0.0.20
 hsrp version 2
 hsrp 751
   preempt
   priority 110
   ip 10.9.136.1
  ip dhcp relay address 10.9.50.150
  ip dhcp relay address 10.9.50.151
  description Tenant 5 VMs
 no shutdown
 mtu 9216
interface Vlan864
 no ip redirects
  ip address 10.8.64.2/24
  ip router eigrp 42
  ip passive-interface eigrp 42
 hsrp version 2
 hsrp 864
   priority 110
    ip 10.8.64.1
  description VXIaaS-SP-Infra
 no shutdown
 mtu 9216
interface Vlan865
 no ip redirects
  ip address 10.8.65.2/24
  ip router eigrp 42
  ip passive-interface eigrp 42
 hsrp version 2
 hsrp 865
   priority 110
    ip 10.8.65.1
  description VXIaaS-SP-DH
 no shutdown
 mtu 9216
interface Vlan866
 no ip redirects
  ip address 10.8.66.2/24
```



```
ip passive-interface eigrp 42
  hsrp version 2
 hsrp 866
   priority 110
   ip 10.8.66.1
  description VXIaaS-OOB-MGMT
 no shutdown
 mtu 9216
interface Vlan867
  no ip redirects
  ip address 10.8.67.2/24
  ip router eigrp 42
  ip passive-interface eigrp 42
 hsrp version 2
 hsrp 867
   priority 110
   ip 10.8.67.1
  description VXIaaS-SP-Hypervisor-MGMT
  no shutdown
  mtu 9216
interface Vlan868
 no ip redirects
  ip address 10.8.68.2/24
  ip router eigrp 42
  ip passive-interface eigrp 42
 hsrp version 2
 hsrp 868
   priority 110
    ip 10.8.68.1
  description VXIaaS-SP-vMotion
 no shutdown
 mtu 9216
interface Vlan941
 vrf member T4-Out
 no ip redirects
  ip address 10.9.192.26/29
  ip ospf passive-interface
  ip router ospf VXIaaS area 0.0.0.10
 hsrp version 2
 hsrp 941
   preempt
   priority 110
   ip 10.9.192.25
  ip dhcp relay address 10.9.40.150
  ip dhcp relay address 10.9.40.151
  description Tenant 4 vWAAS
  no shutdown
  mtu 9216
interface port-channel1
  description vPC Peer Link Between N7Ks
  switchport
  switchport mode trunk
  switchport trunk allowed vlan 711,714-715,721,724-725,731,734-735
  switchport trunk allowed vlan add 741,744-745,751,754-755,761,844
  switchport trunk allowed vlan add 864-868,941,980
  spanning-tree port type network
  mtu 9216
  vpc peer-link
interface port-channel2
  description NON-vPC Peer Link Between N7Ks
 mtu 9216
interface port-channel2.718
  description Tenant 1 N7K-N7K Outside
 mtu 9216
```

```
encapsulation dot1q 718
  vrf member T1-Out
 no ip redirects
 ip address 10.8.78.25/30
  ip ospf network point-to-point
  ip router ospf VXIaaS area 0.0.0.10
  no shutdown
interface port-channel2.719
  description Tenant 1 N7K-N7K Inside
 mtu 9216
  encapsulation dot1q 719
 vrf member T1-In
 no ip redirects
  ip address 10.8.78.29/30
  ip ospf network point-to-point
 ip router ospf VXIaaS area 0.0.0.20
 no shutdown
interface port-channel2.728
  description Tenant 2 N7K-N7K Outside
 mtu 9216
  encapsulation dot1q 728
 vrf member T2-Out
 no ip redirects
  ip address 10.8.78.57/30
  ip ospf network point-to-point
  ip router ospf VXIaaS area 0.0.0.10
 no shutdown
interface port-channel2.729
  description Tenant 1 N7K-N7K Inside
 mtu 9216
 encapsulation dot1q 729
 vrf member T2-In
 no ip redirects
 ip address 10.8.78.61/30
  ip ospf network point-to-point
  ip router ospf VXIaaS area 0.0.0.20
 no shutdown
interface port-channel2.738
  description Tenant 3 N7K-N7K Outside
 mtu 9216
 encapsulation dot1q 738
 vrf member T3-Out
 no ip redirects
 ip address 10.8.78.89/30
  ip ospf network point-to-point
  ip router ospf VXIaaS area 0.0.0.10
  no shutdown
interface port-channel2.739
  description Tenant 1 N7K-N7K Inside
 mtu 9216
 encapsulation dot1q 739
 vrf member T3-In
 no ip redirects
 ip address 10.8.78.93/30
 ip ospf network point-to-point
  ip router ospf VXIaaS area 0.0.0.20
  no shutdown
interface port-channel2.748
  description Tenant 4 N7K-N7K Outside
 mtu 9216
  encapsulation dot1g 748
 vrf member T4-Out
 no ip redirects
  ip address 10.8.78.121/30
```
```
ip ospf network point-to-point
  ip router ospf VXIaaS area 0.0.0.10
 no shutdown
interface port-channel2.749
  description Tenant 1 N7K-N7K Inside
 mtu 9216
  encapsulation dot1q 749
  vrf member T4-In
 no ip redirects
  ip address 10.8.78.125/30
  ip ospf network point-to-point
  ip router ospf VXIaaS area 0.0.0.20
 no shutdown
interface port-channel2.758
  description Tenant 5 N7K-N7K Outside
 mtu 9216
  encapsulation dot1q 758
  vrf member T5-Out
 no ip redirects
  ip address 10.8.78.153/30
  ip ospf network point-to-point
  ip router ospf VXIaaS area 0.0.0.10
 no shutdown
interface port-channel2.759
  description Tenant 1 N7K-N7K Inside
 mtu 9216
  encapsulation dot1q 759
  vrf member T5-In
  no ip redirects
  ip address 10.8.78.157/30
  ip ospf network point-to-point
  ip router ospf VXIaaS area 0.0.0.20
 no shutdown
interface port-channel2.788
  description Global Tenant N7K-N7K Outside
 mtu 9216
  encapsulation dot1g 788
  vrf member GT-Out
  no ip redirects
  ip address 10.8.78.249/30
  ip ospf network point-to-point
  ip router ospf VXIaaS area 0.0.0.10
  no shutdown
interface port-channel3
  description VXIaaS-OOB-MGMT-SW
  switchport
  switchport mode trunk
  switchport trunk allowed vlan 866
  vpc 3
interface port-channel4
  description VXIaaS-00B-Tenant-MGMT-SW
  switchport
  switchport mode trunk
  switchport trunk allowed vlan 866
  vpc 4
interface port-channel5
  description Common N5K Pair
  switchport
  switchport mode trunk
  switchport trunk allowed vlan 844,864-865
  spanning-tree port type edge trunk
```

mtu 9216

```
vpc 5
interface port-channel6
  description VXIaaS-OOB-SP-MGMT-SW
  switchport
  switchport mode trunk
  switchport trunk allowed vlan 866
  vpc 6
interface port-channel55
  description VXIaaS-SP-5K-Pair
  switchport
  switchport mode trunk
  switchport trunk allowed vlan 711,721,731,741,751,761,844,864-865
 switchport trunk allowed vlan add 867-868,941,980
  spanning-tree port type normal
 mtu 9216
 vpc 55
interface port-channel103
  description L3 Link To Service 6500 VSS
  no lacp graceful-convergence
interface port-channel103.611
  description T1 Outside Service 6500
  encapsulation dot1q 611
 vrf member T1-Out
 no ip redirects
  ip address 10.8.76.1/30
  ip ospf network point-to-point
  ip router ospf VXIaaS area 0.0.0.10
  no shutdown
interface port-channel103.613
  description T1 Inside Service 6500
  encapsulation dot1q 613
 vrf member T1-In
 no ip redirects
 ip address 10.8.76.9/30
  ip ospf network point-to-point
  ip router ospf VXIaaS area 0.0.0.20
 no shutdown
interface port-channel103.621
  description T2 Outside Service 6500
  encapsulation dot1q 621
 vrf member T2-Out
 no ip redirects
  ip address 10.8.76.65/30
  ip ospf network point-to-point
  ip router ospf VXIaaS area 0.0.0.10
 no shutdown
interface port-channel103.623
  description T2 Inside Service 6500
  encapsulation dotlg 623
 vrf member T2-In
 no ip redirects
  ip address 10.8.76.73/30
  ip ospf network point-to-point
  ip router ospf VXIaaS area 0.0.0.20
 no shutdown
interface port-channel103.631
  description T3 Outside Service 6500
  encapsulation dot1q 631
 vrf member T3-Out
 no ip redirects
 ip address 10.8.76.129/30
  ip ospf network point-to-point
  ip router ospf VXIaaS area 0.0.0.10
  no shutdown
```

```
interface port-channel103.633
  description T3 Inside Service 6500
  encapsulation dot1q 633
  vrf member T3-In
 no ip redirects
  ip address 10.8.76.137/30
  ip ospf network point-to-point
  ip router ospf VXIaaS area 0.0.0.20
  no shutdown
interface port-channel103.641
  description T4 Outside Service 6500
  encapsulation dot1q 641
 vrf member T4-Out
 no ip redirects
  ip address 10.8.76.193/30
  ip ospf network point-to-point
  ip router ospf VXIaaS area 0.0.0.10
  no shutdown
  ip wccp 61 redirect in
interface port-channel103.643
  description T4 Inside Service 6500
  encapsulation dot1q 643
 vrf member T4-In
 no ip redirects
  ip address 10.8.76.201/30
  ip ospf network point-to-point
  ip router ospf VXIaaS area 0.0.0.20
  no shutdown
interface port-channel103.651
  description T5 Outside Service 6500
  encapsulation dot1q 651
 vrf member T5-Out
 no ip redirects
  ip address 10.8.77.1/30
  ip ospf network point-to-point
  ip router ospf VXIaaS area 0.0.0.10
  no shutdown
interface port-channel103.653
  description T5 Inside Service 6500
  encapsulation dot1q 653
  vrf member T5-In
 no ip redirects
  ip address 10.8.77.9/30
  ip ospf network point-to-point
  ip router ospf VXIaaS area 0.0.0.20
  no shutdown
interface port-channel103.681
  description Global Tenant Outside Service 6500
  encapsulation dotlg 681
 vrf member GT-Out
 no ip redirects
  ip address 10.8.77.193/30
  ip ospf network point-to-point
  ip router ospf VXIaaS area 0.0.0.10
  no shutdown
interface Ethernet4/1
  description vPC Peer Link Between N7Ks
  switchport
  switchport mode trunk
  switchport trunk allowed vlan 711,714-715,721,724-725,731,734-735
  switchport trunk allowed vlan add 741,744-745,751,754-755,761,844
  switchport trunk allowed vlan add 864-868,941,980
  mtu 9216
  channel-group 1 mode active
```

```
no shutdown
interface Ethernet4/2
  description vPC Peer Link Between N7Ks
  switchport
  switchport mode trunk
  switchport trunk allowed vlan 711,714-715,721,724-725,731,734-735
  switchport trunk allowed vlan add 741,744-745,751,754-755,761,844
  switchport trunk allowed vlan add 864-868,941,980
 mtu 9216
 channel-group 1 mode active
 no shutdown
interface Ethernet4/3
interface Ethernet4/4
interface Ethernet4/5
  description NON-vPC Peer Link Between N7Ks
 mtu 9216
 channel-group 2 mode active
 no shutdown
interface Ethernet4/6
  description NON-vPC Peer Link Between N7Ks
 mtu 9216
 channel-group 2 mode active
 no shutdown
interface Ethernet4/7
interface Ethernet4/8
interface Ethernet4/9
interface Ethernet4/10
interface Ethernet4/11
interface Ethernet4/12
interface Ethernet4/13
interface Ethernet4/14
interface Ethernet4/15
interface Ethernet4/16
interface Ethernet4/17
 description Common N5K Pair
  switchport
 switchport mode trunk
  switchport trunk allowed vlan 844,864-865
  spanning-tree port type edge trunk
 mtu 9216
 channel-group 5 mode active
 no shutdown
interface Ethernet4/18
interface Ethernet4/19
interface Ethernet4/20
interface Ethernet4/21
interface Ethernet4/22
interface Ethernet4/23
interface Ethernet4/24
interface Ethernet4/25
interface Ethernet4/26
interface Ethernet4/27
interface Ethernet4/28
interface Ethernet4/29
interface Ethernet4/30
interface Ethernet4/31
interface Ethernet4/32
interface Ethernet4/33
interface Ethernet4/34
interface Ethernet4/35
interface Ethernet4/36
interface Ethernet4/37
interface Ethernet4/38
interface Ethernet4/39
```

1

```
interface Ethernet4/40
interface Ethernet4/41
interface Ethernet4/42
interface Ethernet4/43
interface Ethernet4/44
interface Ethernet4/45
interface Ethernet4/46
interface Ethernet4/47
interface Ethernet4/48
interface Ethernet5/1
  description vPC Peer Link Between N7Ks
  switchport
 switchport mode trunk
  switchport trunk allowed vlan 711,714-715,721,724-725,731,734-735
  switchport trunk allowed vlan add 741,744-745,751,754-755,761,844
  switchport trunk allowed vlan add 864-868,941,980
 mtu 9216
  channel-group 1 mode active
  no shutdown
interface Ethernet5/2
  description vPC Peer Link Between N7Ks
  switchport
  switchport mode trunk
  switchport trunk allowed vlan 711,714-715,721,724-725,731,734-735
  switchport trunk allowed vlan add 741,744-745,751,754-755,761,844
  switchport trunk allowed vlan add 864-868,941,980
 mtu 9216
  channel-group 1 mode active
  no shutdown
interface Ethernet5/3
  switchport
interface Ethernet5/4
  switchport
interface Ethernet5/5
  description NON-vPC Peer Link Between N7Ks
 mtu 9216
  channel-group 2 mode active
  no shutdown
interface Ethernet5/6
  description NON-vPC Peer Link Between N7Ks
 mtu 9216
 channel-group 2 mode active
 no shutdown
interface Ethernet5/7
interface Ethernet5/8
interface Ethernet5/9
interface Ethernet5/10
interface Ethernet5/11
interface Ethernet5/12
interface Ethernet5/13
interface Ethernet5/14
interface Ethernet5/15
interface Ethernet5/16
interface Ethernet5/17
 description Common N5K Pair
  switchport
  switchport mode trunk
  switchport trunk allowed vlan 844,864-865
  spanning-tree port type edge trunk
 mtu 9216
 channel-group 5 mode active
 no shutdown
interface Ethernet5/18
interface Ethernet5/19
```

```
interface Ethernet5/20
interface Ethernet5/21
interface Ethernet5/22
interface Ethernet5/23
interface Ethernet5/24
interface Ethernet5/25
 description VXIaaS-OOB-MGMT-SW
  switchport
  switchport mode trunk
  switchport trunk allowed vlan 866
 channel-group 3 mode active
 no shutdown
interface Ethernet5/26
  description VXIaaS-00B-Tenant-MGMT-SW
  switchport
  switchport mode trunk
  switchport trunk allowed vlan 866
  channel-group 4 mode active
  no shutdown
interface Ethernet5/27
  description VXIaaS-GW (10.81 net)
  ip address 10.8.79.242/30
  ip router eigrp 42
  ip summary-address eigrp 42 10.8.0.0/16
 no shutdown
interface Ethernet5/28
  description VXIaaS-OOB-SP-MGMT-SW
  switchport
  switchport mode trunk
  switchport trunk allowed vlan 866
 channel-group 6 mode active
 no shutdown
interface Ethernet5/29
interface Ethernet5/30
interface Ethernet5/31
interface Ethernet5/32
interface Ethernet5/33
 description Common N5K-1 L3
 mtu 9216
 no ip redirects
 ip address 10.10.0.26/30
 ip router eigrp 42
  ip passive-interface eigrp 42
  no shutdown
interface Ethernet5/34
  description Common N5K-2 L3
 mtu 9216
 no ip redirects
  ip address 10.10.0.34/30
  ip router eigrp 42
 ip passive-interface eigrp 42
 no shutdown
interface Ethernet5/35
interface Ethernet5/36
interface Ethernet5/37
  description VXIaaS-DC-ASR9K-1
 no shutdown
interface Ethernet5/37.712
  description T1 Link to ASR9K-1
  encapsulation dot1g 712
 vrf member T1-Out
 no ip redirects
  ip address 10.8.78.1/30
```

```
ip ospf network point-to-point
  ip router ospf VXIaaS area 0.0.0.0
 no shutdown
interface Ethernet5/37.722
  description T2 Link to ASR9K-1
  encapsulation dot1q 722
  vrf member T2-Out
 no ip redirects
  ip address 10.8.78.33/30
  ip ospf network point-to-point
  ip router ospf VXIaaS area 0.0.0.0
 no shutdown
interface Ethernet5/37.732
  description T3 Link to ASR9K-1
  encapsulation dot1q 732
  vrf member T3-Out
 no ip redirects
  ip address 10.8.78.65/30
  ip ospf network point-to-point
  ip router ospf VXIaaS area 0.0.0.0
 no shutdown
interface Ethernet5/37.742
  description T4 Link to ASR9K-1
  encapsulation dot1q 742
  vrf member T4-Out
 no ip redirects
  ip address 10.8.78.97/30
  ip ospf network point-to-point
  ip router ospf VXIaaS area 0.0.0.0
  ip wccp 62 redirect in
 no shutdown
interface Ethernet5/37.752
  description T5 Link to ASR9K-1
  encapsulation dot1q 752
  vrf member T5-Out
  no ip redirects
  ip address 10.8.78.129/30
  ip ospf network point-to-point
  ip router ospf VXIaaS area 0.0.0.0
 no shutdown
interface Ethernet5/37.782
  description Global Tenant Link to ASR9K-1
  encapsulation dot1q 782
  vrf member GT-Out
 no ip redirects
  ip address 10.8.78.225/30
  ip ospf network point-to-point
  ip router ospf VXIaaS area 0.0.0.0
 no shutdown
interface Ethernet5/38
  description VXIaaS-DC-ASR9K-2
  no shutdown
interface Ethernet5/38.713
  description T1 Link to ASR9K-2
  encapsulation dot1q 713
  vrf member T1-Out
  no ip redirects
  ip address 10.8.78.5/30
  ip ospf network point-to-point
  ip router ospf VXIaaS area 0.0.0.0
 no shutdown
interface Ethernet5/38.723
  description T2 Link to ASR9K-2
  encapsulation dot1q 723
```

vrf member T2-Out no ip redirects ip address 10.8.78.37/30 ip ospf network point-to-point ip router ospf VXIaaS area 0.0.0.0 no shutdown interface Ethernet5/38.733 description T3 Link to ASR9K-2 encapsulation dot1q 733 vrf member T3-Out no ip redirects ip address 10.8.78.69/30 ip ospf network point-to-point ip router ospf VXIaaS area 0.0.0.0 no shutdown interface Ethernet5/38.743 description T4 Link to ASR9K-2 encapsulation dot1q 743 vrf member T4-Out no ip redirects ip address 10.8.78.101/30 ip ospf network point-to-point ip router ospf VXIaaS area 0.0.0.0 ip wccp 62 redirect in no shutdown interface Ethernet5/38.753 description T5 Link to ASR9K-2 encapsulation dot1g 753 vrf member T5-Out no ip redirects ip address 10.8.78.133/30 ip ospf network point-to-point ip router ospf VXIaaS area 0.0.0.0 no shutdown interface Ethernet5/38.783 description Global Tenant Link to ASR9K-2 encapsulation dot1g 783 vrf member GT-Out no ip redirects ip address 10.8.78.229/30 ip ospf network point-to-point ip router ospf VXIaaS area 0.0.0.0 no shutdown interface Ethernet5/39 interface Ethernet5/40 interface Ethernet5/41 description L3 Link To Service 6500 VSS channel-group 103 mode active no shutdown interface Ethernet5/42 description L3 Link To Service 6500 VSS channel-group 103 mode active no shutdown interface Ethernet5/43 interface Ethernet5/44 interface Ethernet5/45 description VXIaaS-SP-5K switchport switchport mode trunk switchport trunk allowed vlan 711,721,731,741,751,761,844,864-865 switchport trunk allowed vlan add 867-868,941,980 mtu 9216

I

channel-group 55 mode active

```
no shutdown
interface Ethernet5/46
  description VXIaaS-SP-5K
  switchport
  switchport mode trunk
  switchport trunk allowed vlan 711,721,731,741,751,761,844,864-865
  switchport trunk allowed vlan add 867-868,941,980
 mtu 9216
  channel-group 55 mode active
  no shutdown
interface Ethernet5/47
interface Ethernet5/48
interface mgmt0
  vrf member management
  ip address 10.8.66.21/24
interface loopback0
  description MGMT Loopback
  ip address 10.8.79.250/32
  ip router eigrp 42
  ip passive-interface eigrp 42
interface loopback1
  description T1 Outside Loopback
  vrf member T1-Out
  ip address 192.168.10.5/32
  ip router ospf VXIaaS area 0.0.0.0
interface loopback2
  description T2 Outside Loopback
  vrf member T2-Out
  ip address 192.168.20.5/32
  ip router ospf VXIaaS area 0.0.0.0
interface loopback3
  description T3 Outside Loopback
  vrf member T3-Out
  ip address 192.168.30.5/32
  ip router ospf VXIaaS area 0.0.0.0
interface loopback4
  description T4 Outside Loopback
  vrf member T4-Out
  ip address 192.168.40.5/32
  ip router ospf VXIaaS area 0.0.0.0
interface loopback5
  description T5 Outside Loopback
  vrf member T5-Out
  ip address 192.168.50.5/32
  ip router ospf VXIaaS area 0.0.0.0
interface loopback8
  description Global Tenant Outside Loopback
  vrf member GT-Out
  ip address 192.168.80.5/32
  ip router ospf VXIaaS area 0.0.0.0
interface loopback10
  description T1 Inside Loopback
  vrf member T1-In
  ip address 192.168.10.9/32
  ip router ospf VXIaaS area 0.0.0.20
interface loopback20
  description T2 Inside Loopback
  vrf member T2-In
  ip address 192.168.20.9/32
  ip router ospf VXIaaS area 0.0.0.20
interface loopback30
  description T3 Inside Loopback
  vrf member T3-In
```

```
ip address 192.168.30.9/32
  ip router ospf VXIaaS area 0.0.0.20
interface loopback40
 description T4 Inside Loopback
  vrf member T4-In
  ip address 192.168.40.9/32
  ip router ospf VXIaaS area 0.0.0.20
interface loopback50
  description T5 Inside Loopback
  vrf member T5-In
  ip address 192.168.50.9/32
  ip router ospf VXIaaS area 0.0.0.20
clock timezone EST -5 0
clock summer-time EDT 2 Sun Mar 02:00 1 Sun Nov 02:00 60
line console
 exec-timeout 0
line vty
 exec-timeout 420
boot kickstart bootflash:/n7000-s1-kickstart.6.1.2.bin sup-1
boot system bootflash:/n7000-s1-dk9.6.1.2.bin sup-1
boot kickstart bootflash:/n7000-s1-kickstart.6.1.2.bin sup-2
boot system bootflash:/n7000-s1-dk9.6.1.2.bin sup-2
router eigrp 42
  default-metric 10000 100 255 1 1500
  redistribute bgp 42 route-map EIGRP-BGP
router ospf VXIaaS
 vrf GT-Out
   router-id 8.8.8.15
    area 0.0.0.10 nssa default-information-originate
   log-adjacency-changes detail
   auto-cost reference-bandwidth 100 Gbps
  vrf T1-In
   router-id 1.1.1.15
   area 0.0.0.20 nssa
   log-adjacency-changes detail
   auto-cost reference-bandwidth 100 Gbps
  vrf T1-Out
   router-id 1.1.1.10
    area 0.0.0.10 nssa default-information-originate
   log-adjacency-changes detail
   auto-cost reference-bandwidth 100 Gbps
  vrf T2-In
   router-id 2.2.2.15
   area 0.0.0.20 nssa
   log-adjacency-changes detail
   auto-cost reference-bandwidth 100 Gbps
  vrf T2-Out
   router-id 2.2.2.10
   area 0.0.0.10 nssa default-information-originate
   log-adjacency-changes detail
   auto-cost reference-bandwidth 100 Gbps
  vrf T3-In
   router-id 3.3.3.15
   area 0.0.0.20 nssa
   log-adjacency-changes detail
   auto-cost reference-bandwidth 100 Gbps
  vrf T3-Out
   router-id 3.3.3.10
    area 0.0.0.10 nssa default-information-originate
   log-adjacency-changes detail
   auto-cost reference-bandwidth 100 Gbps
  vrf T4-In
   router-id 4.4.4.15
    area 0.0.0.20 nssa
```

```
log-adjacency-changes detail
   auto-cost reference-bandwidth 100 Gbps
  vrf T4-Out
   router-id 4.4.4.10
    area 0.0.0.10 nssa default-information-originate
   log-adjacency-changes detail
    auto-cost reference-bandwidth 100 Gbps
  vrf T5-In
    router-id 5.5.5.15
    area 0.0.0.20 nssa
   log-adjacency-changes detail
   auto-cost reference-bandwidth 100 Gbps
  vrf T5-Out
   router-id 5.5.5.10
    area 0.0.0.10 nssa default-information-originate
   log-adjacency-changes detail
    auto-cost reference-bandwidth 100 Gbps
router bgp 42
  address-family ipv4 unicast
    redistribute direct route-map BGP-DIRECT
    aggregate-address 10.8.0.0/16 summary-only
   maximum-paths 4
  neighbor 10.10.0.25 remote-as 1000
    address-family ipv4 unicast
      route-map COMMON-SUM in
  neighbor 10.10.0.33 remote-as 1000
    address-family ipv4 unicast
      route-map COMMON-SUM in
Time: Sat Jun 1 12:21:48 2013
version 6.1(2)
hostname VXIaaS-DC-N7K-2
vdc VXIaaS-DC-N7K-2 id 1
 limit-resource module-type f2
  allocate interface Ethernet4/1-48
  allocate interface Ethernet5/1-48
  limit-resource vlan minimum 16 maximum 4094
  limit-resource monitor-session minimum 0 maximum 2
  limit-resource monitor-session-erspan-dst minimum 0 maximum 23
  limit-resource vrf minimum 2 maximum 4096
  limit-resource port-channel minimum 0 maximum 768
  limit-resource u4route-mem minimum 96 maximum 96
  limit-resource u6route-mem minimum 24 maximum 24
  limit-resource m4route-mem minimum 58 maximum 58
  limit-resource m6route-mem minimum 8 maximum 8
  limit-resource monitor-session-inband-src minimum 0 maximum 1
feature telnet
cfs eth distribute
feature ospf
feature bgp
feature eigrp
feature interface-vlan
feature dot1x
feature hsrp
feature lacp
feature dhcp
feature vpc
feature wccp
logging level pixm 2
username admin password 5 $1$EBvmx1ZW$V1JNH1Nyrvy6kVcEtaTbI1 role network-admin
no password strength-check
ip domain-lookup
ip domain-name vxiaas.local
```

```
ip domain-list cisco.com
ip domain-list vxiaas.local
ip name-server 10.8.64.100
class-map type qos match-any VOICE
 match dscp 46
class-map type qos match-all BULK-DATA
 match dscp 10,12,14
class-map type qos match-any SCAVENGER
 match dscp 8
class-map type qos match-any CALL-SIGNALING
  match dscp 24
class-map type qos match-any NETWORK-CONTROL
 match dscp 48
class-map type qos match-any TRANSACTIONAL-DATA
 match dscp 18,20,22
class-map type qos match-any MULTIMEDIA-STREAMING
 match dscp 26,28,30
class-map type qos match-any MULTIMEDIA-CONFERENCING
 match dscp 34,36,38
class-map type queuing match-any BROADCAST-VIDEO
policy-map type queuing VPN-EDGE
copp profile strict
snmp-server user admin network-admin auth md5 0x7b83230d09d201df578c1f817cb425da priv
0x7b83230d09d201df578c1f817cb425da localizedkey
rmon event 1 log trap public description FATAL(1) owner PMON@FATAL
rmon event 2 log trap public description CRITICAL(2) owner PMON@CRITICAL
rmon event 3 log trap public description ERROR(3) owner PMON@ERROR
rmon event 4 log trap public description WARNING(4) owner PMON@WARNING
rmon event 5 log trap public description INFORMATION(5) owner PMON@INFO
ntp server 10.8.79.254
vlan 1,711,721,731,741,751,761,844,864-868,941,980
vrf context GT-Out
vrf context T1-In
vrf context T1-Out
vrf context T2-In
vrf context T2-Out
vrf context T3-In
vrf context T3-Out
vrf context T4-In
vrf context T4-Out
  ip wccp 61
 ip wccp 62
vrf context T5-In
vrf context T5-Out
vrf context management
  ip route 0.0.0.0/0 10.8.66.1
vlan 711
  name Tenant-1-VM-A
vlan 721
 name Tenant-2-VM-A
vlan 731
 name Tenant-3-VM-A
vlan 741
 name Tenant-4-VM-A
vlan 751
 name Tenant-5-VM-A
vlan 761
 name Tenant-6-VM-A
vlan 844
 name HVXI-NetApp-NFS
vlan 864
 name VXIaaS-SP-Infra
vlan 865
  name VXIaaS-SP-DH
```

```
vlan 866
 name VXIaaS-00B-MGMT
vlan 867
 name VXIaaS-SP-Hypervisor-MGMT
vlan 868
  name VXIaaS-SP-vMotion
vlan 941
  name Tenant-4-vWAAS
vlan 980
  name Desktone-L2-Link-Local
spanning-tree vlan 711,721,731,741,751,761,864-868,980 priority 4096
ip prefix-list BGP-DIRECT seq 5 permit 10.8.0.0/16 le 30
ip prefix-list COMMON-SUM seq 5 permit 10.10.0.0/17
ip prefix-list EIGRP-BGP seq 5 permit 10.10.0.0/17
route-map BGP-DIRECT permit 10
 match ip address prefix-list BGP-DIRECT
route-map COMMON-SUM permit 10
 match ip address prefix-list COMMON-SUM
route-map EIGRP-BGP permit 10
 match ip address prefix-list EIGRP-BGP
service dhcp
ip dhcp relay
vpc domain 42
 peer-switch
  peer-keepalive destination 10.8.66.21 source 10.8.66.22
 peer-gateway
  auto-recovery
  ip arp synchronize
interface Vlan1
interface Vlan711
 vrf member T1-In
 no ip redirects
  ip address 10.9.104.3/21
  ip ospf passive-interface
  ip router ospf VXIaaS area 0.0.0.20
 hsrp version 2
 hsrp 711
   ip 10.9.104.1
  ip dhcp relay address 10.9.10.150
  ip dhcp relay address 10.9.10.151
  description Tenant 1 VMs
  no shutdown
 mtu 9216
interface Vlan721
  vrf member T2-In
  no ip redirects
  ip address 10.9.112.3/21
  ip ospf passive-interface
  ip router ospf VXIaaS area 0.0.0.20
 hsrp version 2
 hsrp 721
   ip 10.9.112.1
  ip dhcp relay address 10.9.20.150
  ip dhcp relay address 10.9.20.151
  description Tenant 2 VMs
  no shutdown
 mtu 9216
interface Vlan731
  vrf member T3-In
 no ip redirects
  ip address 10.9.120.3/21
  ip ospf passive-interface
```

```
ip router ospf VXIaaS area 0.0.0.20
  hsrp version 2
 hsrp 731
   ip 10.9.120.1
  ip dhcp relay address 10.9.30.150
  ip dhcp relay address 10.9.30.151
  description Tenant 3 VMs
  no shutdown
 mtu 9216
interface Vlan741
 vrf member T4-In
 no ip redirects
  ip address 10.9.128.3/21
  ip ospf passive-interface
  ip router ospf VXIaaS area 0.0.0.20
 hsrp version 2
 hsrp 741
   ip 10.9.128.1
  ip dhcp relay address 10.9.40.150
  ip dhcp relay address 10.9.40.151
  description Tenant 4 VMs
 no shutdown
 mtu 9216
interface Vlan751
 vrf member T5-In
 no ip redirects
 ip address 10.9.136.3/21
  ip ospf passive-interface
  ip router ospf VXIaaS area 0.0.0.20
 hsrp version 2
 hsrp 751
   ip 10.9.136.1
  ip dhcp relay address 10.9.50.150
  ip dhcp relay address 10.9.50.151
  description Tenant 5 VMs
 no shutdown
 mtu 9216
interface Vlan864
 no ip redirects
  ip address 10.8.64.3/24
  ip router eigrp 42
 ip passive-interface eigrp 42
 hsrp version 2
 hsrp 864
    ip 10.8.64.1
  description VXIaaS-SP-Infra
 no shutdown
 mtu 9216
interface Vlan865
 no ip redirects
  ip address 10.8.65.3/24
  ip router eigrp 42
  ip passive-interface eigrp 42
 hsrp version 2
 hsrp 865
   ip 10.8.65.1
  description VXIaaS-SP-DH
 no shutdown
 mtu 9216
interface Vlan866
 no ip redirects
  ip address 10.8.66.3/24
  ip router eigrp 42
```

```
ip passive-interface eigrp 42
  hsrp version 2
  hsrp 866
   ip 10.8.66.1
  description VXIaaS-00B-MGMT
 no shutdown
 mtu 9216
interface Vlan867
  no ip redirects
  ip address 10.8.67.3/24
  ip router eigrp 42
  ip passive-interface eigrp 42
 hsrp version 2
  hsrp 867
   ip 10.8.67.1
  description VXIaaS-SP-Hypervisor-MGMT
  no shutdown
 mtu 9216
interface Vlan868
  no ip redirects
  ip address 10.8.68.3/24
  ip router eigrp 42
  ip passive-interface eigrp 42
 hsrp version 2
 hsrp 868
   ip 10.8.68.1
  description VXIaaS-SP-vMotion
  no shutdown
  mtu 9216
interface Vlan941
  vrf member T4-Out
 no ip redirects
  ip address 10.9.192.27/29
  ip ospf passive-interface
  ip router ospf VXIaaS area 0.0.0.10
 hsrp version 2
 hsrp 941
   ip 10.9.192.25
  ip dhcp relay address 10.9.40.150
  ip dhcp relay address 10.9.40.151
  description Tenant 4 vWAAS
 no shutdown
 mtu 9216
interface port-channel1
  description vPC Peer Link Between N7Ks
  switchport
  switchport mode trunk
  switchport trunk allowed vlan 711,714-715,721,724-725,731,734-735
  switchport trunk allowed vlan add 741,744-745,751,754-755,761,844
  switchport trunk allowed vlan add 864-868,941,980
  spanning-tree port type network
 mtu 9216
  vpc peer-link
interface port-channel2
  description NON-vPC Peer Link Between N7Ks
 mtu 9216
interface port-channel2.718
  description Tenant 1 N7K-N7K Outside
 mtu 9216
 encapsulation dot1q 718
 vrf member T1-Out
 no ip redirects
  ip address 10.8.78.26/30
  ip ospf network point-to-point
```

```
ip router ospf VXIaaS area 0.0.0.10
 no shutdown
interface port-channel2.719
  description Tenant 1 N7K-N7K Inside
 mtu 9216
  encapsulation dot1q 719
 vrf member T1-In
 no ip redirects
  ip address 10.8.78.30/30
  ip ospf network point-to-point
  ip router ospf VXIaaS area 0.0.0.20
 no shutdown
interface port-channel2.728
  description Tenant 2 N7K-N7K Outside
 mtu 9216
 encapsulation dot1q 728
 vrf member T2-Out
 no ip redirects
  ip address 10.8.78.58/30
  ip ospf network point-to-point
  ip router ospf VXIaaS area 0.0.0.10
 no shutdown
interface port-channel2.729
  description Tenant 1 N7K-N7K Inside
 mtu 9216
  encapsulation dot1q 729
 vrf member T2-In
 no ip redirects
  ip address 10.8.78.62/30
  ip ospf network point-to-point
  ip router ospf VXIaaS area 0.0.0.20
 no shutdown
interface port-channel2.738
 description Tenant 3 N7K-N7K Outside
 mtu 9216
  encapsulation dot1q 738
 vrf member T3-Out
 no ip redirects
  ip address 10.8.78.90/30
  ip ospf network point-to-point
  ip router ospf VXIaaS area 0.0.0.10
 no shutdown
interface port-channel2.739
  description Tenant 1 N7K-N7K Inside
 mtu 9216
  encapsulation dot1q 739
  vrf member T3-In
 no ip redirects
  ip address 10.8.78.94/30
  ip ospf network point-to-point
  ip router ospf VXIaaS area 0.0.0.20
 no shutdown
interface port-channel2.748
  description Tenant 4 N7K-N7K Outside
 mtu 9216
 encapsulation dot1q 748
  vrf member T4-Out
 no ip redirects
  ip address 10.8.78.122/30
  ip ospf network point-to-point
  ip router ospf VXIaaS area 0.0.0.10
 no shutdown
interface port-channel2.749
  description Tenant 1 N7K-N7K Inside
```

```
mtu 9216
  encapsulation dot1q 749
  vrf member T4-In
 no ip redirects
  ip address 10.8.78.126/30
  ip ospf network point-to-point
  ip router ospf VXIaaS area 0.0.0.20
  no shutdown
interface port-channel2.758
  description Tenant 5 N7K-N7K Outside
  mtu 9216
  encapsulation dot1q 758
 vrf member T5-Out
 no ip redirects
  ip address 10.8.78.154/30
  ip ospf network point-to-point
  ip router ospf VXIaaS area 0.0.0.10
  no shutdown
interface port-channel2.759
  description Tenant 1 N7K-N7K Inside
 mtu 9216
 encapsulation dot1g 759
 vrf member T5-In
 no ip redirects
  ip address 10.8.78.158/30
  ip ospf network point-to-point
  ip router ospf VXIaaS area 0.0.0.20
  no shutdown
interface port-channel2.788
  description Global Tenant N7K-N7K Outside
 mtu 9216
 encapsulation dot1q 788
 vrf member GT-Out
 no ip redirects
  ip address 10.8.78.250/30
  ip ospf network point-to-point
  ip router ospf VXIaaS area 0.0.0.10
  no shutdown
interface port-channel3
  description VXIaaS-OOB-MGMT-SW
  switchport
  switchport mode trunk
  switchport trunk allowed vlan 866
  vpc 3
interface port-channel4
  description VXIaaS-00B-Tenant-MGMT-SW
  switchport
  switchport mode trunk
  switchport trunk allowed vlan 866
  vpc 4
interface port-channel5
  description Common N5K Pair
  switchport
  switchport mode trunk
  switchport trunk allowed vlan 844,864-865
  spanning-tree port type edge trunk
  mtu 9216
  vpc 5
interface port-channel6
  description VXIaaS-OOB-SP-MGMT-SW
  switchport
  switchport mode trunk
  switchport trunk allowed vlan 866
  vpc 6
```

```
interface port-channel55
  description VXIaaS-SP-5K-Pair
  switchport
  switchport mode trunk
  switchport trunk allowed vlan 711,721,731,741,751,761,844,864-865
  switchport trunk allowed vlan add 867-868,941,980
  spanning-tree port type normal
 mtu 9216
  vpc 55
interface port-channel104
  description L3 Link To Service 6500 VSS
 no lacp graceful-convergence
interface port-channel104.612
  description T1 Outside Service 6500
  encapsulation dot1q 612
 vrf member T1-Out
 no ip redirects
  ip address 10.8.76.5/30
  ip ospf network point-to-point
  ip router ospf VXIaaS area 0.0.0.10
 no shutdown
interface port-channel104.614
  description T1 Inside Service 6500
  encapsulation dot1q 614
 vrf member T1-In
 no ip redirects
 ip address 10.8.76.13/30
  ip ospf network point-to-point
  ip router ospf VXIaaS area 0.0.0.20
  no shutdown
interface port-channel104.622
  description T2 Outside Service 6500
  encapsulation dot1q 622
 vrf member T2-Out
 no ip redirects
  ip address 10.8.76.69/30
  ip ospf network point-to-point
  ip router ospf VXIaaS area 0.0.0.10
 no shutdown
interface port-channel104.624
  description T2 Inside Service 6500
  encapsulation dot1q 624
 vrf member T2-In
 no ip redirects
  ip address 10.8.76.77/30
  ip ospf network point-to-point
  ip router ospf VXIaaS area 0.0.0.20
  no shutdown
interface port-channel104.632
  description T3 Outside Service 6500
 encapsulation dot1q 632
 vrf member T3-Out
 no ip redirects
  ip address 10.8.76.133/30
 ip ospf network point-to-point
  ip router ospf VXIaaS area 0.0.0.10
  no shutdown
interface port-channel104.634
  description T3 Inside Service 6500
  encapsulation dot1q 634
 vrf member T3-In
 no ip redirects
  ip address 10.8.76.141/30
  ip ospf network point-to-point
```

```
ip router ospf VXIaaS area 0.0.0.20
  no shutdown
interface port-channel104.642
  description T4 Outside Service 6500
  encapsulation dot1q 642
  vrf member T4-Out
 no ip redirects
  ip address 10.8.76.197/30
  ip ospf network point-to-point
  ip router ospf VXIaaS area 0.0.0.10
  no shutdown
  ip wccp 61 redirect in
interface port-channel104.644
  description T4 Inside Service 6500
  encapsulation dot1q 644
 vrf member T4-In
 no ip redirects
  ip address 10.8.76.205/30
  ip ospf network point-to-point
  ip router ospf VXIaaS area 0.0.0.20
 no shutdown
interface port-channel104.652
  description T5 Outside Service 6500
  encapsulation dot1q 652
 vrf member T5-Out
 no ip redirects
  ip address 10.8.77.5/30
  ip ospf network point-to-point
  ip router ospf VXIaaS area 0.0.0.10
  no shutdown
interface port-channel104.654
  description T5 Inside Service 6500
  encapsulation dot1q 654
 vrf member T5-In
 no ip redirects
  ip address 10.8.77.13/30
  ip ospf network point-to-point
  ip router ospf VXIaaS area 0.0.0.20
  no shutdown
interface port-channel104.682
  description Global Tenant Outside Service 6500
  encapsulation dot1q 682
 vrf member GT-Out
 no ip redirects
  ip address 10.8.77.197/30
  ip ospf network point-to-point
  ip router ospf VXIaaS area 0.0.0.10
  no shutdown
interface Ethernet4/1
  description vPC Peer Link Between N7Ks
  switchport
  switchport mode trunk
  switchport trunk allowed vlan 711,714-715,721,724-725,731,734-735
  switchport trunk allowed vlan add 741,744-745,751,754-755,761,844
  switchport trunk allowed vlan add 864-868,941,980
 mtu 9216
  channel-group 1 mode active
  no shutdown
interface Ethernet4/2
  description vPC Peer Link Between N7Ks
  switchport
  switchport mode trunk
  switchport trunk allowed vlan 711,714-715,721,724-725,731,734-735
```

```
switchport trunk allowed vlan add 741,744-745,751,754-755,761,844
  switchport trunk allowed vlan add 864-868,941,980
 mt11 9216
 channel-group 1 mode active
 no shutdown
interface Ethernet4/3
interface Ethernet4/4
interface Ethernet4/5
  description NON-vPC Peer Link Between N7Ks
 mtu 9216
 channel-group 2 mode active
 no shutdown
interface Ethernet4/6
  description NON-vPC Peer Link Between N7Ks
 mtu 9216
 channel-group 2 mode active
 no shutdown
interface Ethernet4/7
interface Ethernet4/8
interface Ethernet4/9
interface Ethernet4/10
interface Ethernet4/11
interface Ethernet4/12
interface Ethernet4/13
interface Ethernet4/14
interface Ethernet4/15
interface Ethernet4/16
interface Ethernet4/17
  description Common N5K Pair
 switchport
 switchport mode trunk
 switchport trunk allowed vlan 844,864-865
 spanning-tree port type edge trunk
 mtu 9216
 channel-group 5 mode active
 no shutdown
interface Ethernet4/18
interface Ethernet4/19
interface Ethernet4/20
interface Ethernet4/21
interface Ethernet4/22
interface Ethernet4/23
interface Ethernet4/24
interface Ethernet4/25
interface Ethernet4/26
interface Ethernet4/27
interface Ethernet4/28
interface Ethernet4/29
interface Ethernet4/30
interface Ethernet4/31
interface Ethernet4/32
interface Ethernet4/33
interface Ethernet4/34
interface Ethernet4/35
interface Ethernet4/36
interface Ethernet4/37
interface Ethernet4/38
interface Ethernet4/39
interface Ethernet4/40
interface Ethernet4/41
interface Ethernet4/42
interface Ethernet4/43
interface Ethernet4/44
interface Ethernet4/45
```

```
interface Ethernet4/46
interface Ethernet4/47
interface Ethernet4/48
interface Ethernet5/1
  description vPC Peer Link Between N7Ks
  switchport
  switchport mode trunk
  switchport trunk allowed vlan 711,714-715,721,724-725,731,734-735
  switchport trunk allowed vlan add 741,744-745,751,754-755,761,844
  switchport trunk allowed vlan add 864-868,941,980
 mtu 9216
 channel-group 1 mode active
 no shutdown
interface Ethernet5/2
  description vPC Peer Link Between N7Ks
  switchport
  switchport mode trunk
  switchport trunk allowed vlan 711,714-715,721,724-725,731,734-735
  switchport trunk allowed vlan add 741,744-745,751,754-755,761,844
  switchport trunk allowed vlan add 864-868,941,980
 mtu 9216
 channel-group 1 mode active
 no shutdown
interface Ethernet5/3
interface Ethernet5/4
interface Ethernet5/5
  description NON-vPC Peer Link Between N7Ks
 mtu 9216
  channel-group 2 mode active
 no shutdown
interface Ethernet5/6
  description NON-vPC Peer Link Between N7Ks
 mtu 9216
 channel-group 2 mode active
 no shutdown
interface Ethernet5/7
interface Ethernet5/8
interface Ethernet5/9
interface Ethernet5/10
interface Ethernet5/11
interface Ethernet5/12
interface Ethernet5/13
interface Ethernet5/14
interface Ethernet5/15
interface Ethernet5/16
interface Ethernet5/17
  description Common N5K Pair
  switchport
  switchport mode trunk
  switchport trunk allowed vlan 844,864-865
  spanning-tree port type edge trunk
 mtu 9216
  channel-group 5 mode active
 no shutdown
interface Ethernet5/18
interface Ethernet5/19
interface Ethernet5/20
interface Ethernet5/21
interface Ethernet5/22
interface Ethernet5/23
interface Ethernet5/24
interface Ethernet5/25
  description VXIaaS-OOB-MGMT-SW
  switchport
```

switchport mode trunk switchport trunk allowed vlan 866 channel-group 3 mode active no shutdown interface Ethernet5/26 description VXIaaS-00B-Tenant-MGMT-SW switchport switchport mode trunk switchport trunk allowed vlan 866 channel-group 4 mode active no shutdown interface Ethernet5/27 description VXIaaS-GW (10.81 net) ip address 10.8.79.246/30 ip router eigrp 42 ip summary-address eigrp 42 10.8.0.0/16 no shutdown interface Ethernet5/28 description VXIaaS-OOB-SP-MGMT-SW switchport switchport mode trunk switchport trunk allowed vlan 866 channel-group 6 mode active no shutdown interface Ethernet5/29 interface Ethernet5/30 interface Ethernet5/31 interface Ethernet5/32 interface Ethernet5/33 description Common N5K-1 L3 mtu 9216 no ip redirects ip address 10.10.0.30/30 ip router eigrp 42 ip passive-interface eigrp 42 no shutdown interface Ethernet5/34 description Common N5K-2 L3 mtu 9216 no ip redirects ip address 10.10.0.38/30 ip router eigrp 42 ip passive-interface eigrp 42 no shutdown interface Ethernet5/35 interface Ethernet5/36 interface Ethernet5/37 description desc VXIaaS-DC-ASR9K-1 no shutdown interface Ethernet5/37.714 description T1 Link to ASR9K-1 encapsulation dot1q 714 vrf member T1-Out no ip redirects ip address 10.8.78.9/30 ip ospf network point-to-point ip router ospf VXIaaS area 0.0.0.0 no shutdown interface Ethernet5/37.724 description T2 Link to ASR9K-1 encapsulation dot1q 724 vrf member T2-Out

no ip redirects

```
ip address 10.8.78.41/30
  ip ospf network point-to-point
  ip router ospf VXIaaS area 0.0.0.0
 no shutdown
interface Ethernet5/37.734
  description T3 Link to ASR9K-1
  encapsulation dot1q 734
  vrf member T3-Out
  no ip redirects
  ip address 10.8.78.73/30
  ip ospf network point-to-point
  ip router ospf VXIaaS area 0.0.0.0
 no shutdown
interface Ethernet5/37.744
  description T4 Link to ASR9K-1
  encapsulation dot1q 744
  vrf member T4-Out
 no ip redirects
  ip address 10.8.78.105/30
  ip ospf network point-to-point
  ip router ospf VXIaaS area 0.0.0.0
  ip wccp 62 redirect in
 no shutdown
interface Ethernet5/37.754
  description T5 Link to ASR9K-1
  encapsulation dot1q 754
  vrf member T5-Out
  no ip redirects
  ip address 10.8.78.137/30
  ip ospf network point-to-point
  ip router ospf VXIaaS area 0.0.0.0
 no shutdown
interface Ethernet5/37.784
  description Global Tenant Link to ASR9K-1
  encapsulation dot1q 784
  vrf member GT-Out
 no ip redirects
  ip address 10.8.78.233/30
  ip ospf network point-to-point
  ip router ospf VXIaaS area 0.0.0.0
  no shutdown
interface Ethernet5/38
  description VXIaaS-DC-ASR9K-2
  no shutdown
interface Ethernet5/38.715
  description T1 Link to ASR9K-2
  encapsulation dot1q 715
  vrf member T1-Out
 no ip redirects
  ip address 10.8.78.13/30
  ip ospf network point-to-point
  ip router ospf VXIaaS area 0.0.0.0
  no shutdown
interface Ethernet5/38.725
  description T2 Link to ASR9K-2
  encapsulation dot1q 725
  vrf member T2-Out
  no ip redirects
  ip address 10.8.78.45/30
  ip ospf network point-to-point
  ip router ospf VXIaaS area 0.0.0.0
  no shutdown
interface Ethernet5/38.735
```

```
description T3 Link to ASR9K-2
  encapsulation dot1q 735
 vrf member T3-Out
 no ip redirects
 ip address 10.8.78.77/30
  ip ospf network point-to-point
  ip router ospf VXIaaS area 0.0.0.0
  no shutdown
interface Ethernet5/38.745
  description T4 Link to ASR9K-2
  encapsulation dot1q 745
 vrf member T4-Out
 no ip redirects
 ip address 10.8.78.109/30
  ip ospf network point-to-point
 ip router ospf VXIaaS area 0.0.0.0
  ip wccp 62 redirect in
 no shutdown
interface Ethernet5/38.755
  description T5 Link to ASR9K-2
  encapsulation dot1q 755
 vrf member T5-Out
 no ip redirects
  ip address 10.8.78.141/30
  ip ospf network point-to-point
  ip router ospf VXIaaS area 0.0.0.0
 no shutdown
interface Ethernet5/38.785
  description Global Tenant Link to ASR9K-2
  encapsulation dot1q 785
 vrf member GT-Out
 no ip redirects
 ip address 10.8.78.237/30
 ip ospf network point-to-point
  ip router ospf VXIaaS area 0.0.0.0
 no shutdown
interface Ethernet5/39
interface Ethernet5/40
interface Ethernet5/41
  description L3 Link To Service 6500 VSS
  channel-group 104 mode active
 no shutdown
interface Ethernet5/42
  description L3 Link To Service 6500 VSS
  channel-group 104 mode active
 no shutdown
interface Ethernet5/43
interface Ethernet5/44
interface Ethernet5/45
  description VXIaaS-SP-5K
 switchport
 switchport mode trunk
  switchport trunk allowed vlan 711,721,731,741,751,761,844,864-865
  switchport trunk allowed vlan add 867-868,941,980
 mtu 9216
 channel-group 55 mode active
  no shutdown
interface Ethernet5/46
  description VXIaaS-SP-5K
  switchport
 switchport mode trunk
  switchport trunk allowed vlan 711,721,731,741,751,761,844,864-865
  switchport trunk allowed vlan add 867-868,941,980
 mtu 9216
```

channel-group 55 mode active no shutdown interface Ethernet5/47 interface Ethernet5/48 interface mgmt0 vrf member management ip address 10.8.66.22/24 interface loopback0 description MGMT Loopback ip address 10.8.79.251/32 ip router eigrp 42 ip passive-interface eigrp 42 interface loopback1 description T1 Outside Loopback vrf member T1-Out ip address 192.168.10.6/32 ip router ospf VXIaaS area 0.0.0.0 interface loopback2 description T2 Outside Loopback vrf member T2-Out ip address 192.168.20.6/32 ip router ospf VXIaaS area 0.0.0.0 interface loopback3 description T3 Outside Loopback vrf member T3-Out ip address 192.168.30.6/32 ip router ospf VXIaaS area 0.0.0.0 interface loopback4 description T4 Outside Loopback vrf member T4-Out ip address 192.168.40.6/32 ip router ospf VXIaaS area 0.0.0.0 interface loopback5 description T5 Outside Loopback vrf member T5-Out ip address 192.168.50.6/32 ip router ospf VXIaaS area 0.0.0.0 interface loopback8 description Global Tenant Outside Loopback vrf member GT-Out ip address 192.168.80.6/32 ip router ospf VXIaaS area 0.0.0.0 interface loopback10 description T1 Inside Loopback vrf member T1-In ip address 192.168.10.10/32 ip router ospf VXIaaS area 0.0.0.20 interface loopback20 description T2 Inside Loopback vrf member T2-In ip address 192.168.20.10/32 ip router ospf VXIaaS area 0.0.0.20 interface loopback30 description T3 Inside Loopback vrf member T3-In ip address 192.168.30.10/32 ip router ospf VXIaaS area 0.0.0.20 interface loopback40 description T4 Inside Loopback vrf member T4-In ip address 192.168.40.10/32 ip router ospf VXIaaS area 0.0.0.20 interface loopback50

```
description T5 Inside Loopback
  vrf member T5-In
  ip address 192.168.50.10/32
  ip router ospf VXIaaS area 0.0.0.20
clock timezone EST -5 0
clock summer-time EDT 2 Sun Mar 02:00 1 Sun Nov 02:00 60
line console
  exec-timeout 0
line vty
  exec-timeout 420
boot kickstart bootflash:/n7000-s1-kickstart.6.1.2.bin sup-1
boot system bootflash:/n7000-s1-dk9.6.1.2.bin sup-1
boot kickstart bootflash:/n7000-s1-kickstart.6.1.2.bin sup-2
boot system bootflash:/n7000-s1-dk9.6.1.2.bin sup-2
router eigrp 42
 default-metric 10000 100 255 1 1500
 redistribute bgp 42 route-map EIGRP-BGP
router ospf VXIaaS
 vrf GT-Out
   router-id 8.8.8.11
   area 0.0.0.10 nssa default-information-originate
   log-adjacency-changes detail
   auto-cost reference-bandwidth 100 Gbps
  vrf T1-In
   router-id 1.1.1.16
   area 0.0.0.20 nssa
   log-adjacency-changes detail
   auto-cost reference-bandwidth 100 Gbps
  vrf T1-Out
   router-id 1.1.1.11
   area 0.0.0.10 nssa default-information-originate
   log-adjacency-changes detail
   auto-cost reference-bandwidth 100 Gbps
  vrf T2-In
   router-id 2.2.2.16
   area 0.0.0.20 nssa
   log-adjacency-changes detail
   auto-cost reference-bandwidth 100 Gbps
  vrf T2-Out
   router-id 2.2.2.11
   area 0.0.0.10 nssa default-information-originate
   log-adjacency-changes detail
   auto-cost reference-bandwidth 100 Gbps
  vrf T3-In
   router-id 3.3.3.16
   area 0.0.0.20 nssa
   log-adjacency-changes detail
   auto-cost reference-bandwidth 100 Gbps
  vrf T3-Out
   router-id 3.3.3.11
   area 0.0.0.10 nssa default-information-originate
   log-adjacency-changes detail
   auto-cost reference-bandwidth 100 Gbps
 vrf T4-In
   router-id 4.4.4.16
   area 0.0.0.20 nssa
    log-adjacency-changes detail
   auto-cost reference-bandwidth 100 Gbps
  vrf T4-Out
   router-id 4.4.4.11
   area 0.0.0.10 nssa default-information-originate
   log-adjacency-changes detail
   auto-cost reference-bandwidth 100 Gbps
  vrf T5-Tn
```

```
router-id 5.5.5.16
    area 0.0.0.20 nssa
   log-adjacency-changes detail
   auto-cost reference-bandwidth 100 Gbps
  vrf T5-Out
   router-id 5.5.5.11
    area 0.0.0.10 nssa default-information-originate
    log-adjacency-changes detail
    auto-cost reference-bandwidth 100 Gbps
router bgp 42
  address-family ipv4 unicast
   redistribute direct route-map BGP-DIRECT
   aggregate-address 10.8.0.0/16 summary-only
   maximum-paths 4
  neighbor 10.10.0.29 remote-as 1000
   address-family ipv4 unicast
      route-map COMMON-SUM in
  neighbor 10.10.0.37 remote-as 1000
    address-family ipv4 unicast
      route-map COMMON-SUM in
```

## **Cisco Catalyst 6506 configuration:**

```
version 12.2
service timestamps debug datetime msec
service timestamps log datetime msec
no service password-encryption
service counters max age 5
hostname VXIaaS-DC-SVC-6500
boot-start-marker
boot system flash bootflash:s72033-ipservicesk9_wan-mz.122-33.SXJ1.bin
boot-end-marker
security passwords min-length 1
no logging console
enable password cisco_123
username admin password 0 cisco_123
aaa new-model
aaa authentication login default local
aaa session-id common
clock timezone EST -5
clock summer-time EDT recurring
firewall autostate
firewall multiple-vlan-interfaces
firewall switch 1 module 3 vlan-group 1,3
firewall switch 2 module 3 vlan-group 1,3
firewall vlan-group 1 910,915
firewall vlan-group 3 616,617,626,627,636,637,646,647,656,657
ip vrf GT-In
ip vrf GT-Out
ip vrf T1-In
ip vrf T1-Out
ip vrf T2-In
ip vrf T2-Out
ip vrf T3-In
ip vrf T3-Out
ip vrf T4-In
ip vrf T4-Out
ip vrf T5-In
ip vrf T5-Out
ip vrf T6-In
ip vrf T6-Out
ip vrf T7-In
ip vrf T7-Out
```

ip ssh source-interface Vlan866 no ip domain-lookup ip domain-name vxiaas.local vtp mode transparent switch virtual domain 42 switch mode virtual mls netflow interface spanning-tree mode rapid-pvst spanning-tree extend system-id diagnostic bootup level complete redundancy main-cpu auto-sync running-config mode sso vlan internal allocation policy ascending vlan access-log ratelimit 2000 vlan 616 name T1-ASA-Out vlan 617 name T1-ASA-In vlan 626 name T2-ASA-Out vlan 627 name T2-ASA-In vlan 636 name T3-ASA-Out vlan 637 name T3-ASA-In vlan 646 name T4-ASA-Out vlan 647 name T4-ASA-In vlan 656 name T5-ASA-Out vlan 657 name T5-ASA-In vlan 686 name GT-ASA-Out vlan 687 name GT-ASA-In vlan 866 name VXIaaS-00B-MGMT vlan 910 name ASA-FW-LAN-FO vlan 915 name ASA-FW-STATE-FO nterface Loopback1 description T1 Outside Loopback ip vrf forwarding T1-Out ip address 192.168.10.7 255.255.255.255 interface Loopback2 description T2 Outside Loopback ip vrf forwarding T2-Out ip address 192.168.20.7 255.255.255.255 interface Loopback3 description T3 Outside Loopback ip vrf forwarding T3-Out ip address 192.168.30.7 255.255.255.255 interface Loopback4 description T4 Outside Loopback ip vrf forwarding T4-Out ip address 192.168.40.7 255.255.255.255 interface Loopback5 description T5 Outside Loopback

ip vrf forwarding T5-Out ip address 192.168.50.7 255.255.255.255 interface Loopback8 description GT Outside Loopback ip vrf forwarding GT-Out ip address 192.168.80.7 255.255.255.255 interface Loopback10 description T1 Inside Loopback ip vrf forwarding T1-In ip address 192.168.10.8 255.255.255.255 interface Loopback20 description T2 Inside Loopback ip vrf forwarding T2-In ip address 192.168.20.8 255.255.255.255 interface Loopback30 description T3 Inside Loopback ip vrf forwarding T3-In ip address 192.168.30.8 255.255.255.255 interface Loopback40 description T4 Inside Loopback ip vrf forwarding T4-In ip address 192.168.40.8 255.255.255.255 interface Loopback50 description T5 Inside Loopback ip vrf forwarding T5-In ip address 192.168.50.8 255.255.255.255 interface Loopback80 description GT Inside Loopback ip vrf forwarding GT-In ip address 192.168.80.8 255.255.255.255 interface Port-channel10 no switchport no ip address switch virtual link 1 mls qos trust cos no mls qos channel-consistency interface Port-channel15 description VPN ASA Outside no switchport ip vrf forwarding GT-Out ip address 10.8.77.209 255.255.258.248 no ip redirects no ip unreachables no ip proxy-arp ip ospf network point-to-point interface Port-channel16 description VPN ASA Inside no switchport no ip address no ip redirects no ip unreachables no ip proxy-arp interface Port-channel16.635 encapsulation dot1Q 635 ip vrf forwarding T3-Out ip address 10.8.76.153 255.255.258.248 no ip redirects no ip unreachables no ip proxy-arp ip ospf network point-to-point interface Port-channel20 no switchport no ip address switch virtual link 2

```
mls qos trust cos
no mls qos channel-consistency
interface Port-channel103
description N7K-1 Uplink
no switchport
no ip address
interface Port-channel103.611
description T1 Outside N7K-1
encapsulation dot10 611
ip vrf forwarding T1-Out
ip address 10.8.76.2 255.255.255.252
no ip redirects
no ip unreachables
no ip proxy-arp
ip ospf network point-to-point
interface Port-channel103.613
description T1 Inside N7K-1
encapsulation dot1Q 613
ip vrf forwarding T1-In
ip address 10.8.76.10 255.255.255.252
no ip redirects
no ip unreachables
no ip proxy-arp
ip ospf network point-to-point
interface Port-channel103.621
description T2 Outside N7K-1
encapsulation dot10 621
ip vrf forwarding T2-Out
ip address 10.8.76.66 255.255.255.252
no ip redirects
no ip unreachables
no ip proxy-arp
ip ospf network point-to-point
interface Port-channel103.623
description T2 Inside N7K-1
encapsulation dot1Q 623
ip vrf forwarding T2-In
ip address 10.8.76.74 255.255.255.252
no ip redirects
no ip unreachables
no ip proxy-arp
ip ospf network point-to-point
interface Port-channel103.631
description T3 Outside N7K-1
encapsulation dot1Q 631
ip vrf forwarding T3-Out
ip address 10.8.76.130 255.255.255.252
no ip redirects
no ip unreachables
no ip proxy-arp
ip ospf network point-to-point
shutdown
interface Port-channel103.633
description T3 Inside N7K-1
encapsulation dot10 633
ip vrf forwarding T3-In
ip address 10.8.76.138 255.255.255.252
no ip redirects
no ip unreachables
no ip proxy-arp
ip ospf network point-to-point
interface Port-channel103.641
description T4 Outside N7K-1
 encapsulation dot1Q 641
```

```
ip vrf forwarding T4-Out
 ip address 10.8.76.194 255.255.255.252
no ip redirects
no ip unreachables
no ip proxy-arp
ip ospf network point-to-point
interface Port-channel103.643
description T4 Inside N7K-1
 encapsulation dot10 643
 ip vrf forwarding T4-In
 ip address 10.8.76.202 255.255.255.252
no ip redirects
no ip unreachables
no ip proxy-arp
 ip ospf network point-to-point
interface Port-channel103.651
description T5 Outside N7K-1
encapsulation dot1Q 651
 ip vrf forwarding T5-Out
 ip address 10.8.77.2 255.255.255.252
no ip redirects
no ip unreachables
no ip proxy-arp
ip ospf network point-to-point
interface Port-channel103.653
description T5 Inside N7K-1
 encapsulation dot1Q 653
ip vrf forwarding T5-In
 ip address 10.8.77.10 255.255.255.252
no ip redirects
no ip unreachables
no ip proxy-arp
ip ospf network point-to-point
interface Port-channel103.681
description GT Outside N7K-1
 encapsulation dot1Q 681
 ip vrf forwarding GT-Out
ip address 10.8.77.194 255.255.255.252
no ip redirects
no ip unreachables
no ip proxy-arp
ip ospf network point-to-point
interface Port-channel104
description N7K-2 Uplink
no switchport
no ip address
interface Port-channel104.612
 description T1 Outside N7K-2
encapsulation dot1Q 612
ip vrf forwarding T1-Out
ip address 10.8.76.6 255.255.255.252
no ip redirects
no ip unreachables
no ip proxy-arp
ip ospf network point-to-point
interface Port-channel104.614
 description T1 Inside N7K-2
 encapsulation dot1Q 614
 ip vrf forwarding T1-In
ip address 10.8.76.14 255.255.255.252
no ip redirects
no ip unreachables
no ip proxy-arp
ip ospf network point-to-point
```

```
interface Port-channel104.622
description T2 Outside N7K-2
encapsulation dot1Q 622
ip vrf forwarding T2-Out
ip address 10.8.76.70 255.255.255.252
no ip redirects
no ip unreachables
no ip proxy-arp
ip ospf network point-to-point
interface Port-channel104.624
description T2 Inside N7K-2
encapsulation dot1Q 624
ip vrf forwarding T2-In
ip address 10.8.76.78 255.255.255.252
no ip redirects
no ip unreachables
no ip proxy-arp
ip ospf network point-to-point
interface Port-channel104.632
description T3 Outside N7K-2
encapsulation dot1Q 632
ip vrf forwarding T3-Out
ip address 10.8.76.134 255.255.255.252
no ip redirects
no ip unreachables
no ip proxy-arp
ip ospf network point-to-point
shutdown
interface Port-channel104.634
description T3 Inside N7K-2
encapsulation dot1Q 634
ip vrf forwarding T3-In
ip address 10.8.76.142 255.255.255.252
no ip redirects
no ip unreachables
no ip proxy-arp
ip ospf network point-to-point
interface Port-channel104.642
description T4 Outside N7K-2
encapsulation dot1Q 642
ip vrf forwarding T4-Out
ip address 10.8.76.198 255.255.255.252
no ip redirects
no ip unreachables
no ip proxy-arp
ip ospf network point-to-point
interface Port-channel104.644
description T4 Inside N7K-2
encapsulation dot1Q 644
ip vrf forwarding T4-In
ip address 10.8.76.206 255.255.255.252
no ip redirects
no ip unreachables
no ip proxy-arp
ip ospf network point-to-point
interface Port-channel104.652
description T5 Outside N7K-2
encapsulation dot1Q 652
ip vrf forwarding T5-Out
ip address 10.8.77.6 255.255.255.252
no ip redirects
no ip unreachables
no ip proxy-arp
ip ospf network point-to-point
```

```
interface Port-channel104.654
description T5 Inside N7K-2
encapsulation dot1Q 654
ip vrf forwarding T5-In
ip address 10.8.77.14 255.255.255.252
no ip redirects
no ip unreachables
no ip proxy-arp
ip ospf network point-to-point
interface Port-channel104.682
description GT Outside N7K-2
encapsulation dot1Q 682
ip vrf forwarding GT-Out
ip address 10.8.77.198 255.255.255.252
no ip redirects
no ip unreachables
no ip proxy-arp
ip ospf network point-to-point
interface TenGigabitEthernet1/1/1
description N7K-1 Uplink
no switchport
no ip address
channel-group 103 mode active
interface TenGigabitEthernet1/1/2
description N7K-2 Uplink
no switchport
no ip address
channel-group 104 mode active
interface TenGigabitEthernet1/1/3
description VPN ASA Outside
no switchport
no ip address
channel-group 15 mode active
interface TenGigabitEthernet1/1/4
description VPN ASA Inside
no switchport
no ip address
channel-group 16 mode active
interface GigabitEthernet1/5/1
no switchport
no ip address
shutdown
interface GigabitEthernet1/5/2
no switchport
no ip address
shutdown
interface GigabitEthernet1/5/3
 description VXIaaS-OOB-MGMT SW1
switchport
switchport access vlan 866
switchport mode access
arp timeout 1500
interface TenGigabitEthernet1/5/4
no switchport
no ip address
mls qos trust cos
 channel-group 10 mode on
interface TenGigabitEthernet1/5/5
no switchport
no ip address
mls gos trust cos
channel-group 10 mode on
interface TenGigabitEthernet2/1/1
description N7K-1 Uplink
```

no switchport no ip address channel-group 103 mode active interface TenGigabitEthernet2/1/2 description N7K-2 Uplink no switchport no ip address channel-group 104 mode active interface TenGigabitEthernet2/1/3 description VPN ASA Inside no switchport no ip address channel-group 16 mode active interface TenGigabitEthernet2/1/4 description VPN ASA Outside no switchport no ip address channel-group 15 mode active interface GigabitEthernet2/5/1 no switchport no ip address shutdown interface GigabitEthernet2/5/2 no switchport no ip address shutdown interface GigabitEthernet2/5/3 description VXIaaS-OOB-MGMT SW2 switchport switchport access vlan 866 switchport mode access arp timeout 1500 interface TenGigabitEthernet2/5/4 no switchport no ip address mls qos trust cos channel-group 20 mode on interface TenGigabitEthernet2/5/5 no switchport no ip address mls qos trust cos channel-group 20 mode on interface Vlan1 no ip address shutdown interface Vlan616 description T1 ASA Outside ip vrf forwarding T1-Out ip address 10.8.76.33 255.255.258.248 interface Vlan617 description T1 ASA Inside ip vrf forwarding T1-In ip address 10.8.76.41 255.255.258.248 interface Vlan626 description T2 ASA Outside ip vrf forwarding T2-Out ip address 10.8.76.97 255.255.258.248 interface Vlan627 description T2 ASA Inside ip vrf forwarding T2-In ip address 10.8.76.105 255.255.258.248 interface Vlan636 description T3 ASA Outside

ip vrf forwarding T3-Out

ip address 10.8.76.161 255.255.258.248 interface Vlan637 description T3 ASA Inside ip vrf forwarding T3-In ip address 10.8.76.169 255.255.258.248 interface Vlan646 description T4 ASA Outside ip vrf forwarding T4-Out ip address 10.8.76.225 255.255.258.248 interface Vlan647 description T4 ASA Inside ip vrf forwarding T4-In ip address 10.8.76.233 255.255.258.248 interface Vlan656 description T5 ASA Outside ip vrf forwarding T5-Out ip address 10.8.77.33 255.255.258.248 interface Vlan657 description T5 ASA Inside ip vrf forwarding T5-In ip address 10.8.77.41 255.255.258.248 interface Vlan866 description VXIaaS-OOB-MGMT ip address 10.8.66.13 255.255.255.0 no ip redirects no ip unreachables no ip proxy-arp arp timeout 1500 router ospf 10 vrf T1-Out router-id 1.1.1.12 log-adjacency-changes detail auto-cost reference-bandwidth 100000 nsf ietf capability vrf-lite area 10 nssa redistribute static subnets passive-interface Loopback1 passive-interface Vlan616 network 10.8.76.2 0.0.0.0 area 10 network 10.8.76.6 0.0.0.0 area 10 network 10.8.76.33 0.0.0.0 area 10 network 192.168.10.7 0.0.0.0 area 10 router ospf 20 vrf T2-Out router-id 2.2.2.12 log-adjacency-changes detail auto-cost reference-bandwidth 100000 nsf ietf capability vrf-lite area 10 nssa redistribute static subnets passive-interface Loopback2 passive-interface Vlan626 network 10.8.76.66 0.0.0.0 area 10 network 10.8.76.70 0.0.0.0 area 10 network 10.8.76.97 0.0.0.0 area 10 network 192.168.20.7 0.0.0.0 area 10 router ospf 30 vrf T3-Out router-id 3.3.3.12 log-adjacency-changes detail auto-cost reference-bandwidth 100000 nsf ietf capability vrf-lite area 10 nssa redistribute static subnets

```
passive-interface Loopback3
passive-interface Vlan636
network 10.8.76.130 0.0.0.0 area 10
network 10.8.76.134 0.0.0.0 area 10
network 10.8.76.153 0.0.0.0 area 10
network 10.8.76.161 0.0.0.0 area 10
network 192.168.30.7 0.0.0.0 area 10
router ospf 40 vrf T4-Out
router-id 4.4.4.12
log-adjacency-changes detail
auto-cost reference-bandwidth 100000
nsf ietf
capability vrf-lite
area 10 nssa
redistribute static subnets
passive-interface Loopback4
passive-interface Vlan646
network 10.8.76.194 0.0.0.0 area 10
network 10.8.76.198 0.0.0.0 area 10
network 10.8.76.225 0.0.0.0 area 10
network 192.168.40.7 0.0.0.0 area 10
router ospf 50 vrf T5-Out
router-id 5.5.5.12
log-adjacency-changes detail
auto-cost reference-bandwidth 100000
nsf ietf
capability vrf-lite
area 10 nssa
redistribute static subnets
passive-interface Loopback5
passive-interface Vlan656
network 10.8.77.2 0.0.0.0 area 10
network 10.8.77.6 0.0.0.0 area 10
network 10.8.77.33 0.0.0.0 area 10
network 192.168.50.7 0.0.0.0 area 10
router ospf 15 vrf T1-In
router-id 1.1.1.13
log-adjacency-changes detail
auto-cost reference-bandwidth 100000
nsf ietf
capability vrf-lite
area 20 nssa default-information-originate
passive-interface Loopback10
passive-interface Vlan617
network 10.8.76.10 0.0.0.0 area 20
network 10.8.76.14 0.0.0.0 area 20
network 10.8.76.41 0.0.0.0 area 20
network 192.168.10.8 0.0.0.0 area 20
router ospf 25 vrf T2-In
router-id 2.2.2.13
log-adjacency-changes detail
auto-cost reference-bandwidth 100000
nsf ietf
capability vrf-lite
area 20 nssa default-information-originate
passive-interface Vlan627
network 10.8.76.74 0.0.0.0 area 20
network 10.8.76.78 0.0.0.0 area 20
network 10.8.76.105 0.0.0.0 area 20
network 192.168.20.8 0.0.0.0 area 20
router ospf 35 vrf T3-In
router-id 3.3.3.13
log-adjacency-changes detail
```

auto-cost reference-bandwidth 100000
```
nsf ietf
 capability vrf-lite
 area 20 nssa default-information-originate
passive-interface Loopback30
passive-interface Vlan637
network 10.8.76.138 0.0.0.0 area 20
network 10.8.76.142 0.0.0.0 area 20
network 10.8.76.169 0.0.0.0 area 20
network 192.168.30.8 0.0.0.0 area 20
router ospf 45 vrf T4-In
 router-id 4.4.4.13
log-adjacency-changes detail
auto-cost reference-bandwidth 100000
nsf ietf
capability vrf-lite
area 20 nssa default-information-originate
passive-interface Loopback40
passive-interface Vlan647
network 10.8.76.202 0.0.0.0 area 20
network 10.8.76.206 0.0.0.0 area 20
network 10.8.76.233 0.0.0.0 area 20
network 192.168.40.8 0.0.0.0 area 20
router ospf 55 vrf T5-In
router-id 5.5.5.13
 log-adjacency-changes detail
auto-cost reference-bandwidth 100000
nsf ietf
 capability vrf-lite
 area 20 nssa default-information-originate
passive-interface Loopback50
passive-interface Vlan657
network 10.8.77.10 0.0.0.0 area 20
network 10.8.77.14 0.0.0.0 area 20
network 10.8.77.41 0.0.0.0 area 20
network 192.168.50.8 0.0.0.0 area 20
router ospf 80 vrf GT-Out
router-id 8.8.8.12
log-adjacency-changes detail
 auto-cost reference-bandwidth 100000
nsf ietf
capability vrf-lite
area 10 nssa
redistribute static subnets
passive-interface Loopback8
network 10.8.77.194 0.0.0.0 area 10
network 10.8.77.198 0.0.0.0 area 10
network 10.8.77.209 0.0.0.0 area 10
network 192.168.80.7 0.0.0.0 area 10
ip classless
ip forward-protocol nd
ip route 0.0.0.0 0.0.0.0 10.8.66.1
ip route vrf T1-In 0.0.0.0 0.0.0.0 10.8.76.43
ip route vrf T1-Out 10.9.104.0 255.255.248.0 10.8.76.35
ip route vrf T2-In 0.0.0.0 0.0.0.0 10.8.76.107
ip route vrf T2-Out 10.9.112.0 255.255.248.0 10.8.76.99
ip route vrf T3-In 0.0.0.0 0.0.0.0 10.8.76.171
ip route vrf T3-Out 10.9.120.0 255.255.248.0 10.8.76.163
ip route vrf T4-In 0.0.0.0 0.0.0.0 10.8.76.235
ip route vrf T4-Out 10.9.128.0 255.255.248.0 10.8.76.227
ip route vrf T5-In 0.0.0.0 0.0.0.0 10.8.77.43
ip route vrf T5-Out 10.9.136.0 255.255.248.0 10.8.77.35
no ip http server
no ip http secure-server
control-plane
```

```
dial-peer cor custom
line con 0
 exec-timeout 0 0
logging synchronous
line vty 0 4
 exec-timeout 300 0
password cisco_123
logging synchronous
 transport input telnet ssh
mac-address-table aging-time 1800
module provision switch 1
slot 1 slot-type 148 port-type 60 number 4 virtual-slot 17
slot 2 slot-type 207 port-type 106 number 1 virtual-slot 18
slot 3 slot-type 330 port-type 111 number 3 virtual-slot 19
slot 5 slot-type 254 port-type 31 number 2 port-type 61 number 1 port-type 60 number
2 virtual-slot 21
module provision switch 2
 slot 1 slot-type 148 port-type 60 number 4 virtual-slot 33
 slot 2 slot-type 207 port-type 106 number 1 virtual-slot 34
 slot 3 slot-type 330 port-type 111 number 3 virtual-slot 35
slot 5 slot-type 254 port-type 31 number 2 port-type 61 number 1 port-type 60 number
2 virtual-slot 37
end
```

## **Cisco ASA Service Module Tenant 1 configuration:**

```
ASA Version 8.5(1) <context>
hostname T1
enable password MkHB0dBX0zv6EXRs encrypted
passwd 2KFQnbNIdI.2KYOU encrypted
names
interface Vlan616
nameif outside
security-level 10
ip address 10.8.76.35 255.255.255.248 standby 10.8.76.36
interface Vlan617
nameif inside
security-level 100
ip address 10.8.76.43 255.255.255.248 standby 10.8.76.44
access-list inside-acl extended permit ip any any
access-list inside-acl extended permit udp any any
access-list inside-acl extended permit tcp any any
access-list inside-acl extended permit icmp any any
access-list outside-acl extended permit ip any any
access-list outside-acl extended permit udp any any
access-list outside-acl extended permit tcp any any
access-list outside-acl extended permit icmp any any
access-list mgmt-acl extended permit icmp any any
access-list mgmt-acl extended permit tcp any any
access-list mgmt-acl extended permit udp any any
access-list mgmt-acl extended permit ip any any
pager lines 24
logging buffered debugging
mtu outside 1500
mtu inside 1500
icmp unreachable rate-limit 1 burst-size 1
icmp permit any outside
icmp permit any inside
no asdm history enable
arp timeout 1500
access-group outside-acl in interface outside per-user-override
access-group inside-acl in interface inside per-user-override
route outside 0.0.0.0 0.0.0.0 10.8.76.33 1
route inside 10.9.104.0 255.255.248.0 10.8.76.41 1
```

```
timeout xlate 3:00:00
timeout conn 1:00:00 half-closed 0:10:00 udp 0:02:00 icmp 0:00:02
timeout sunrpc 0:10:00 h323 0:05:00 h225 1:00:00 mgcp 0:05:00 mgcp-pat 0:05:00
timeout sip 0:30:00 sip_media 0:02:00 sip-invite 0:03:00 sip-disconnect 0:02:00
timeout sip-provisional-media 0:02:00 uauth 0:05:00 absolute
timeout tcp-proxy-reassembly 0:01:00
timeout floating-conn 0:00:00
no snmp-server location
no snmp-server contact
telnet timeout 5
ssh timeout 5
no threat-detection statistics tcp-intercept
class-map inspection_default
match default-inspection-traffic
policy-map type inspect dns preset_dns_map
parameters
 message-length maximum client auto
 message-length maximum 512
policy-map global_policy
 class inspection_default
  inspect dns preset_dns_map
  inspect ftp
  inspect h323 h225
  inspect h323 ras
  inspect ip-options
  inspect netbios
  inspect rsh
  inspect rtsp
  inspect skinny
  inspect esmtp
  inspect sqlnet
  inspect sunrpc
  inspect tftp
  inspect sip
  inspect xdmcp
service-policy global_policy global
Cryptochecksum:bc9bd98b298c334af9d76007204a043b
: end
```

## **Cisco ASR 9006 configurations:**

```
!! IOS XR Configuration 4.2.0
!! Last configuration change at Mon Jan 14 18:43:43 2013 by admin
hostname VXIaaS-DC-9K-1
logging disable
domain name vxiaas.local
cdp
vrf GT
vrf T1
vrf T2
vrf T3
vrf T4
vrf T5
vrf management
line console
exec-timeout 0 0
length 32
interface Loopback1
description Tenant 1 VRF Loopback
vrf T1
ipv4 address 192.168.10.1 255.255.255.255
interface Loopback2
description Tenant 2 VRF Loopback
vrf T2
```

```
ipv4 address 192.168.20.1 255.255.255.255
interface Loopback3
description Tenant 3 VRF Loopback
vrf T3
ipv4 address 192.168.30.1 255.255.255.255
interface Loopback4
description Tenant 4 VRF Loopback
vrf T4
ipv4 address 192.168.40.1 255.255.255.255
interface Loopback5
description Tenant 5 VRF Loopback
vrf T5
ipv4 address 192.168.50.1 255.255.255.255
interface Loopback8
description Global Tenant VRF Loopback
vrf GT
ipv4 address 192.168.80.1 255.255.255.255
interface MgmtEth0/RSP0/CPU0/0
description MGMT Interface
vrf management
ipv4 address 10.8.66.15 255.255.255.0
interface MgmtEth0/RSP0/CPU0/1
shutdown
interface GigabitEthernet0/1/0/0
description Global Tenant Internet
vrf GT
ipv4 point-to-point
ipv4 address 192.168.200.2 255.255.255.252
interface GigabitEthernet0/1/0/1
shutdown
interface GigabitEthernet0/1/0/2
shutdown
interface GigabitEthernet0/1/0/3
shutdown
interface GigabitEthernet0/1/0/4
shutdown
interface GigabitEthernet0/1/0/5
shutdown
interface GigabitEthernet0/1/0/6
shutdown
interface GigabitEthernet0/1/0/7
shutdown
interface GigabitEthernet0/1/0/8
shutdown
interface GigabitEthernet0/1/0/9
shutdown
interface GigabitEthernet0/1/0/10
shutdown
interface GigabitEthernet0/1/0/11
shutdown
interface GigabitEthernet0/1/0/12
shutdown
interface GigabitEthernet0/1/0/13
shutdown
interface GigabitEthernet0/1/0/14
shutdown
interface GigabitEthernet0/1/0/15
shutdown
interface GigabitEthernet0/1/0/16
shutdown
interface GigabitEthernet0/1/0/17
shutdown
interface GigabitEthernet0/1/0/18
shutdown
```

interface GigabitEthernet0/1/0/19 shutdown interface GigabitEthernet0/1/0/20 shutdown interface GigabitEthernet0/1/0/21 shutdown interface GigabitEthernet0/1/0/22 shutdown interface GigabitEthernet0/1/0/23 shutdown interface GigabitEthernet0/1/0/24 shutdown interface GigabitEthernet0/1/0/25 shutdown interface GigabitEthernet0/1/0/26 shutdown interface GigabitEthernet0/1/0/27 shutdown interface GigabitEthernet0/1/0/28 shutdown interface GigabitEthernet0/1/0/29 shutdown interface GigabitEthernet0/1/0/30 shutdown interface GigabitEthernet0/1/0/31 shutdown interface GigabitEthernet0/1/0/32 shutdown interface GigabitEthernet0/1/0/33 shutdown interface GigabitEthernet0/1/0/34 shutdown interface GigabitEthernet0/1/0/35 shutdown interface GigabitEthernet0/1/0/36 shutdown interface GigabitEthernet0/1/0/37 shutdown interface GigabitEthernet0/1/0/38 shutdown interface GigabitEthernet0/1/0/39 shutdown interface TenGigE0/0/0/0 description VXIaaS-N7K-1 cdp interface TenGigE0/0/0/0.712 description T1 N7K-1 vrf T1 ipv4 point-to-point ipv4 address 10.8.78.2 255.255.255.252 encapsulation dot1q 712 interface TenGigE0/0/0/0.722 description T2 N7K-1 vrf T2 ipv4 point-to-point ipv4 address 10.8.78.34 255.255.255.252 encapsulation dot1q 722 interface TenGigE0/0/0/0.732 description T3 N7K-1 vrf T3 ipv4 point-to-point ipv4 address 10.8.78.66 255.255.255.252 encapsulation dot1q 732 interface TenGigE0/0/0/0.742

```
description T4 N7K-1
vrf T4
ipv4 point-to-point
ipv4 address 10.8.78.98 255.255.255.252
encapsulation dot1q 742
interface TenGigE0/0/0/0.752
description T5 N7K-1
vrf T5
ipv4 point-to-point
ipv4 address 10.8.78.130 255.255.255.252
encapsulation dot1q 752
interface TenGigE0/0/0/0.782
description Global Tenant N7K-1
vrf GT
ipv4 point-to-point
ipv4 address 10.8.78.226 255.255.255.252
encapsulation dot1q 782
interface TenGigE0/0/0/1
description VXIaaS-N1K-2
cdp
interface TenGigE0/0/0/1.714
description T1-N7K-2
vrf T1
ipv4 point-to-point
ipv4 address 10.8.78.10 255.255.255.252
encapsulation dotlg 714
interface TenGigE0/0/0/1.724
description T2-N7K-2
vrf T2
ipv4 point-to-point
ipv4 address 10.8.78.42 255.255.255.252
encapsulation dot1q 724
interface TenGigE0/0/0/1.734
description T3-N7K-2
vrf T3
ipv4 point-to-point
ipv4 address 10.8.78.74 255.255.255.252
 encapsulation dot1q 734
interface TenGigE0/0/0/1.744
description T4-N7K-2
vrf T4
ipv4 point-to-point
ipv4 address 10.8.78.106 255.255.255.252
encapsulation dot1q 744
interface TenGigE0/0/0/1.754
description T5-N7K-2
vrf T5
ipv4 point-to-point
ipv4 address 10.8.78.138 255.255.255.252
encapsulation dot1q 754
interface TenGigE0/0/0/1.784
description GT-N7K-2
vrf GT
ipv4 point-to-point
ipv4 address 10.8.78.234 255.255.255.252
encapsulation dot1q 784
interface TenGigE0/0/0/2
cdp
shutdown
interface TenGigE0/0/0/3
cdp
shutdown
interface TenGigE0/0/0/4
```

description SP-ASR9K-1

```
cdp
interface TenGigE0/0/0/4.511
vrf T1
ipv4 point-to-point
ipv4 address 10.8.2.2 255.255.255.252
encapsulation dot1q 511
interface TenGigE0/0/0/4.521
vrf T2
 ipv4 point-to-point
ipv4 address 10.8.2.10 255.255.255.252
 encapsulation dot1q 521
interface TenGigE0/0/0/4.531
vrf T3
ipv4 point-to-point
ipv4 address 10.8.2.18 255.255.255.252
encapsulation dot1q 531
interface TenGigE0/0/0/4.541
vrf T4
ipv4 point-to-point
ipv4 address 10.8.2.26 255.255.255.252
encapsulation dot1q 541
interface TenGigE0/0/0/4.551
vrf T5
ipv4 point-to-point
ipv4 address 10.8.2.34 255.255.255.252
encapsulation dot1q 551
interface TenGigE0/0/0/5
description SP-ASR9K-2
cdp
interface TenGigE0/0/0/5.513
vrf T1
ipv4 point-to-point
ipv4 address 10.8.2.66 255.255.255.252
encapsulation dot1q 513
interface TenGigE0/0/0/5.523
vrf T2
ipv4 point-to-point
 ipv4 address 10.8.2.74 255.255.255.252
 encapsulation dot1q 523
interface TenGigE0/0/0/5.533
vrf T3
ipv4 point-to-point
ipv4 address 10.8.2.82 255.255.255.252
encapsulation dot1q 533
interface TenGigE0/0/0/5.543
vrf T4
 ipv4 point-to-point
 ipv4 address 10.8.2.90 255.255.255.252
encapsulation dot1q 543
interface TenGigE0/0/0/5.553
vrf T5
ipv4 point-to-point
ipv4 address 10.8.2.98 255.255.255.252
encapsulation dot1q 553
interface TenGigE0/0/0/6
description VXIaaS-ASR9K-2
cdp
interface TenGigE0/0/0/6.716
description T1 ASR9K-2
vrf T1
ipv4 point-to-point
 ipv4 address 10.8.78.17 255.255.255.252
encapsulation dotlg 716
interface TenGigE0/0/0/6.726
```

```
description T2 ASR9K-2
vrf T2
ipv4 point-to-point
ipv4 address 10.8.78.49 255.255.255.252
encapsulation dot1q 726
interface TenGigE0/0/0/6.736
description T3 ASR9K-2
vrf T3
ipv4 point-to-point
ipv4 address 10.8.78.81 255.255.255.252
encapsulation dot1q 736
interface TenGigE0/0/0/6.746
description T4 ASR9K-2
vrf T4
ipv4 point-to-point
ipv4 address 10.8.78.113 255.255.255.252
encapsulation dotlg 746
interface TenGigE0/0/0/6.756
description T5 ASR9K-2
vrf T5
ipv4 point-to-point
ipv4 address 10.8.78.145 255.255.255.252
encapsulation dot1q 756
interface TenGigE0/0/0/6.786
description GT ASR9K-2
vrf GT
ipv4 point-to-point
ipv4 address 10.8.78.241 255.255.255.252
 encapsulation dot1q 786
interface TenGigE0/0/0/7
description VXIaaS-ASR9K-2
cdp
interface TenGigE0/0/0/7.717
description T1 ASR9K-2
vrf T1
ipv4 point-to-point
ipv4 address 10.8.78.21 255.255.255.252
 encapsulation dot1q 716
interface TenGigE0/0/0/7.727
description T2 ASR9K-2
vrf T2
ipv4 point-to-point
ipv4 address 10.8.78.53 255.255.255.252
encapsulation dot1q 726
interface TenGigE0/0/0/7.737
description T3 ASR9K-2
vrf T3
ipv4 point-to-point
ipv4 address 10.8.78.85 255.255.255.252
encapsulation dot1q 736
interface TenGigE0/0/0/7.747
description T4 ASR9K-2
vrf T4
ipv4 point-to-point
ipv4 address 10.8.78.117 255.255.255.252
encapsulation dot1q 746
interface TenGigE0/0/0/7.757
description T5 ASR9K-2
vrf T5
ipv4 point-to-point
ipv4 address 10.8.78.149 255.255.255.252
encapsulation dot1q 756
interface TenGigE0/0/0/7.787
description GT ASR9K-2
```

```
vrf GT
ipv4 point-to-point
ipv4 address 10.8.78.245 255.255.255.252
encapsulation dot1q 786
rd-set 100:110
  end-set
rd-set 200:220
  end-set
rd-set 300:330
  end-set
rd-set 400:440
 end-set
rd-set 500:550
 end-set
rd-set 800:880
 end-set
route-policy all
 pass
 end-policy
route-policy GT-BGP
 pass
 end-policy
route-policy T1-BGP
 pass
  end-policy
route-policy T2-BGP
 pass
  end-policy
route-policy T3-BGP
 pass
  end-policy
route-policy T4-BGP
 pass
  end-policy
route-policy T5-BGP
 pass
  end-policy
route-policy GT-OSPF
 pass
  end-policy
route-policy T1-OSPF
 pass
  end-policy
route-policy T2-OSPF
 pass
  end-policy
route-policy T3-OSPF
 pass
  end-policy
route-policy T4-OSPF
 pass
 end-policy
route-policy T5-OSPF
 pass
 end-policy
router static
vrf management
  address-family ipv4 unicast
   0.0.0/0 10.8.66.1
router ospf VXIaaS
vrf GT
 router-id 8.8.8.1
  auto-cost reference-bandwidth 100000
  default-information originate
```

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redistribute bgp 42 route-policy GT-BGP area O interface Loopback8 network point-to-point passive enable interface TenGigE0/0/0/0.782 network point-to-point neighbor 10.8.78.225 interface TenGigE0/0/0/1.784 network point-to-point neighbor 10.8.78.233 interface TenGigE0/0/0/6.786 network point-to-point neighbor 10.8.78.242 interface TenGigE0/0/0/7.787 network point-to-point neighbor 10.8.78.246 vrf T1 router-id 1.1.1.1 auto-cost reference-bandwidth 100000 default-information originate redistribute bgp 42 route-policy T1-BGP area O interface Loopback1 network point-to-point passive enable interface TenGigE0/0/0/0.712 network point-to-point neighbor 10.8.78.1 interface TenGigE0/0/0/1.714 network point-to-point neighbor 10.8.78.9 interface TenGigE0/0/0/6.716 network point-to-point neighbor 10.8.78.18 interface TenGigE0/0/0/7.717 network point-to-point neighbor 10.8.78.22 vrf T2 router-id 2.2.2.1 auto-cost reference-bandwidth 100000 default-information originate area O interface Loopback2 network point-to-point passive enable interface TenGigE0/0/0/0.722 network point-to-point neighbor 10.8.78.33 interface TenGigE0/0/0/1.724 network point-to-point neighbor 10.8.78.41 interface TenGigE0/0/0/6.726 network point-to-point neighbor 10.8.78.50 interface TenGigE0/0/0/7.727 network point-to-point neighbor 10.8.78.54 vrf T3 router-id 3.3.3.1 auto-cost reference-bandwidth 100000 default-information originate area O

```
interface Loopback3
   network point-to-point
   passive enable
interface TenGigE0/0/0/0.732
   network point-to-point
   neighbor 10.8.78.65
interface TenGigE0/0/0/1.734
   network point-to-point
   neighbor 10.8.78.73
interface TenGigE0/0/0/6.736
   network point-to-point
   neighbor 10.8.78.82
interface TenGigE0/0/0/7.737
   network point-to-point
   neighbor 10.8.78.86
vrf T4
  router-id 4.4.4.1
  auto-cost reference-bandwidth 100000
  default-information originate
  area O
   interface Loopback4
   network point-to-point
   passive enable
interface TenGigE0/0/0/0.742
   network point-to-point
   neighbor 10.8.78.97
interface TenGigE0/0/0/1.744
   network point-to-point
   neighbor 10.8.78.105
interface TenGigE0/0/0/6.746
   network point-to-point
   neighbor 10.8.78.114
interface TenGigE0/0/0/7.747
   network point-to-point
   neighbor 10.8.78.118
vrf T5
  router-id 5.5.5.1
  auto-cost reference-bandwidth 100000
  default-information originate
  area O
   interface Loopback5
   network point-to-point
   passive enable
interface TenGigE0/0/0/0.752
   network point-to-point
   neighbor 10.8.78.129
interface TenGigE0/0/0/1.754
   network point-to-point
   neighbor 10.8.78.137
interface TenGigE0/0/0/6.756
   network point-to-point
   neighbor 10.8.78.146
interface TenGigE0/0/0/7.757
   network point-to-point
   neighbor 10.8.78.150
router bgp 42
address-family ipv4 unicast
address-family vpnv4 unicast
vrf GT
 rd 800:880
 bgp router-id 8.8.8.1
  address-family ipv4 unicast
   redistribute ospf VXIaaS route-policy GT-OSPF
neighbor 192.168.200.1
```

```
remote-as 40
   address-family ipv4 unicast
   route-policy all in
   route-policy all out
vrf T1
  rd 100:110
  bgp router-id 1.1.1.1
  address-family ipv4 unicast
   redistribute ospf VXIaaS route-policy T1-OSPF
neighbor 10.8.2.1
   remote-as 20
   address-family ipv4 unicast
   route-policy all in
   route-policy all out
neighbor 10.8.2.65
   remote-as 20
   address-family ipv4 unicast
   route-policy all in
   route-policy all out
vrf T2
  rd 200:220
  bgp router-id 2.2.2.1
  address-family ipv4 unicast
   redistribute ospf VXIaaS route-policy T2-OSPF
neighbor 10.8.2.9
   remote-as 20
   address-family ipv4 unicast
   route-policy all in
   route-policy all out
neighbor 10.8.2.73
   remote-as 20
   address-family ipv4 unicast
   route-policy all in
   route-policy all out
vrf T3
  rd 300:330
  bgp router-id 3.3.3.1
  address-family ipv4 unicast
   redistribute ospf VXIaaS route-policy T3-OSPF
neighbor 10.8.2.17
   remote-as 20
   address-family ipv4 unicast
   route-policy all in
   route-policy all out
neighbor 10.8.2.81
   remote-as 20
   address-family ipv4 unicast
    route-policy all in
   route-policy all out
vrf T4
  rd 400:440
  bgp router-id 4.4.4.1
  address-family ipv4 unicast
   redistribute ospf VXIaaS route-policy T4-OSPF
neighbor 10.8.2.25
   remote-as 20
   address-family ipv4 unicast
    route-policy all in
   route-policy all out
neighbor 10.8.2.89
   remote-as 20
   address-family ipv4 unicast
    route-policy all in
```

route-policy all out

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```
vrf T5
  rd 500:550
 bgp router-id 5.5.5.1
  address-family ipv4 unicast
   redistribute ospf VXIaaS route-policy T5-OSPF
neighbor 10.8.2.33
   remote-as 20
   address-family ipv4 unicast
   route-policy all in
    route-policy all out
neighbor 10.8.2.97
   remote-as 20
   address-family ipv4 unicast
   route-policy all in
    route-policy all out
ssh server vrf management
end
!! IOS XR Configuration 4.2.0
!! Last configuration change at Mon Jan 14 18:48:08 2013 by admin
hostname VXIaaS-DC-9K-2
logging disable
domain name vxiaas.local
cdp
vrf GT
vrf T1
vrf T2
vrf T3
vrf T4
vrf T5
vrf management
line console
exec-timeout 0 0
length 23
interface Loopback1
 description Tenant 1 VRF Loopback
 vrf T1
 ipv4 address 192.168.10.2 255.255.255.255
interface Loopback2
 description Tenant 2 VRF Loopback
vrf T2
ipv4 address 192.168.20.2 255.255.255.255
interface Loopback3
description Tenant 3 VRF Loopback
vrf T3
 ipv4 address 192.168.30.2 255.255.255.255
interface Loopback4
 description Tenant 4 VRF Loopback
vrf T4
ipv4 address 192.168.40.2 255.255.255.255
interface Loopback5
description Tenant 5 VRF Loopback
vrf T5
 ipv4 address 192.168.50.2 255.255.255.255
interface Loopback8
description Global Tenant VRF Loopback
 vrf GT
 ipv4 address 192.168.80.2 255.255.255.255
interface MgmtEth0/RSP0/CPU0/0
description MGMT Interface
vrf management
 ipv4 address 10.8.66.16 255.255.255.0
interface MgmtEth0/RSP0/CPU0/1
 shutdown
```

interface GigabitEthernet0/1/0/0 description Global Tenant Internet vrf GT ipv4 point-to-point ipv4 address 192.168.200.6 255.255.255.252 interface GigabitEthernet0/1/0/1 shutdown interface GigabitEthernet0/1/0/2 shutdown interface GigabitEthernet0/1/0/3 shutdown interface GigabitEthernet0/1/0/4 shutdown interface GigabitEthernet0/1/0/5 shutdown interface GigabitEthernet0/1/0/6 shutdown interface GigabitEthernet0/1/0/7 shutdown interface GigabitEthernet0/1/0/8 shutdown interface GigabitEthernet0/1/0/9 shutdown interface GigabitEthernet0/1/0/10 shutdown interface GigabitEthernet0/1/0/11 shutdown interface GigabitEthernet0/1/0/12 shutdown interface GigabitEthernet0/1/0/13 shutdown interface GigabitEthernet0/1/0/14 shutdown interface GigabitEthernet0/1/0/15 shutdown interface GigabitEthernet0/1/0/16 shutdown interface GigabitEthernet0/1/0/17 shutdown interface GigabitEthernet0/1/0/18 shutdown interface GigabitEthernet0/1/0/19 shutdown interface GigabitEthernet0/1/0/20 shutdown interface GigabitEthernet0/1/0/21 shutdown interface GigabitEthernet0/1/0/22 shutdown interface GigabitEthernet0/1/0/23 shutdown interface GigabitEthernet0/1/0/24 shutdown interface GigabitEthernet0/1/0/25 shutdown interface GigabitEthernet0/1/0/26 shutdown interface GigabitEthernet0/1/0/27 shutdown interface GigabitEthernet0/1/0/28 shutdown interface GigabitEthernet0/1/0/29 shutdown interface GigabitEthernet0/1/0/30

shutdown interface GigabitEthernet0/1/0/31 shutdown interface GigabitEthernet0/1/0/32 shutdown interface GigabitEthernet0/1/0/33 shutdown interface GigabitEthernet0/1/0/34 shutdown interface GigabitEthernet0/1/0/35 shutdown interface GigabitEthernet0/1/0/36 shutdown interface GigabitEthernet0/1/0/37 shutdown interface GigabitEthernet0/1/0/38 shutdown interface GigabitEthernet0/1/0/39 shutdown interface TenGigE0/0/0/0 description VXIaaS-N1K-1 cdp interface TenGigE0/0/0/0.713 description T1 N7K-1 vrf T1 ipv4 point-to-point ipv4 address 10.8.78.6 255.255.255.252 encapsulation dot1g 713 interface TenGigE0/0/0/0.723 description T2 N7K-1 vrf T2 ipv4 point-to-point ipv4 address 10.8.78.38 255.255.255.252 encapsulation dot1q 723 interface TenGigE0/0/0/0.733 description T3 N7K-1 vrf T3 ipv4 point-to-point ipv4 address 10.8.78.70 255.255.255.252 encapsulation dot1q 733 interface TenGigE0/0/0/0.743 description T4 N7K-1 vrf T4 ipv4 point-to-point ipv4 address 10.8.78.102 255.255.255.252 encapsulation dot1q 743 interface TenGigE0/0/0/0.753 description T5 N7K-1 vrf T5 ipv4 point-to-point ipv4 address 10.8.78.134 255.255.255.252 encapsulation dot1q 753 interface TenGigE0/0/0/0.783 description Global Tenant N7K-1 vrf GT ipv4 point-to-point ipv4 address 10.8.78.230 255.255.255.252 encapsulation dot1q 783 interface TenGigE0/0/0/1 description VXIaaS-N1K-2 cdp interface TenGigE0/0/0/1.715 description T1 N7K-2 vrf T1

```
ipv4 point-to-point
ipv4 address 10.8.78.14 255.255.255.252
encapsulation dot1q 715
interface TenGigE0/0/0/1.725
description T2 N7K-2
vrf T2
ipv4 point-to-point
ipv4 address 10.8.78.46 255.255.255.252
encapsulation dot1q 725
interface TenGigE0/0/0/1.735
description T3 N7K-2
vrf T3
ipv4 point-to-point
ipv4 address 10.8.78.78 255.255.255.252
encapsulation dot1q 735
interface TenGigE0/0/0/1.745
description T4 N7K-2
vrf T4
ipv4 point-to-point
ipv4 address 10.8.78.110 255.255.255.252
encapsulation dot1q 745
interface TenGigE0/0/0/1.755
description T5 N7K-2
vrf T5
ipv4 point-to-point
ipv4 address 10.8.78.142 255.255.255.252
encapsulation dot1q 755
interface TenGigE0/0/0/1.785
description GT-N7K-2
vrf GT
ipv4 point-to-point
ipv4 address 10.8.78.238 255.255.255.252
encapsulation dot1q 785
interface TenGigE0/0/0/2
cdp
shutdown
interface TenGigE0/0/0/3
cdp
shutdown
interface TenGigE0/0/0/4
description SP-ASR9K-1
cdp
interface TenGigE0/0/0/4.512
vrf T1
ipv4 point-to-point
ipv4 address 10.8.2.6 255.255.255.252
encapsulation dot1q 512
interface TenGigE0/0/0/4.522
vrf T2
ipv4 point-to-point
ipv4 address 10.8.2.14 255.255.255.252
encapsulation dot1q 522
interface TenGigE0/0/0/4.532
vrf T3
ipv4 point-to-point
ipv4 address 10.8.2.22 255.255.255.252
 encapsulation dot1q 532
interface TenGigE0/0/0/4.542
vrf T4
ipv4 point-to-point
ipv4 address 10.8.2.30 255.255.255.252
encapsulation dot1q 542
interface TenGigE0/0/0/4.552
vrf T5
```

```
ipv4 point-to-point
 ipv4 address 10.8.2.38 255.255.255.252
encapsulation dot1q 552
interface TenGigE0/0/0/5
description SP-ASR9K-2
cdp
interface TenGigE0/0/0/5.514
vrf T1
ipv4 point-to-point
ipv4 address 10.8.2.70 255.255.255.252
 encapsulation dot1q 514
interface TenGigE0/0/0/5.524
vrf T2
ipv4 point-to-point
ipv4 address 10.8.2.78 255.255.255.252
encapsulation dot1q 524
interface TenGigE0/0/0/5.534
vrf T3
ipv4 point-to-point
ipv4 address 10.8.2.86 255.255.255.252
encapsulation dot1q 534
interface TenGigE0/0/0/5.544
vrf T4
ipv4 point-to-point
ipv4 address 10.8.2.94 255.255.255.252
encapsulation dot1q 544
interface TenGigE0/0/0/5.554
vrf T5
 ipv4 point-to-point
ipv4 address 10.8.2.102 255.255.255.252
encapsulation dot1q 554
interface TenGigE0/0/0/6
description VXIaaS-ASR9K-1
cdp
interface TenGigE0/0/0/6.716
description T1 ASR9K-1
vrf T1
ipv4 point-to-point
 ipv4 address 10.8.78.18 255.255.255.252
encapsulation dot1q 716
interface TenGigE0/0/0/6.726
description T2 ASR9K-1
vrf T2
ipv4 point-to-point
ipv4 address 10.8.78.50 255.255.255.252
encapsulation dot1q 726
interface TenGigE0/0/0/6.736
description T3 ASR9K-1
vrf T3
ipv4 point-to-point
ipv4 address 10.8.78.82 255.255.255.252
encapsulation dot1q 736
interface TenGigE0/0/0/6.746
description T4 ASR9K-1
vrf T4
ipv4 point-to-point
ipv4 address 10.8.78.114 255.255.255.252
encapsulation dot1q 746
interface TenGigE0/0/0/6.756
description T5 ASR9K-1
vrf T5
ipv4 point-to-point
ipv4 address 10.8.78.146 255.255.255.252
encapsulation dot1q 756
```

```
interface TenGigE0/0/0/6.786
description GT ASR9K-1
vrf GT
ipv4 point-to-point
ipv4 address 10.8.78.242 255.255.255.252
 encapsulation dot1q 786
interface TenGigE0/0/0/7
description VXIaaS-ASR9K-1
cdp
interface TenGigE0/0/0/7.717
 description T1 ASR9K-1
vrf T1
ipv4 point-to-point
 ipv4 address 10.8.78.22 255.255.255.252
 encapsulation dot1q 716
interface TenGigE0/0/0/7.727
description T2 ASR9K-1
vrf T2
 ipv4 point-to-point
 ipv4 address 10.8.78.54 255.255.255.252
 encapsulation dot1q 726
interface TenGigE0/0/0/7.737
description T3 ASR9K-1
vrf T3
ipv4 point-to-point
ipv4 address 10.8.78.86 255.255.255.252
 encapsulation dot1q 736
interface TenGigE0/0/0/7.747
 description T4 ASR9K-1
vrf T4
ipv4 point-to-point
ipv4 address 10.8.78.118 255.255.255.252
 encapsulation dot1q 746
interface TenGigE0/0/0/7.757
description T5 ASR9K-1
vrf T5
 ipv4 point-to-point
 ipv4 address 10.8.78.150 255.255.255.252
 encapsulation dot1q 756
interface TenGigE0/0/0/7.787
description GT ASR9K-1
vrf GT
ipv4 point-to-point
ipv4 address 10.8.78.246 255.255.255.252
 encapsulation dot1q 786
rd-set 100:110
  end-set
rd-set 200:220
 end-set
rd-set 300:330
 end-set
rd-set 400:440
 end-set
rd-set 500:550
 end-set
rd-set 800:880
 end-set
route-policy all
 pass
 end-policy
route-policy GT-BGP
 pass
  end-policy
```

route-policy T1-BGP

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pass end-policy route-policy T2-BGP pass end-policy route-policy T3-BGP pass end-policy route-policy T4-BGP pass end-policy route-policy T5-BGP pass end-policy route-policy GT-OSPF pass end-policy route-policy T1-OSPF pass end-policy route-policy T2-OSPF pass end-policy route-policy T3-OSPF pass end-policy route-policy T4-OSPF pass end-policy route-policy T5-OSPF pass end-policy router static vrf management address-family ipv4 unicast 0.0.0/0 10.8.66.1 router ospf VXIaaS redistribute bgp 42 route-policy GT-BGP vrf GT router-id 8.8.8.2 auto-cost reference-bandwidth 100000 default-information originate area O interface Loopback8 network point-to-point passive enable interface TenGigE0/0/0/0.783 network point-to-point neighbor 10.8.78.229 interface TenGigE0/0/0/1.785 network point-to-point neighbor 10.8.78.237 interface TenGigE0/0/0/6.786 network point-to-point neighbor 10.8.78.241 interface TenGigE0/0/0/7.787 network point-to-point neighbor 10.8.78.245 vrf T1 router-id 1.1.1.2 auto-cost reference-bandwidth 100000 default-information originate redistribute bgp 42 route-policy T1-BGP area O

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interface Loopback1 network point-to-point passive enable interface TenGigE0/0/0/0.713 network point-to-point neighbor 10.8.78.5 interface TenGigE0/0/0/1.715 network point-to-point neighbor 10.8.78.13 interface TenGigE0/0/0/6.716 network point-to-point neighbor 10.8.78.17 interface TenGigE0/0/0/7.717 network point-to-point neighbor 10.8.78.21 vrf T2 router-id 2.2.2.2 auto-cost reference-bandwidth 100000 default-information originate area O interface Loopback2 network point-to-point passive enable interface TenGigE0/0/0/0.723 network point-to-point interface TenGigE0/0/0/1.725 network point-to-point neighbor 10.8.78.45 interface TenGigE0/0/0/6.726 network point-to-point neighbor 10.8.78.49 interface TenGigE0/0/0/7.727 network point-to-point neighbor 10.8.78.53 vrf T3 router-id 3.3.3.2 auto-cost reference-bandwidth 100000 default-information originate area O interface Loopback3 network point-to-point passive enable interface TenGigE0/0/0/0.733 network point-to-point neighbor 10.8.78.69 interface TenGigE0/0/0/1.735 network point-to-point neighbor 10.8.78.77 interface TenGigE0/0/0/6.736 network point-to-point neighbor 10.8.78.81 interface TenGigE0/0/0/7.737 network point-to-point neighbor 10.8.78.85 vrf T4 router-id 4.4.4.2 auto-cost reference-bandwidth 100000 default-information originate area O interface Loopback4 network point-to-point passive enable interface TenGigE0/0/0/0.743

network point-to-point

```
neighbor 10.8.78.101
   interface TenGigE0/0/0/1.745
   network point-to-point
   neighbor 10.8.78.109
   interface TenGigE0/0/0/6.746
   network point-to-point
   neighbor 10.8.78.113
   interface TenGigE0/0/0/7.747
   network point-to-point
   neighbor 10.8.78.117
 vrf T5
  router-id 5.5.5.2
  auto-cost reference-bandwidth 100000
  default-information originate
  area O
  interface Loopback5
   network point-to-point
   passive enable
   interface TenGigE0/0/0/0.753
   network point-to-point
   neighbor 10.8.78.133
   interface TenGigE0/0/0/1.755
   network point-to-point
   neighbor 10.8.78.141
   interface TenGigE0/0/0/6.756
   network point-to-point
   neighbor 10.8.78.145
   interface TenGigE0/0/0/7.757
   network point-to-point
   neighbor 10.8.78.149
router bgp 42
address-family ipv4 unicast
address-family vpnv4 unicast
vrf GT
 rd 800:880
 bgp router-id 8.8.8.2
  address-family ipv4 unicast
  redistribute ospf VXIaaS route-policy GT-OSPF
  neighbor 192.168.200.5
  remote-as 40
   address-family ipv4 unicast
   route-policy all in
   route-policy all out
 vrf T1
 rd 100:110
 bgp router-id 1.1.1.2
  address-family ipv4 unicast
  redistribute ospf VXIaaS route-policy T1-OSPF
  neighbor 10.8.2.5
  remote-as 20
   address-family ipv4 unicast
   route-policy all in
   route-policy all out
  neighbor 10.8.2.69
  remote-as 20
   address-family ipv4 unicast
    route-policy all in
   route-policy all out
 vrf T2
 rd 200:220
 bgp router-id 2.2.2.2
  address-family ipv4 unicast
   redistribute ospf VXIaaS route-policy T2-OSPF
  neighbor 10.8.2.13
```

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```
remote-as 20
   address-family ipv4 unicast
   route-policy all in
   route-policy all out
  neighbor 10.8.2.77
  remote-as 20
  address-family ipv4 unicast
   route-policy all in
   route-policy all out
vrf T3
  rd 300:330
 bgp router-id 3.3.3.2
 address-family ipv4 unicast
  redistribute ospf VXIaaS route-policy T3-OSPF
 neighbor 10.8.2.21
  remote-as 20
  address-family ipv4 unicast
   route-policy all in
   route-policy all out
  neighbor 10.8.2.85
  remote-as 20
  address-family ipv4 unicast
   route-policy all in
   route-policy all out
vrf T4
 rd 400:440
 bgp router-id 4.4.4.2
  address-family ipv4 unicast
  redistribute ospf VXIaaS route-policy T4-OSPF
  neighbor 10.8.2.29
  remote-as 20
  address-family ipv4 unicast
   route-policy all in
   route-policy all out
  neighbor 10.8.2.93
  remote-as 20
  address-family ipv4 unicast
   route-policy all in
   route-policy all out
vrf T5
 rd 500:550
 bgp router-id 5.5.5.2
 address-family ipv4 unicast
  redistribute ospf VXIaaS route-policy T5-OSPF
 neighbor 10.8.2.37
  remote-as 20
  address-family ipv4 unicast
   route-policy all in
   route-policy all out
  neighbor 10.8.2.101
  remote-as 20
  address-family ipv4 unicast
   route-policy all in
   route-policy all out
ssh server vrf management
end
```

## **8 Related Documents**

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The following links provide more detailed information regarding:

- Cisco VMDC
- Cisco UCS
- Cisco Nexus Switch
- Cisco Catalyst 6500 Switch
- Cisco ASR
- Cisco ASA
- Desktone

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