Unify OpenScape
Solution Set V10

Virtual Machine Resourcing and Configuration Guide

Service Documentation

A31003-S11A0-S100-40-7620

Atos

Provide feedback to further optimize this document to edoku@atos.net.

As reseller please address further presales related questions to the responsible presales organization at Unify or at your distributor. For specific technical inquiries you may use the support knowledgebase, raise - if a software support contract is in place - a ticket via our partner portal or contact your distributor.

Our Quality and Environmental Management Systems are implemented according to the requirements of the ISO9001 and ISO14001 standards and are certified by an external certification company.

Reference No.: A31003-S11A0-S100-40-7620

atos.net

Contents

1 Change Log

Issue	Description
Issue 1	First issue for V10. The base for this document was Issue 57 of the V9 VM Guide.
Issue 2	Updated guide to include Fault Management V10 and V11
Issue 3	Updated vDisk size for OpenScape Composer
Issue 4	Removed all references to SLES 11
Issue 5	Removed chapter 5.8 CDSS
Issue 6	Updated entries regarding OpenScape 4000 V10
Issue 7	Updated vCPU reservation guidelines
Issue 8	Updated chapter 5.20 OpenScape Voice
Issue 9	Updated chapter 5.19 Openfire Server
Issue 10	Created sub-chapters 5.13.1 and 5.13.2 about OpenScape Enterprise Express V9 and V10
Issue 11	Updated chapter 3.3 Supported VMware vSphere Versions with ESXi V7.0 and OpenScape 4000 V10 R0
Issue 12	Updated for V10R1, chapters: - 5.7 OpenScape Branch - 5.17 OpenScape Session Border Controller (SBC)
Issue 13	Updated 3.3 Supported VMware vSphere Versions, about virtualization with ESXi 7.0 (HW-Vers. 11)
Issue 14	Created sub-chapter 3.3.1 General Statement and updated table in 3.3.2 Supported VMware vSphere Versions
Issue 15	Updated format and subchapters of chapter 3.3 Supported VMware vSphere Versions with ESXi V7.0
Issue 16	Restructuring
Issue 17	SBC/OSB V10R1 updates
Issue 18	OS4K V10R1 updates and MSBF
Issue 19	Added important notice in chapter 5.20 OpenScape Voice
Issue 20	Addition of First Response section and Rebranding
Issue 21	Updated ESXi compability for OpenScape Branch, SBC and OpenScape Voice
Issue 22	OSCC V11 update for Windows Server support and added references to SPECint2017
Issue 23	Update chapter 5.4 OpenScape 4000 with SLES 15 SP3 (64 bit) plus updates for V10R1. Remove information about Physical CPU requirement from chapter 5.4 OpenScape 4000. Create sub-chapters 5.5.1 OpenScape 4000 Manager V10R0 and 5.5.2 OpenScape 4000 Manager V10R1.
Issue 24	Minor updates in sub-chapter 5.5.2 OpenScape 4000 Manager V10R1.
Issue 25	Update chapter 5.4 OpenScape 4000 with Quorum no longer supported for V1OR1 or higher
Issue 26	Updated chapter 3.3.1 and 4.1 about information regarding ESXi 7.0 in regards to OSV
Issue 27	Update the operating system information in chapter 5.

Issue	Description
Issue 28	Update chapter 5.28.1 with information about OpenScape Contact Center V10. Update chapter 5.28.2 with information about OpenScape Contact Center V11.
Issue 29	Update chapter 5.11.3 with information about OpenScape Contact Center V10 Main Server and Application Server. Update chapter 5.11.4 with information about OpenScape Contact Center V11 Main Server and Application Server.
Issue 30	Update chapter 5.4 OpenScape 4000 with information hints [3] and [4].
Issue 31	Update chapter 5.10 OpenScape Concierge with information about General Product Info.
Issue 32	Updated chapter 3.3.1 and 4.1 about information regarding ESXi 7.0 in regards to OSV
Issue 33	Updated chapter 5.26 OpenScape Xpressions with version information (OpenScape Xpressions V7 R1 FR5)
Issue 34	Updated chapters 2, 3.3.1, 3.3.2, 3.4, 5.12, 5.11.1, 5.11.2 with information about OpenScape Contact Center and OpenScape Contact Media Center.
Issue 35	Updated chapters 5.7 OpenScape Branch and 5.18 OpenScape Session Border Controller (SBC) with information about memory size.
Issue 36	Updated chapter 3.3.1 Supported Appliances with information about the supported hardware versions. Updated chapters 5.7 OpenScape Branch and 5.18 OpenScape SBC OpenScape Branch with information about vCPU/vCPU Reserv.
Issue 37	Updated chapter 5.23 OpenScape Web Collaboration with the supported operating systems. Updated chapter 5.4 OpenScape 4000 with information about Quorum.
Issue 38	Updated chapter 6.3 OpenScape Media Service Bridge Function (MSBF)
Issue 39	Updated chapter 5.11 OpenScape Contact Center. Added chapter 2.1 Acronyms. Updated links/wording in chapters 3.1, 3.2, 3.3, 3.5, 4.1, 4.3.2, 4.3.3, 4.3.5, 5.20, 5.21.
Issue 40	Updated Chapter 3.3.1 Supported Appliances

1.1 Open Issues

1) For each of the products shown in Section 5, the specific deployment model and Call Model used to determine the required virtual machine resource information is required to be provided. At a high level – the deployment model and the Call Model that corresponds to these resourcing figures, i.e., for OSV it may be 20% keyset, CAC enabled, 100% of subscribers with TLS, two CSTA applications, and 3.5 BHCA per user.

2 Objective and Scope

The Objective of this document is to provide a consolidated approach to resource and configure virtual machines that will host Unify applications.

The Scope is reflected by the following product list that supports virtualization in Solution Set V10:

Product	Version	Notes
HiPath CAP Management	V3.0 SMR13	
HiPath QoS Management	V1 R7	
HiPath User Management	V3 R1	
OpenScape 4000	V10	
OpenScape 4000 Manager	V10	
OpenScape Accounting	V4	
OpenScape Branch	V10	
OpenScape Common Management Portal (CMP) & Assistants	V10	
OpenScape Composer	V2	
OpenScape Concierge	V4 Rx	
OpenScape Contact Center	V10, V11	
OpenScape Contact Media Service	V10, V11	
OpenScape Deployment Server (DLS)	V10	
OpenScape Enterprise Express (OSEE)	V9, V10	
OpenScape Fault Management	V9, V10, V11	
OpenScape Media Server	V10	
OpenScape Mobile Client Façade Server (MCFS)	V7	
OpenScape Controller (SBC)	V10	
OpenScape UC Application	V10	
OpenScape UC Application – OpenFire Server	V7	
OpenScape Voice	V10	
OpenScape Voice Survival Authority (SA)	V10	
OpenScape Web Collaboration	V7	
OpenScape Xpert	V6 R1	
OpenScape Xpressions	V7	
SESAP SW Suite	V2	

2.1 Acronyms

In this document the following acronyms are used:

Acronym	Meaning
ALI	Advanced Locking ID
API	Application Programming Interface
BCF	OpenScape Border Controller Function
BHCA	Busy Hour Call Attempts
BoM	Bill of Materials
CAC	Carrier Access Code
CMP	Common Management Platform
CPU	Central Processing Unit
CSL	Customer Solution Lab
CSTA	Computer Supported Telecommunications Applications
DLS	OpenScape Deployment Server
DNS	Domain Name System
DPM	Distributed Power Management
DRS	Distributed Resource Scheduler
EVC	Enhanced vMotion Compatibility Mode
FT	Fault Tolerance
HA	High Availability
HD	Hard Disk
HT	Hyper-Threading
HW	Hardware
IOPS	Input/output operations per second
IP	Internet Protocol
KB	Knowledge Base
LAN	Local Area Network
MAC	Media Access Control
Master TT	Master Trading Turret
MCFS	OpenScape Mobile Client Façade Server
MLC	Multi Line Controller
MSBF	OpenScape Media Service Bridge Function
NAT	Network Address Translation
NIC	Network Interface Card

Acronym	Meaning
NW	Network
OS	Operating System
OS4K	OpenScape 4000
OSB	OpenScape Branch
OSCAR	OpenScape Alarm Response
OSCC	OpenScape Contact Center
OSEE	OpenScape Enterprise Express
OSV	OpenScape Voice
PSAP	Public Safety Answering Point
PSR	Product Specific Rules
PSS	OpenScape Policy Store Service
QoS	Quality of Service
RAM	Random Access Memory
RTP	Real-Time Transport Protocol
SA	Survivable Authority
SAN	Storage Area Network
SBC	OpenScape Session Border Controller
SCSI	Small Computer System Interface
SESAP	Secured Enterprise Service and Administration Platform
SIP	Session Initiation Protocol
SM	System Manager
SRM	Site Recovery Manager
SSO	Smart Switch Over
SSP	SIP Service Provider
SW	Software
TLS	Transport Layer Security
UC	OpenScape Unified Commumications
vApp	Virtual Appliance
vCPUs	virtual CPUs
VDP	VMware Data Protection
VDR	VMware Data Recovery
vHD	Virtual Hard Disk
VM	Virtual Machine
vNIC	Virtual Network Interface

Acronym	Meaning
vRAM	Virtual Memory
WAN	Wide Area Network
XPR	OpenScape Xpressions

3 Virtualized OpenScape UC Suite

3.1 Advantages of Virtualization

The most important features provided by virtualization are the reduced number of servers and the capability of our solution to be hardware agnostic.

Therefore OpenScape UC Suite operation in a virtual environment enables the following capabilities:

- Server Consolidation

The applications and virtual machines deployed onto a VMware host can use different guest operating systems, i.e. OpenScape Voice (Linux) and OpenScape Concierge (Windows) can both be deployed onto the same VMware host and share its physical resources.

- Hardware Independence

Having many hardware server vendors and models in a Data Center environment adds complexity and cost to the operation, therefore Unify's customers often look to standardize their IT hardware infra-structure.Virtualization allows customers to deploy Unify applications onto any hardware platform, assuming it has been certified by VMware and it meets the resource requirements of the application, as described in this document.

Virtualization further enables OpenScape UC Suite to:

- Improve our staging concept
- Enable the "pay as you grow" concept for hardware investment
- Implement high-availability for all solution components
- Decrease installation costs

3.2 VMware vSphere – Info and References

For a description of VMware vSphere V5 Virtualization Basics, please follow the link below.It provides an introduction to virtualization, and to its benefits.

- `https://docs.vmware.com/en/VMware-vSphere/index.html`

The list of the certified hardware with VMware hypervisor can be found here:

- `http://www.vmware.com/resources/compatibility/search.php`

For information on the different licensing and packaging of the different VMware editions please see the following:

- https://www.vmware.com/content/dam/digitalmarketing/vmware/en/pdf/whitepaper/vmware-vsphere_pricing-white-paper.pdf

Some important factors to consider when deciding license edition are below.

- What VMware features are required (vMotion, HA, FT, DRS/DPM)
- Max number of vCPUs (virtual CPUs) required per VM
- Max amount of vRAM allowed per ESXi Host (sum of vRAM for all VMs in a host)
- Number of ESXi hosts
- Number of CPUs sockets per server

More information on the Essentials and Essentials plus packages can be found at:

- https://store-us.vmware.com/products/data-center-virtualization-cloud-infrastructure.html#topproducts

More information on the Standard, Advanced, Enterprise and Enterprise plus packages can be found at:

- https://www.vmware.com/products/vsphere.html#compare-editions
- https://www.vmware.com/content/dam/digitalmarketing/vmware/en/pdf/whitepaper/vmware-vsphere_pricing-white-paper.pdf

Further information on the vSphere features can be found at:

- https://www.vmware.com/products/vsphere.html#features

Further information on SAN concepts can be found at:

- https://www.vmware.com/topics/glossary/content/storage-area-network-san.html

3.3 Supported VMware vSphere Versions

As a general rule there is no dependency on the ESXi version or HW version for all products that are applications (not appliances).

Appliances:

These are the products of OpenScape Portfolio that are delivered along with the operating system, like OSV, SBC and OSB.

Applications:

The rest of the OpenScape Portfolio products, are referred to as applications. Application products like UC, DLS or OpenScape Contact Center have no dependency on the ESXi versions or VM HW versions.

3.3.1 Supported Appliances

The following information applies to appliances:

VM Compatibility:

To make sure that your Operating system is supported by your ESXi Version you can find details about VMware software compatibility in the following link:

https://www.vmware.com/resources/compatibility/search.php?deviceCategory=software

VM Lifecycle Support:

The supported VMware vSphere versions for all products that are not provided as appliances, are bound to the VMware software lifecycle. For more information regarding supported versions please refer to:

https://lifecycle.vmware.com/#/

Hardware version Compatibility:

The same as above applies for VM HW versions. Any VM HW version (of products that are NOT provided as appliances) could be used, based on your ESXi version. For a list of the supported and compatible virtual machine hardware versions in VMware vSphere refer to:

`https://kb.vmware.com/kb/2007240`

For the rest of the products that are provided as appliances, please refer to the following table:

Virtualized OpenScape UC Suite
Supported VMware vSphere Versions

	Product Version	ESXi V6.0	ESXi V6.5	ESXi V6.7	ESXi V7.0	ESXi V8.0
OpenScape 4000	**V8**	**YES**	**YES**	**YES**	**YES**	
	V10 R0	**NO**	**YES**	**YES**	**YES**	
	Supported HW Version(s)	9	9	9	9	
	V10 R1	**NO**	**YES**	**YES**	**YES**	
	Supported HW Version(s)		13	13	13	
OpenScape 4000 Manager	**V8**	**YES**	**YES**	**YES**	**YES**	
	V10 R0	**YES**	**YES**	**YES**	**YES**	
	Supported HW Version(s)	9,10,11	9,10,11,13	9,10,11,13,14	9,10,11,13,14	
	V10 R1	**NO**	**YES**	**YES**	**YES**	
	Supported HW Version(s)		13	13	13	
OpenScape Branch	**V9**	**YES**	**YES**	**YES**	**YES**	
	V10	**YES**	**YES**	**YES**	**YES**	
	Supported HW Version(s)	10,11	10,11,13	10,11,13	10,11,13	
	V10 R1, V10 R2	**YES**	**YES**	**YES**	**YES**	
	Supported HW Version(s)	10,11	10,11,13	10,11,13,14	10,11,13,14, 15, 17,18,19	
	V10R3	**YES**	**YES**	**YES**	**YES**	**YES**
	Supported HW Version(s)	10,11	10,11,13	10,11,13,14	10,11,13,14, 15, 17,18,19	10,11,13,14, 15,17,18,19,20
OpenScape SBC	**V9**	**YES**	**YES**	**YES**	**YES**	
	V10	**YES**	**YES**	**YES**	**YES**	
	Supported HW Version(s)	10,11	10,11,13	10,11,13	10,11,13	
	V10 R1 , V10 R2	**YES**	**YES**	**YES**	**YES**	
	Supported HW Version(s)	10,11	10,11,13	10,11,13,14	10,11,13,14, 15, 17,18,19	
	V10R3	**YES**	**YES**	**YES**	**YES**	**YES**
	Supported HW Version(s)	10,11	10,11,13	10,11,13,14	10,11,13,14, 15, 17,18,19	10,11,13,14, 15,17,18,19,20
OpenScape Voice	**V9**	**YES**	**YES**	**YES**	**YES**	
	V10	**YES**	**YES**	**YES**	**YES**	
	Supported HW Version(s)	10,11	10,11,13	10,11,13	10,11,13,19[1]	

	Product Version	ESXi V6.0	ESXi V6.5	ESXi V6.7	ESXi V7.0	ESXi V8.0
OpenScape Contact Media Service	**V10**	**YES**	**YES**	**YES**	**YES**	
	V11	**YES**	**YES**	**YES**	**YES**	
	Supported HW Version(s)	10,11	10,11,13	10,11,13,14	10,11,13,14, 15,17,18,19	

1 HW Versions 14-18 are allowed, however please note that support for VMware related issues is provided for highest verified HW version 19 only, although no issues are known for versions 14-18

3.3.2 Supported Applications

Product - Application	VMware ESXi / HW Versions
OpenScape CMP / Assistants	No dependency to the ESXi version or HW version INFO: Please refer to chapter 3.2 VMware vSphere – Info and References
OpenScape Composer	
OpenScape Contact Center	
OpenScape DLS	
OpenScape Media Server	
OpenScape Mobile Façade Server	
OpenScape UC Application	
OpenScape UC Application – Openfire Server	
OpenScape Voice Survival Authority (SA)	
HiPath CAP Management	
OpenScape Concierge	
OpenScape Xpert	
OpenScape Accounting	
OpenScape Fault Management	

3.4 Supported VMware vSphere Features

OpenScape Solution Set V8	vMotion	HA	FT	SRM	vStorage-APIs for Data Protection	VMware-Tools	EVC	vCloud Director
HiPath CAP Management	Y	Y	N	Y	Y	Y	Y	N
HiPath QoS Management	Y	Y	N	Y	Y	Y	Y	N
HiPath User Management	Y	Y	N	Y	Y	Y	Y	N
OpenScape 4000	Y	Y	N	N	Y	Y	Y*	N
OpenScape 4000 Manager	Y	Y	N	Y	Y	Y	Y	N

OpenScape Solution Set V8	vMotion	HA	FT	SRM	vStorage-APIs for Data Protection	VMware-Tools	EVC	vCloud Director
OpenScape 4000 SoftGate	Y	Y	N	Y	Y	Y	Y	N
OpenScape Accounting	Y	Y	N	Y	Y	Y	Y	N
OpenScape Branch	Y	Y	N	N	N	Y	Y	N
OpenScape Contact Center	Y	Y	N	Y	N	Y	Y	N
OpenScape Contact Media Service	Y	Y	N	Y	N	N	Y	N
OpenScape CMP & Assistants	Y	Y	N	PSR	N	Y	Y	N
OpenScape Composer	Y	Y	N	PSR	N	Y	Y	N
OpenScape Concierge	Y	Y	N	Y	Y	Y	Y	N
OpenScape DLS	Y	Y	N	PSR	N	Y	Y	N
OpenScape Fault Management	Y	Y	N	Y	Y	Y	Y	N
OpenScape Media Server	Y	Y	N	Y	Y	Y	Y	N
OpenScape Mobile Facade Server	Y	Y	N	N	PSR	Y	Y	N
OpenScape SBC	Y	Y	N	N	N	Y	Y	N
OpenScape UC Application	Y	Y	N	N	Y	Y	Y	N
OpenScape UC Application – OpenFire Server	Y	Y	N	N	Y	Y	Y	N
OpenScape Voice	Y	Y	N	N	Y	Y	Y	PSR
OpenScape Voice SA	Y	Y	Y	Y	Y	Y	Y	N
OpenScape Web Collaboration	Y	Y	N	N	PSR	Y	Y	N
OpenScape Xpert (MLC)	Y	Y	Y (1vCPU)	N	N	Y	Y	N
OpenScape Xpert (SM)	Y	Y	N	N	N	Y	Y	N
OpenScape Xpert (Master TT)	Y	Y	N	N	N	Y	Y	N
OpenScape Xpressions	Y	Y	N	Y	Y	Y	Y	N
SESAP SW-Suite	Y	Y	N	N	Y	Y	Y	N

vMotion: vMotion is supported only during non-business hours or times of minimum system load. Application problems and issues during a vMotion process are not addressable towards the Unify applications. There are known issues when executing the vMotion process under load:

a) OSV might not route incoming/outgoing calls for a short time (seconds)
b) Media Server and Xpressions might create crackling noises, a fax might have black lines or might be terminated during transmission
c) For Microsoft Cluster based solutions, please be aware that vMotion is not supported for vSphere 5.5 and lower by Microsoft. The Microsoft cluster might execute a failover action while executing vMotion, etc.
d) In general UTP packet loss might occur for a limited time

High Availability (HA): HA tries to automatically restart a VM easing the recovery of a host failure. Due to the unpredictable nature of host failures, data inconsistencies (extremely seldom) might inhibit an instant restart might not be possible. In that case, backup mechanisms have to be used for recovery.

Site Recovery Manager (SRM): SRM is supported in Layer 2 networks only. The failover site need to allow the failed over VMs to operate with identical IP settings (IP-address, DNS, Gateways, etc). The network environment is expected to deal with site outages and execute a proper IP routing to the failover site. Upfront Professional Service involvement is highly recommended for SRM based solutions.

Distributed Resource Scheduler (DRS): DRS uses VMware vMotion to migrate VMs from one ESX server to another one, while the VM provides it's service to the end user. As VMware vMotion is supporting only during off hours, because of known "issues" the DRS feature is supported only with limitations:

a) "DRS in fully automated mode" might cause unpredictable vMotion activities and therefore is not supported by Unify. If customers activate this mode, a conservative setting is recommended. Issues resulting from vMotion operations are not addressable towards Unify).

b) "DRS in partially automated mode" only deals with initial VM placement and does not cause a dynamic system behavior later on. Applying reasonable DRS rules in order to have a reasonable VM placement is recommended and is supported by Unify.

c) "DRS in manual mode" does neither automate initial placement nor does it cause dynamics throughout operations and is supported by Unify.

Enhanced vMotion Compatibility Mode (EVC): Unify defines a reference CPU within the Bill of Materials (BoM) for each product version released. As long as the choice of the EVC mode does not contradict this, EVC can be successfully used for Unify products that support vMotion.

* VMware EVC Mode must be set to a suitable level that supports VHV e.g. "Intel® "Nehalem" Generation" for OS4K Host deployments.

3.5 General Statements and Best Practice Recommendations for Virtualization at Unify

General Support Statement for virtualized Unify products

In a virtualized environment configuration, care must be taken that the customer has two support contracts: one with Unify and one with VMware.

If the customer opens a ticket with the Unify Service Desk, the ticket will be accepted and evaluated to determine the root cause (whether the problem is with a Unify product or with VMware). This can require the involvement of several levels in the Unify support organization including GO and GVS.

If the root cause analysis has determined that the error is not an VMware issue, GVS will investigate further. If it is suspected to be a VMware software issue, the ticket will be routed back to the customer who will then be asked to open a ticket with VMware.

Follow the VMware Best Practice Recommendations

Below you can find a list of Best Practice publications provided by VMware:

VMware Publication	Link
General Performance Best Practice	www.vmware.com/pdf/Perf_Best_Practices_vSphere5.0.pdf
General Performance Best Practice (continued)	www.vmware.com/pdf/Perf_Best_Practices_vSphere5.1.pdf
VMWare Networking Concepts to be understood	www.vmware.com/files/pdf/virtual_networking_concepts.pdf
Best Practice VMWare Tools Installation	http://kb.vmware.com/kb/2004754
Time Keeping Best Practice for Linux OS	http://kb.vmware.com/kb/1006427
Time Keeping Best Practice for Windows OS	http://kb.vmware.com/kb/1318

Usage of Virtual Machine Snapshots:

INFO: Snapshots are used as part of official Unify Service procedures. However, the following restrictions must be observed.

1. Snapshots are NOT to be taken on production systems during normal operation.

2. Snapshots taken previously must NOT remain active on a production system during normal operation.
3. Snapshots can be taken, if needed, during maintenance windows, or during the installation procedure.
   Snapshots can be a valuable mechanism during maintenance operations. For example, they allow a quick rollback to a well-defined state of the VM if a mass provisioning script fails.
4. Note that Snapshots are used internally by backup tools such as VDP or VDR. It must be ensured that (a) these backup operations are scheduled off business hours, and (b) that any Snapshots generated by these tools are deleted at the conclusion of the backup operation.

For further information regarding Snapshots please consult the VMware Knowledge Base (KB). A good starting point is KB Article 1025279-Best Practices for virtual machine snapshots in the VMware environment:

`http://kb.vmware.com/kb/1025279`

Usage of Advanced Locking ID (ALI):

The use of Advanced Locking ID is recommended whenever the Unify product supports ALI.

Recommended Disk Mode:

1. For disk mode the default settings should be kept, since this allows for the creation and use of snapshots.
2. The disk mode must not be set to "independent", since this would prevent snapshots from being taken.

4 Virtualization Dimensioning Overview

4.1 VM Co-Residency and Quality of Service policy

This VM Co-Residency and Quality of Service Policy provides the rules for the parties responsible for deploying the Unify VMs and managing the virtual environment when deploying Unify VMs on consolidated network and hardware resources:

- It is up to the parties responsible for deploying the Unify VMs and managing the virtual environment to ensure the performance criteria is met. Uncertainty can be reduced by pre-deployment testing, baselining, and following the rules of Unify VM Configuration and Resource Guide (VM R&C) including this policy.
- VMs with Unify real time and mission critical applications shall be protected from other applications in the routing and switching network to ensure voice/video network traffic get the needed bandwidth and protection from delay and jitter.
- VMs with Unify real time and mission critical applications shall be protected from other applications when the virtualization host shares compute, storage, and network hardware among multiple application virtual machines (e.g. you cannot schedule Unify real time applications to run on a host with insufficient resources for the VM).
- All components in the virtual environment shall be on VMware's Compatibility Guide (`https://www.vmware.com/resources/compatibility/search.php`).

  NOTICE: It has been observed limited hard disk capacity after fresh installation on ESXi 7.0U2, without the ability to expand the existing VFMS datastore. This is because ESXi 7.0 has introduced a system-storage boot media layout designed to ensure new features and capabilities could be added in future releases. For more information, please see: `https://kb.vmware.com/s/article/81166`

- All components in the virtual environment shall be designed to fulfill VMware’s best practice guidelines.
- Adherence to Unify Virtualization and Resource configuration rules (e.g. physical/virtual hardware sizing, co-residency policy, etc.) is required in order to ensure Unify VMs get the needed CPU, memory, storage capacity and storage/network performance.
- Unify VMs shall not be hosted on the same HW with third-party VMs that have incomplete resource requirements defined.
- Host hardware shall be continuously monitored (e.g. by vCenter) and operated below 80% CPU usage with a %RDY value of 5% max.

- The total amount of RAM, Storage, and NW (including Storage Network) throughput shall not exceed the capacity of the Host hardware (no over subscription).
- Even if the host processor is hyper-threading-capable and HT is enabled, a physical core shall only be counted once.
- In case customer wishes to optimize VM resources (vCPU reservation) to a minimum, then a continuous and close monitoring of the system is absolutely required. As a starting point, a vCPU Reservation of 50% of the Unify recommended value can be configured but that percentage will need to be adjusted by observing the peak CPU consumption required during normal business operation/hours.

  IMPORTANT NOTES:
  - In general such customizing should not be made for any critical real-time communication platform (e.g. OSV, SBC..).
  - In case of any performance issues (e.g. system/component overloads, outage etc.) the recommended values per VM system as described in this document must be applied.
  - Please note that the responsibility for such customized configurations lies to the parties that deploy and manage the Unify VMs and the virtual environment.
- vCPU Shares shall be configured to guarantee mission critical Unify VMs (including real time VMs) are never starved for CPU time.

  The following table shows the default vCPU share values for a particular Share Value configured for a virtual machine:

Setting	vCPU Share Value
Custom	Configurable number of shares per virtual CPU (up to 1,000,000)
High	2000 shares per virtual CPU
Normal	1000 shares per virtual CPU
Low	500 shares per virtual CPU

NOTICE: The value configured is per virtual CPU.

IMPORTANT: Configure vCPU Share setting to Custom and value to 1,000,000 for critical Unify VMs.

- Customers are responsible to fulfill the requirements, even if the VM is moved around in the environment, e.g. by manually re-configuring the CPU shares of a VM if it gets moved to another ESXi host or resource pool.
- Disaster Recovery plans need to take into account the additional resources required in case a fail over occurs (datacenter 2).

4.2 Key Support Considerations

Customers must adhere to the following in order to enable Unify TAC to effectively provide support when running virtualized Unify mission critical and real time applications such as OSV, UC app, and Media Server co-resident with Unify non real time/3rd-party app VMs:

- Customers with Managed Services shall verify if Managed Services would agree to operate a particular deployment proposal based on using vCPU shares and reduced vCPU reservations.
- Issues resulting from resource contention cannot be addressed towards Unify. If Unify investigates any issues shown to be related to lacking resources, or the datacenter is unable to provide to Unify the VM diagnostic data required to investigate the issue, the organization receiving the support agrees to reimburse Unify for the investigation time spent.
- Unify support can require to switch back to default settings in case of issues (or when investigating issues).
- Unify must be granted access to vCenter logs and performance metrics.
- Software: Unify TAC may require changes to the software workload to troubleshoot or resolve application performance problems. Examples include:
  - temporary power-down of non-critical VMs to facilitate performance troubleshooting.
  - moving critical VMs and/or non-critical VMs to alternate virtualization host/physical server as a temporary or permanent solution.
- Hardware: Unify TAC may require changes to the physical hardware, to troubleshoot or resolve application performance problems. Examples include:
  - Unify TAC may require additions/upgrades to "fix" an overloaded host as an alternative to powering-down VMs or moving VMs.
  - adding more physical disks to increase storage capacity and/or provide IOPS.
  - decreasing storage latency.
  - adding more physical memory or more physical CPU cores.
  - adding physical NIC interfaces to address LAN congestion.

4.3 Physical Resource Dimensioning

The following resources must be properly dimensioned and configured in order for any application to operate properly in a VMware vSphere environment:

- Virtual Cores (vCPU) – Both, the number of virtual cores consumed by the application(s), and the vCPU power in GHz consumed by the applications.

- Virtual Memory (vRAM) –Amount of memory in GB consumed by the applications
- Virtual Hard Disks (vHD) – The amount of storage in GB consumed by the application(s), and the throughput required.
- Virtual Network Interfaces (vNIC) – The number of virtual network adaptors, and the bandwidth required.

INFO: Virtual core is synonymous to virtual CPU.

4.3.1 Dimensioning the Required Physical CPUs for a Deployment

Two inputs from the product virtualization dimensioning tables are relevant to dimension the resource CPU:

- Number of virtual cores (vCPU) required by this product
- Minimum percentage of the totally allocated CPU resources required for normal operation by this product. This is the percentage that is used for vCPU reservations.

The number of physical CPU cores required by the vSphere host when multiple Unify applications are co-resident on that vSphere host is determined using the following equation:

```
# of Physical Cores > Total Reservation by all applications
/ Physical CPU Frequency
```

NOTE: If a Unify application does not perform CPU reservation at all then use 50% as a minimum for that product (*).

Example: We have 4 Unify applications in the same vSphere host, which has a CPU clocked at 2.0 GHz. The following table lists the requirements of the aforementioned applications:

Application	# of vCPU	Reservation percentage	Reservation
A	4	75%	6,000 MHz
B	1	100%	2,000 MHz
C	2	0% (*50%)	2,000 MHz
D	2	100%	4,000 MHz
Total	-	-	14,000 MHz

Using the formula provided above (14,000 / 2,000 = 7) we see that the total number of physical CPU cores must be **greater than 7**.

This method can also be used to estimate the aggregate number of physical cores for an entire solution composed of numerous Unify virtual products over multiple vSphere hosts.

Remarks:

- All VM resourcing information that is provided by development for each product already includes peak load requirements, and
- The hypervisor will reserve some (~10%) of the resources provided by one physical CPU core of a vSphere host. In order to avoid having the hypervisor overhead being multiplied, no hypervisor overhead is considered here when estimating the physical resources required for Unify products/applications.Hypervisor overhead is to be accounted by the vSphere system planners/designers/administrators.This fact needs to be clearly understood by or communicated to those implementing deployments.

4.3.2 Dimensioning the Required Physical RAM for a Deployment

Sum up the virtual memory (vRAM) requirements of each of the Unify virtual products to be deployed and ensure that:

- Amount of physical memory ≥ Sum of vRAM required by selected products

Remarks:

Be aware that extra space is needed by the ESXi host for its own code and data structures, beyond the memory allocated to each virtual machine. Overhead memory depends on the number of virtual CPUs and the configured memory for the guest operating syste. A RAM overhead of **4 GB per ESXi host** will cover the majority of deployments. For more information see the following:

`https://docs.vmware.com/en/VMware-vSphere/8.0/rn/vmware-vsphere-80-release-notes/index.html`

4.3.3 Dimensioning the Required Physical Storage for a Deployment

Sum up the virtual storage space (vHD) requirements of each of the Unify virtual products to be deployed and ensure that:

- Amount of physical storage space ≥ Sum of vHD required by selected products.
- A storage space overhead of 25% is accounted.

Remarks:

- Storage latency is expected not to exceed 10ms.
- The number of IOPS is an important factor that needs to be considered.

4.3.4 Dimensioning the Network

Initially the required bandwidth per application is not available in our OpenScape UC Suite configuration tables.

However a 1 Gbps Ethernet Interface provides enough bandwidth for an OpenScape UC Suite with up to 10,000 users running in an environment with high traffic.

For redundancy reasons you should not configure a server with less than 2 Ethernet ports.

Whenever the VMware features vMotion, DRS, High-Availability, Fault Tolerance, Data Recovery are used, VMware requires at least 6 x 1 Gbps Ethernet interface.

4.3.5 Usage of other Server Hardware Systems and CPU Architecture

The current reference hardware system is the IBM System x3550 M3. It uses an Intel Xeon X5650 CPU with a clock speed of 2.66 GHz. This reference system has a 'SPECint_base2006' value of 34.0 and an equivalent 'SPECint_base2017' value of 4.

Whenever using a different hardware system than the reference, and especially if the CPU is different than the reference, apply the following rule to determine if it is suitable:

- Lookup the 'SPECint_base2006' and 'SPECint2017' values of the proposed alternative hardware system. See:
  - http://www.spec.org/cgi-bin/osgresults?conf=cpu2006
  - http://www.spec.org/cgi-bin/osgresults?conf=cpu2017
- The alternative hardware server is suitable if the SPECint_base2006 and SPECint2017 value of this alternative hardware server is **greater or equal** to the reference hardware server. If the value is slightly smaller a request for a PSR can be tried. This rule which provides a permissible deviation based on SPECint_base2006 and SPECint2017 comparisons **only** apply to CPU clock speed. All other resource requirements, e.g., the number of CPUs, must be followed as stated for each product in Chapter 5.

The following example describes the details of such an exercise:

If in a given customer project ProLiant Servers from Hewlett Packard are a mandatory requirement we perform the following steps to determine the proper server system and CPU type selection.

- Go to http://www.spec.org/cgi-bin/osgresults?conf=cpu2006 or https://www.spec.org/cgi-bin/osgresults?conf=cpu2017

- Ensure that 'Hardware Vendor' is selected in the dropdown box, and enter 'Hewlett-Packard' in the search box
- From the results returned, look at the server systems, which have similar CINT2006 values
- For this example we select ProLiant BL460c Gen8 using a Xeon E5-2620 with a clock speed of 2.0 GHz:
  http://www.spec.org/cpu2006/results/res2012q3/cpu2006-20120813-24226.html
- The SPECint_base2006 value for this ProLiant server is 36.6 and the SPECint_base2017 value is 4.3. Since the value is higher than the one of the reference hardware system, this ProLiant server is a valid choice.

> ***INFO:*** Important - When performing the calculations mentioned in chapter 4.1.1 make sure that you use the clock speed of the alternative CPU.

5 Virtualization Dimensioning Details

The following table lists all ports that are used by more than one product and indicates which of them are configurable.When products that make use of the same port are installed on the same VM, the appropriate adjustments should be made to avoid port overlapping.

Port	Web Col-lab	Con-cierge	Xpert	TM	SESAP Syslog	DLS	XPR	Account-ing	Fault Mgmt
80	FIXED	config.	config.	not used	not used	not used	not used	not used	not used
443	FIXED(2)	not used	not used	not used	not used	not used	not used	FIXED(2)	not used
514	not used	not used	not used	config.	FIXED(1)	not used	not used	not used	FIXED(1)
1433	config.	config.	not used	not used	not used	FIXED	config.	not used	not used
17001	not used	FIXED	not used	config.	not used	not used	not used	not used	not used
17010	not used	FIXED	not used	config.	not used	not used	not used	not used	not used

(1) If OpenScape Fault Management and SESAP are installed on the same VM do not deploy the Syslog server for SESAP.

(2) OpenScape Accounting and OpenScape Web Collaboration should not be deployed in the same VM.

Example (port 80): OpenScape Web Collaboration, OpenScape Concierge and OpenScape Xpert need to be installed on the same VM but all three of them use the same port.Since OpenScape Web Collaboration cannot be configured to use a different port (see table), it will use port 80 while OpenScape Concierge and OpenScape Xpert will be configured to use other ports.

INFO: Always refer to each product's release notes for any possible impacts to the dimensioning details contained in this section of the document.

5.1 HiPath CAP Management

HiPath CAP Management V3.0 SMR13		
General Product Info	Operating System	Please see the Release Note
	Native Redundancy Support	No
	Redundancy Strategy	-
	Voice/Video Media Terminating	No
	Voice/Video Signalling Traffic	No
	Other real-time critical requirements	No
VMware Feature Compatibility	vMotion Support	Yes **Restrictions / Limitations:** vMotion should not be used during business hours on high system load.
	High Availability (HA) Support	Yes
	Fault Tolerance (FT) Support	No
	Site Recovery Manager (SRM) Support	Yes **Note:** All VMware requirements (incl. Hardware) and best practices have to be fulfilled. The network between the data center sites has to be a transparent layer 2 network which provides identical environments in both locations.
	Backup with vStorage-APIs for Data Protection	Yes **Note:** vStorage APIs can be used as an additional backup layer for image level backups that allow to restore virtual disk contents after a disk failure fast. The standard backup mechanisms normally used in physical deployments have to be applied in addition.
	VMware Tools Support	Yes **Note:** Installation of VMware Tools is recommended.
	Virtual Appliance (vApp) Support	No

HiPath CAP Management V3.0 SMR13									
		Smallest	**Depl. 1**	**Depl. 2**	**Depl. 2**	**Depl. 3**	**Depl. 3**	**Depl. 4**	**Depl. 4**
Depl. Scenarios	Depl. Scenario	Single Node	Single Node	Multi Node	Multi Node	Multi Node	Multi Node	Multi Node	Multi Node
	Number of Nodes	1	1	Frontend Server	Backend Server	Frontend Server	Backend Server	Frontend Server	Backend Server
	Max Users	500	5,000	10,000	10,000	30,000	30,000	50,000	50,000
vCPU	vCPU	1	2	1	2	1	2	1	2
	vCPU Shares	Normal							
	vCPU Reserv.	0	0	0	0	0	0	0	0
		Issues resulting from CPU contention cannot be addressed towards the application							
	vCPU Limit	Unlimited							
vRAM	vRAM	2 GB	2 GB	2 GB	2 GB	4 GB	4 GB	4 GB	4 GB
	vRAM Shares	Normal							
	vRAM Reserv.	2 GB	2 GB	2 GB	2 GB	4 GB	4 GB	4 GB	4 GB
	vRAM Limit	Unlimited							
vNIC	vNIC (No. Req'd)	1	1	1	1	1	1	1	1
	vNIC Type	VMXNET3	VMXNET3	VMXNET3	VMXNET3	VMXNET3	VMXNET3	VMXNET3	VMXNET3
	vNIC Manual MAC	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
		If parameter is set to Y, please refer to "OpenScape Solution Set V10, How to check MAC Addresses for Virtual Systems, Quick Reference Guide" on e-doku.							
		No, if remote CLA is used							
	Network Bandwidth (estimated reqm't)	400 Kbps	400 Kbps	400 Kbps	400 Kbps	400 Kbps	400 Kbps	400 Kbps	400 Kbps
Storage (vDisk)	vDisk (No. Req'd)	1	1	1	1	1	1	1	1
	vDisk Size	60 GB	60 GB	60 GB	80 GB	135 GB	265 GB	135 GB	265 GB
		vDisk Size is the total amount of storage needed for the operating system, the application, and the application data.							
	vDisk Mode	Keep Defaults (which allows Snapshots)							
	vDisk Format	Thick Lazy-zeroed							
	Addt'l Storage	NO	NO	NO	NO	NO	NO	NO	NO
	Storage Throughput (estimated reqm't)[1]	~200KB/S per SCC	~200KB/S per SCC	~200KB/S per SCC	~50KB/S per SCC	~200KB/S per SCC	~50KB/S per SCC	~200KB/S per SCC	~50KB/S per SCC
	Storage IOPS (estimated reqm't)[2]	2 per SCC	2 per SCC	2 per SCC	2 per SCC	2 per SCC	2 per SCC	2 per SCC	2 per SCC

1 Depends on log level and load
2 Maximum 10 SCCs are allowed per Frontend server

5.2 HiPath QoS Management

HiPath QoS Management V1 R7		
General Product Info	Operating System	Please see the Release Note
	Native Redundancy Support	No
	Redundancy Strategy	-
	Voice/Video Media Terminating	No
	Voice/Video Signalling Traffic	No
	Other real-time critical requirements	No
VMware Feature Compatibility	vMotion Support	Yes **Restrictions / Limitations:** vMotion should not be used during business hours on high system load
	High Availability (HA) Support	Yes
	Fault Tolerance (FT) Support	No
	Site Recovery Manager (SRM) Support	Yes **Note:** All VMware requirements (incl. Hardware) and best practices have to be fulfilled. The network between the data center sites has to be a transparent layer 2 network which provides identical environments in both locations.
	Backup with vStorage-APIs for Data Protection	Yes **Note:** vStorage APIs can be used as an additional backup layer for image level backups that allow to restore virtual disk contents after a disk failure fast. The standard backup mechanisms normally used in physical deployments have to be applied in addition
	VMware Tools Support	Yes **Note:** Installation of VMware Tools is recommended.
	Virtual Appliance (vApp) Support	No

HiPath QoS Management V1 R7									
		Smallest	**Depl. 1**	**Depl. 2**	**Depl. 2**	**Depl. 3**	**Depl. 3**	**Depl. 4**	**Depl. 4**
Depl. Scenarios	Depl. Scenario	Single Node	Single Node	Multi Node	Multi Node	Multi Node	Multi Node	Multi Node	Multi Node
	Number of Nodes	1	1	HPQM Server	QCU	HPQM Server	QCU	HPQM Server	QCU
	Max Users	500	5,000	10,000	10,000	30,000	30,000	50,000	50,000
vCPU	vCPU	1	2	1	2	1	2	1	2
	vCPU Shares	Normal							
	vCPU Reserv.	0	0	0	0	0	0	0	0
		Issues resulting from CPU contention cannot be addressed towards the application							
	vCPU Limit	Unlimited							
vRAM	vRAM	4 GB	4 GB	4 GB	4 GB	4 GB	4 GB	4 GB	4 GB
	vRAM Shares	Normal							
	vRAM Reserv.	4 GB	4 GB	4 GB	4 GB	4 GB	4 GB	4 GB	4 GB
	vRAM Limit	Unlimited							
vNIC	vNIC (No. Req'd)	1	1	1	1	1	1	1	1
	vNIC Type	VMXNET3	VMXNET3	VMXNET3	VMXNET3	VMXNET3	VMXNET3	VMXNET3	VMXNET3
	vNIC Manual MAC	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
		If parameter is set to Y, please refer to "OpenScape Solution Set V10, How to check MAC Addresses for Virtual Systems, Quick Reference Guide" on e-doku.							
		No, if remote CLA is used							
	Network Bandwidth (estimated reqm't)	200 Kbps	320 Kbps	320 Kbps	320 Kbps	400 Kbps	320 Kbps	400 Kbps	320 Kbps
Storage (vDisk)	vDisk (No. Req'd)	1	1	1	1	1	1	1	1
	vDisk Size	50 GB	50 GB	50 GB	65 GB	135 GB	265 GB	135 GB	265 GB
		vDisk Size is the total amount of storage needed for the operating system, the application, and the application data.							
	vDisk Mode	Keep Defaults (which allows Snapshot)							
	vDisk Format	Thick Lazy-zeroed							
	Addt'l Storage	10 GB	10 GB	10 GB					
	Storage Throughput (estimated reqm't)	800 Kbps	1920 Kbps	3200 Kbps	640 Kbps	4800 Kbps	800 Kbps	8000 Kbps	1120 Kbps
	Storage IOPS(estimated reqm't)	13 IOPS	30 IOPS	50 IOPS	10 IOPS	75 IOPS	13 IOPS	125 IOPS	18 IOPS

5.3 HiPath User Management

HiPath User Management V3 R1		
General Product Info	Operating System	Please see the Release Note
	Native Redundancy Support	No
	Redundancy Strategy	-
	Voice/Video Media Terminating	No
	Voice/Video Signalling Traffic	No
	Other real-time critical requirements	No
VMware Feature Compatibility	vMotion Support	Yes **Restrictions / Limitations:** vMotion should not be used during business hours on high system load
	High Availability (HA) Support	Yes
	Fault Tolerance (FT) Support	No
	Site Recovery Manager (SRM) Support	Yes **Note:** All VMware requirements (incl. Hardware) and best practices have to be fulfilled. The network between the data center sites has to be a transparent layer 2 network which provides identical environments in both locations.
	Backup with vStorage-APIs for Data Protection	Yes **Note:** vStorage APIs can be used as an additional backup layer for image level backups that allow to restore virtual disk contents after a disk failure fast. The standard backup mechanisms normally used in physical deployments have to be applied in addition
	VMware Tools Support	Yes **Note:** Installation of VMware Tools is recommended.
	Virtual Appliance (vApp) Support	No

HiPath User Management V3 R1								
		Smallest	**Depl. 1**	**Depl. 2**	**Depl. 3**	**Depl. 4**	**Depl. 5**	**Largest**
Depl. Scenarios	Depl. Scenario	Single Node	Single Node	Single Node	Single Node	Single Node		
	Number of Nodes	1	1	1	1	1		
	Max Users	500	5,000	10,000	30,000	50,000		
vCPU	vCPU	1	1	2	2	2		
	vCPU Shares	Normal	Normal	Normal	Normal	Normal		
	vCPU Reserv.	0	0	0	0	0		
		Issues resulting from CPU contention cannot be addressed towards the application						
	vCPU Limit	Unlimited	Unlimited	Unlimited	Unlimited	Unlimited		
vRAM	vRAM	4 GB	4 GB	4 GB	4 GB	4 GB		
	vRAM Shares	Normal	Normal	Normal	Normal	Normal		
	vRAM Reserv.	4 GB	4 GB	4 GB	4 GB	4 GB		
	vRAM Limit	Unlimited	Unlimited	Unlimited	Unlimited	Unlimited		
vNIC	vNIC (No. Req'd)	1	1	1	1	1		
	vNIC Type	VMXNET3	VMXNET3	VMXNET3	VMXNET3	VMXNET3		
	vNIC Manual MAC	Yes	Yes	Yes	Yes	Yes		
		No, if remote CLA is used						
		If parameter is set to Y, please refer to OpenScape Solution Set V10, How to check MAC Addresses for Virtual Systems, Quick Reference Guide on e-doku.						
	Network Bandwidth (estimated reqm't)	50 Kbps	50 Kbps	100 Kbps	250 Kbps	400 Kbps		
Storage (vDisk)	vDisk (No. Req'd)	1	1	1	1	1		
	vDisk Size	80 GB	80 GB	80 GB	120 GB	120 GB		
		vDisk Size is the total amount of storage needed for the operating system, the application, and the application data.						
	vDisk Mode	Keep Defaults (which allows Snapshots)	Keep Defaults (which allows Snapshots)	Keep Defaults (which allows Snapshots)	Keep Defaults (which allows Snapshots)	Keep Defaults (which allows Snapshots)		
	vDisk Format	thick lazy-zeroed	thick lazy-zeroed	thick lazy-zeroed	thick lazy-zeroed	thick lazy-zeroed		
	Addt'l Storage	No	No	No	No	No		
	Storage Throughput (estimated reqm't)	800 Kbps	800 Kbps	1600 Kbps	2000 Kbps	2400 Kbps		
	Storage IOPS(estimated reqm't)	13	13	25	32	38		

5.4 OpenScape 4000

OpenScape 4000 V10 Core Simplex/Duplex and SoftGate		
General Product Info	Operating System	Please see the Release Note
	Native Redundancy Support	Yes
	Redundancy Strategy	Hot Standby (in Duplex mode)
	Voice/Video Media Terminating	Yes (In case Simplex with softGate)
	Voice/Video Signalling Traffic	Yes
	Other real-time critical requirements	Yes
VMware Feature Compatibility	vMotion Support	**Restrictions / Limitations:** This VMware feature should NOT be performed on production systems during normal operation. Using this feature may lead to soft or hard restarts of the system, however the system will return to its normal operating state automatically after the restart. It can be performed, if needed, during maintenance windows. **NOTE:** OS4K nodes should not be part of DRS life migration as it uses vMotion.
	High Availability (HA) Support	Yes
	Fault Tolerance (FT) Support	No
	Site Recovery Manager (SRM) Support	• SRM can be used for SoftGate Standlone cases. • SRM is supported indirectly by deploying one OS4K node at the Protected site and the other OS4K node at the Recovery site.
	Backup with vStorage-APIs for Data Protection	Snapshots allowed if observing guidelines documented in *Section 3.5 General Statements and Best Practice Recommendations for Virtualization at Unify.*
	VMware Tools Support	Yes, no manual installation allowed; approved updates will be delivered with OS4K Software.
	Virtual Appliance (vApp) Support	Yes, the usage of the OS4K OVF templates is mandatory for the configuration of virtual machines.

OpenScape 4000 V10								
		Core System				Survivable		SoftGate only
			Quorum					
		Simplex/Separated Duplex	Quorum [2]	Quorum with SG Standard [4]	Simplex + SoftGate	Surviv-able Unit	Survivable SG Stan-dard	SG Stan-dard
Depl. Scenar-ios	Depl. Scenario	OpenScape 4000	Quorum	Quorum with Soft-Gate	Simplex with Soft-Gate	Survivable Unit	Survivable SoftGate	Standalone SoftGate
	Number of Nodes	1/2	1	1	1	1	1	1
	SG Max parallel channels			250	250			
vCPU	vCPU	4	2	4	4	4	4	4
	vCPU Shares	High	High	High	High	High	High	High
	vCPU Reserv.	# vCPU × physical CPU Freq* **[1]**	0.5 GHz	Must calculate # vCPU × physical CPU Freq*				
	vCPU Limit	Unlimited						
vRAM	vRAM	4 GB **[3]**	2 GB	4 GB	8 GB	4 GB	8 GB	4 GB
		It is important that the hypervisor has sufficient RAM resources on top of the RAM configuration to be potentially used by guest virtual machines. For more details see VMware Knowledge Base						
	vRAM Shares	Normal	Normal	Normal	Normal	Normal	Normal	Normal
	vRAM Reserv.	4 GB	1 GB	4 GB	8 GB	4 GB	8 GB	4 GB
	vRAM Limit	4 GB	1 GB	4 GB	8 GB	4 GB	8 GB	4 GB
vNIC	vNIC (No. Req'd)	3/4	2	3	3	3	3	1
	vNIC Type	VMXNET3						
	vNIC Manual MAC	No	No	No	No	No	No	No
		If parameter is set to Y, please refer to: "OpenScape Solution Set V10, How to check MAC Addresses for Virtual Systems, Quick Reference Guide" on e-doku.						
	Network Bandwidth (estimated reqm't)	For details, refer to Chapter "Required Bandwidth per Connection" in OpenScape 4000 V8, Section 4 - IP Solutions, Service Documentation.						
Storage (vDisk)	vDisk (No. Req'd)	1	1	1	1	1	1	1
	vDisk Size	250 GB	30 GB	75 GB	250 GB	250 GB	250 GB	75 GB
		NOTE: vDisk Size is the total amount of storage needed for the operating system, the application, and the application data.						
	vDisk Mode	Keep Defaults (which allows Snapshots)						
	vDisk Format	Thick Lazy-Zeroed						
	Addt'l Storage	No	No	No	No	No	No	No
	Storage Through-put (estimated reqm't)	1250 KBps	1250 KBps	1250 KBps	1250 KBps	1250 KBps	1250 KBps	1250 KBps
	Storage IOPS (estimated reqm't)	250 tps	250 tps	250 tps	250 tps	250 tps	250 tps	250 tps

[1] Systems upgraded from OS4K V7 can continue to operate with previous vCPU Reservations as detailed under OpenScape Solution Set guides V7 & V8 where it is not possible to update the vCPU assignment.

[2] This deployment is supported until V10_R0. From V10_R1, only Quorum with SG Standard will be supported. Before upgrading from V8_R2 or V10_R0 to V10_R1, Quorum must be redeployed using the **Quorum with SG Standard** OVF template (75GB HD), either via a first install or via installation using RISO for the Quorum Node.
For more information on migrating Quorum please refer to the *OpenScape 4000 Assistant, Appliance Management, Administrator Documentation* and look for the Recovery ISO feature including the reinstallation process described in *Chapter 7: Reinstallation of an appliance from Recovery ISO image*.

[3] Default vRAM is 4 GB, in case of stability issues, e.g. RMX Watchdog 0, triggered by Admin or I/O actions as reported sporadically, an increase to 6 GB vRAM is an option. vRAM reservation adaptations are not needed.

[4] Adding a Standard SoftGate on this deployment is optional.

5.5 OpenScape 4000 Manager

5.5.1 OpenScape 4000 Manager V10R0

OpenScape 4000 Manager V10R0		
General Product Info	Operating System	Please see the Release Note
	Native Redundancy Support	Yes
	Redundancy Strategy	Cold Standby (with Smart Switch Over)
	Voice/Video Media Terminating	No
	Voice/Video Signalling Traffic	No
	Other real-time critical requirements	No
VMware Feature Compatibility	vMotion Support	Yes
	High Availability (HA) Support	Yes
	Fault Tolerance (FT) Support	No
	Site Recovery Manager (SRM) Support	No - SRM is supported indirectly by deploying one OS4k Manager node at the Protected site and the other OS4k Manager node at the Recovery Site.
	Backup with vStorage-APIs for Data Protection	Yes
	VMware Tools Support	Yes. Tools are neither delivered nor installed with the product.Note: Usage of VMXNET3 driver is recommended.
	Virtual Appliance (vApp) Support	No

OpenScape 4000 Manager V10R0					
		Small Network	**Medium Network**	**Large Network**	**Very Large Network**
Depl. Scenarios	Max number of OS4K systems	8	30	100	200
	Max number of OS4K ports	5,000	10,000	30,000	100,000
	Max users	3	8	16	50
vCPU	vCPU	4	6	8	16
	vCPU Shares	High			
	vCPU Reserv.	Must calculate # vCPU × physical CPU Freq			
	vCPU Limit	Unlimited			
vRAM	vRAM	4 GB	8 GB	12 GB	16 GB
	vRAM Shares	Normal			
	vRAM Reserv.	2 GB	2 GB	2 GB	2 GB
	vRAM Limit	Unlimited			

OpenScape 4000 Manager V10R0					
		Small Network	**Medium Network**	**Large Network**	**Very Large Network**
vNIC	vNIC (No. Req'd)	1	1	1	1
		SSO feature requires +1 vNIC with at least 1 Gb bandwidth.			
	vNIC Type	VMXNET3			
	vNIC Manual MAC	No	No	No	No
		If parameter is set to Y, please refer to "OpenScape Solution Set V10, How to check MAC Addresses for Virtual Systems, Quick Reference Guide" on e-doku.			
	Network Bandwidth (estimated reqm't)	No	No	No	No
		For more information refer to Chapter "Required Bandwidth per Connection" in HiPath/OpenScape 4000 V6/7, Section 4 - IP Solutions, Service Documentation.			
Storage (vDisk)	vDisk (No. Req'd)	1	1	1	1
	vDisk Size	200 GB	300 GB	400 GB	600 GB
		Note: SSO feature requires double the Storage vDisk Size.			
	vDisk Mode	Keep Defaults (which allows Snapshots)			
	vDisk Format	Thick Lazy-Zeroed	Thick Lazy-Zeroed	Thick Lazy-Zeroed	Thick Lazy-Zeroed
	Storage Throughput (estimated reqm't)	1250 KBps	1250 KBps	1250 KBps	1250 KBps
	Storage IOPS(estimated reqm't)	250 tps	250 tps	250 tps	250 tps

5.5.2 OpenScape 4000 Manager V10R1

OpenScape 4000 Manager V10R1		
General Product Info	Operating System	Please see the Release Note
	Native Redundancy Support	Yes
	Redundancy Strategy	Legacy SSO (Smart Switch Over) functionality is now achieved through: - OpenScape EcoServer RAID1, ethernet bonding and Backup & Restore methodologies e.g. Recovery HD, Appliance Management etc. - VMware availability features
	Voice/Video Media Terminating	No
	Voice/Video Signalling Traffic	No
	Other real-time critical requirements	No
VMware Feature Compatibility	vMotion Support	Yes
	High Availability (HA) Support	Yes
	Fault Tolerance (FT) Support	No
	Site Recovery Manager (SRM) Support	No
	Backup with vStorage-APIs for Data Protection	Yes
	VMware Tools Support	Yes
	Virtual Appliance (vApp) Support	No

OpenScape 4000 Manager V10R1		
		Standard
vCPU	vCPU	4*
	vCPU Shares	Standard
	vCPU Reserv.	0
	vCPU Limit	Unlimited
vRAM	vRAM	8 GB*
	vRAM Shares	Normal
	vRAM Reserv.	0
	vRAM Limit	Unlimited

OpenScape 4000 Manager V10R1		
		Standard
vNIC	vNIC (No. Req'd)	1
	vNIC Type	VMXNET3
	vNIC Manual MAC	No
		If parameter is set to Y, please refer to "OpenScape Solution Set, How to check MAC Addresses for Virtual Systems, Quick Reference Guide" on e-doku.
	Network Bandwidth (estimated reqm't)	No
		Number of OS4K systems dependent
Storage (vDisk)	vDisk (No. Req'd)	1
	vDisk Size	1000 GB
	vDisk Mode	Keep Defaults (which allows Snapshots)
	vDisk Format	Thin Provisioned
	Storage Throughput (estimated reqm't)	1250 KBps
	Storage IOPS(estimated reqm't)	250 tps

* For OpenScape 4000 Managers requiring higher demands (either from specific application usage or larger networks), the CPU and Memory resources can be scaled upwards with additional CPU or Memory via VMware resource administration. Potential resource bottlenecks can be identified via normal VMware resource monitoring. Dedicated resource reservations are not necessary.

5.6 OpenScape Accounting

OpenScape Accounting V3		
General Product Info	Operating System	Please see the Release Note
	Native Redundancy Support	No
	Redundancy Strategy	-
	Voice/Video Media Terminating	No
	Voice/Video Signalling Traffic	No
	Other real-time critical requirements	No
VMware Feature Compatibility	vMotion Support	Yes **Restrictions / Limitations:** vMotion should not be used during business hours on high system load
	High Availability (HA) Support	Yes
	Fault Tolerance (FT) Support	No
	Site Recovery Manager (SRM) Support	Yes **Note:** All VMware requirements (incl. Hardware) and best practices have to be fulfilled. The network between the data center sites has to be a transparent layer 2 network which provides identical environments in both locations.
	Backup with vStorage-APIs for Data Protection	Yes **Note:** vStorage APIs can be used as an additional backup layer for image level backups that allow to restore virtual disk contents after a disk failure fast. The standard backup mechanisms normally used in physical deployments have to be applied in addition
	VMware Tools Support	Yes **Note:** Installation of VMware Tools is recommended.
	Virtual Appliance (vApp) Support	No

OpenScape Accounting								
		Smallest	**Depl. 1**	**Depl. 2**	**Depl. 3**	**Depl. 4**	**Depl. 5**	**Largest**
Depl. Scenarios	Depl. Scenario	Single Node	Single Node	Single Node	Single Node			Multi Node
	Number of Nodes	1	1	1	1			
	Max Users	300	3,000	5,000	10,000			unlimited
								PSR required!
vCPU	vCPU	2	2	2	4			
	vCPU Shares	Normal	Normal	Normal	Normal			
	vCPU Reserv.	0	0	0	0			
		Issues resulting from CPU contention cannot be addressed towards the application						
	vCPU Limit	Unlimited	Unlimited	Unlimited	Unlimited			
vRAM	vRAM	4 GB	8 GB	16 GB	32 GB			
	vRAM Shares	Normal	Normal	Normal	Normal			
	vRAM Reserv.	4 GB	4 GB	4 GB	16 GB			
	vRAM Limit	Unlimited	Unlimited	Unlimited	Unlimited			
vNIC	vNIC (No. Req'd)	1	1	1	1			
	vNIC Type	VMXNET3	VMXNET3	VMXNET3	VMXNET3			
	vNIC Manual MAC	Yes	Yes	Yes	Yes			
		If parameter is set to Y, please refer to "OpenScape Solution Set V10, How to check MAC Addresses for Virtual Systems, Quick Reference Guide" on e-doku.						
		No, if remote CLA is used	No, if remote CLA is used	No, if remote CLA is used	No, if remote CLA is used			
	Network Bandwidth (estimated reqm't)	TBD.	TBD.	TBD.	TBD.			
Storage (vDisk)	vDisk (No. Req'd)	1	1	1	1			
	vDisk Size	60 GB	60 GB	120 GB	120 GB			
		vDisk Size is the total amount of storage needed for the operating system, the application, and the application data.						
	vDisk Mode	Keep Defaults (which allows Snapshots)						
	vDisk Format	thick lazy-zeroed	thick lazy-zeroed	thick lazy-zeroed	thick lazy-zeroed			
	Addt'l Storage	No	No	No	No			
	Storage Throughput (estimated reqm't)	TBD.	TBD.	TBD.	TBD.			
	Storage IOPS(estimated reqm't)	TBD.	TBD.	TBD.	TBD.			

5.7 OpenScape Branch

OpenScape Branch V10		
General Product Info	Operating System	Please see the Release Note
	Native Redundancy Support	Yes
	Redundancy Strategy	Active / Standby
	Voice/Video Media Terminating	Yes
	Voice/Video Signalling Traffic	Yes
	Other real-time critical requirements	No
VMware Feature Compatibility	vMotion Support	Yes
	High Availability (HA) Support	Yes
	Fault Tolerance (FT) Support	No
	Site Recovery Manager (SRM) Support	No
	Backup with vStorage-APIs for Data Protection	No
	VMware Tools Support	Yes
	Virtual Appliance (vApp) Support	Yes

OpenScape Branch V10						
		Smallest	**Depl. 1**	**Depl. 2**	**Depl. 3**	**Largest**
Depl. Scenarios	Depl. Scenario		OSB 250	OSB 1000	OSB 6000	
	Number of Nodes		1	1	1	
	Max Users		250	1,000	6,000	
vCPU	vCPU		2	4	8	
	vCPU Shares		High	High	Custom [20 GHz]	
	vCPU Reserv. [1]		Must calculate # vCPU × physical CPU Freq			
	vCPU Limit		Unlimited			
vRAM	vRAM		4 GB	4 GB	6 GB	
	vRAM Shares		Normal	Normal	Normal	
	vRAM Reserv.		4 GB	4 GB	6 GB	
	vRAM Limit		Unlimited			

OpenScape Branch V10						
		Smallest	**Depl. 1**	**Depl. 2**	**Depl. 3**	**Largest**
vNIC	vNIC (No. Req'd)		1 (proxy mode) or 2 (SBC mode) **Note:** This is the default value, but it is possible to configure up to 4 vNICs			
	vNIC Type		VMXNET3	VMXNET3	VMXNET3	
	vNIC Manual MAC		Yes, only for local license file			
		If parameter is set to Y, please refer to "OpenScape Solution Set V10, How to check MAC Addresses for Virtual Systems, Quick Reference Guide" on e-doku.				
	Network Bandwidth (estimated reqm't)		1 MB/s (for proxy mode) or 10MB/s (for SBC mode)	2 MB/s (for proxy mode) or 20MB/s (for SBC mode)	6 MB/s (for proxy mode) or 60MB/s (for SBC mode)	
Storage (vDisk)	vDisk (No. Req'd)		1	1	1	
	vDisk Size		40 GB	40 GB	60 GB	
		vDisk Size is the total amount of storage needed for the operating system, the application, and the application data.				
	vDisk Mode		Keep Defaults (which allows Snapshots)			
	vDisk Format		Thick Provision Lazy Zeroed			
	Addt'l Storage		No	No	No	
	Storage Throughput (estimated reqm't)		400 KB/s	600 KB/s	600 KB/s	
	Storage IOPS(estimated reqm't)		Shares = N + unlimited IOPS (defaults) 20	Shares = N + unlimited IOPS (defaults) 20	Shares = N + unlimited IOPS (defaults) 30	

1 OpenScape Branch and OpenScape SBC are considered critical real time applications. Therefore, the CPU reservation settings should be adjusted to allow as much CPU speed as possible.
The performance tests executed on V10 used a SR250 server with four cores running at 3.5 GHz, with a **SPECint_base2017** value of 9.77. This is the recommended value for achieving the specified performance figures.
If the selected host processor has a **SPECint_base2017** value lower than the recommended one or the reservation settings cannot allocate the host CPU frequency for all required cores, then the reservation values can be lowered. In this case, the customer/service shall monitor closely the OpenScape Branch/SBC CPU usage to avoid performance bottlenecks. Alarms should be set for conditions and the recommented solution is to increase the host CPU capacities or reduce the resources for other non-critical applications running on same host.

NOTICE: For the OpenScape Branch until V10R0 the vRAM of the VMware virtual machine is specified according to the following table:

		Smallest	**Depl. 1**	**Depl. 2**	**Depl. 3**	**Largest**
vRAM	vRAM		2 GB	2 GB	4 GB	
	vRAM Shares		Normal	Normal	Normal	
	vRAM Reserv.		2 GB	2 GB	4 GB	
	vRAM Limit		Unlimited			

5.8 OpenScape CMP and Assistants

CMP Standalone: Whenever you do not have OpenScape UC packages (e.g. OpenScapeUC_MultipleCommunicationServerAdmin deployment), you do have to include the CMP to manage OpenScape Voice, OpenScape Branch, OpenScape Media Server, etc.

OpenScape CMP V10 & Assistants V10		
General Product Info	Operating System	Please see the Release Note
	Native Redundancy Support	No
	Redundancy Strategy	-
	Voice/Video Media Terminating	No
	Voice/Video Signalling Traffic	No
	Other real-time critical require-ments	No
VMware Feature Compatibility	vMotion Support	Yes
	High Availability (HA) Support	Yes
	Fault Tolerance (FT) Support	No
	Site Recovery Manager (SRM) Sup-port	SRM is offered as a PSR
	Backup with vStorage-APIs for Data Protection	No
	VMware Tools Support	Yes
	Virtual Appliance (vApp) Support	Yes

OpenScape CMP V10 & Assistants V10								
		Smallest	**Depl. 1**	**Depl. 2**	**Depl. 3**	**Depl 4**	**Depl. 5**	**Largest**
Depl. Scenarios	Depl. Scenario		Single-node					Single-node
	Number of Nodes		1					1
	Max Users		5,000					50,000
vCPU	vCPU		4					4
	vCPU Shares		Normal					Normal
	vCPU Reserv.		0					0
	vCPU Limit		Unlimited					Unlimited
vRAM	vRAM		6 GB					8 GB
	vRAM Shares		Normal					Normal
	vRAM Reserv.		2 GB					2 GB
	vRAM Limit		Unlimited					Unlimited
vNIC	vNIC (No. Req'd)		1					1
	vNIC Type		VMXNET3					VMXNET3
	vNIC Manual MAC		Yes					Yes
		If parameter is set to Y, please refer to "OpenScape Solution Set V10, How to check MAC Addresses for Virtual Systems, Quick Reference Guide" on e-doku.						
	Network Bandwidth (estimated reqm't)		TBD.					TBD.
Storage (vDisk)	vDisk (No. Req'd)		1					1
	vDisk Size		30 GB					30 GB
		vDisk Size is the total amount of storage needed for the operating system, the application, and the application data. If the installation medium needs to be stored on the server, increase the vDisk size accordingly.						
	vDisk Mode		See note.					See note.
		NOTE: Independent persistent is recommended - Snapshots allowed if observing guidelines documented in Section 3.5 General Statements and Best Practice Recommendations for Virtualization at Unify.						
	vDisk Format		any thick					any thick
	Addt'l Storage		No					No
	Storage Throughput (estimated reqm't)		TBD.					TBD.
	Storage IOPS(estimated reqm't)		TBD.					TBD.

5.9 OpenScape Composer

Composer Standalone: Composer is usually installed on the same server as OpenScape CMP, but it is also possible to install it as a standalone application.

OpenScape Composer V2		
General Product Info	Operating System	Please see the Release Note
	Native Redundancy Support	No
	Redundancy Strategy	-
	Voice/Video Media Terminating	No
	Voice/Video Signalling Traffic	No
	Other real-time critical requirements	No
VMware Feature Compatibility	vMotion Support	Yes
	High Availability (HA) Support	Yes
	Fault Tolerance (FT) Support	No
	Site Recovery Manager (SRM) Support	SRM is offered as a PSR
	Backup with vStorage-APIs for Data Protection	No
	VMware Tools Support	Yes
	Virtual Appliance (vApp) Support	Yes

OpenScape Composer V2								
		Smallest	**Depl. 1**	**Depl. 2**	**Depl. 3**	**Depl 4**	**Depl. 5**	**Largest**
Depl. Scenarios	Depl. Scenario		Single-node					
	Number of Nodes		1					
	Max Users		no dependency Composer resources are not dependent to the users in the solution					
vCPU	vCPU		2					
	vCPU Shares		Normal					
	vCPU Reserv.		0					
	vCPU Limit		Unlimited					
vRAM	vRAM		6 GB					
	vRAM Shares		Normal					
	vRAM Reserv.		2 GB					
	vRAM Limit		Unlimited					
vNIC	vNIC (No. Req'd)		1					
	vNIC Type		VMXNET3					
	vNIC Manual MAC		Yes					
		If parameter is set to Y, please refer to "OpenScape Solution Set V10, How to check MAC Addresses for Virtual Systems, Quick Reference Guide" on e-doku.						
	Network Bandwidth (estimated reqm't)		TBD.					TBD.
Storage (vDisk)	vDisk (No. Req'd)		1					1
	vDisk Size		80 GB					80 GB
		vDisk Size is the total amount of storage needed for the operating system, the application, and the application data. If the installation medium needs to be stored on the server, increase the vDisk size accordingly.						
	vDisk Mode		See note.					See note.
		NOTE: Independent persistent is recommended - Snapshots allowed if observing guidelines documented in Section 3.5 General Statements and Best Practice Recommendations for Virtualization at Unify.						
	vDisk Format		any thick					any thick
	Addt'l Storage		No					No
	Storage Throughput (estimated reqm't)		TBD.					TBD.
	Storage IOPS(estimated reqm't)		TBD.					TBD.

5.10 OpenScape Concierge

This table shows the hardware requirements for

- small deployments (Smallest & Depl. 1) with up to 10 Attendants working in an environment with up to 30,000 subscribers in the

telephone book database and a maximum of 1,200 BHCA (Busy Hour Call Attempts) as well as for

- medium deployments (Depl. 2) with up to 30 Attendants working in an environment with up to 40,000 subscribers in the telephone book database and a maximum of 2,400 BHCA.
- large deployments (Largest) with up to 100 Attendants working in an environment with up to 100,000 subscribers in the telephone book database and a maximum of 6,000 BHCA.

OpenScape Concierge V4 Rx		
General Product Info	Operating System	Please see the Release Note
	Database Server(s)	Microsoft SQL Server 2019
	E-mail Server(s)	Microsoft Exchange Server 2019
	Native Redundancy Support	Yes
	Redundancy Strategy	Active
	Voice/Video Media Terminating	
	Voice/Video Signalling Traffic	
	Other real-time critical requirements	
VMware Feature Compatibility	vMotion Support	Yes **Restrictions / Limitations:** It is recommended to perform a Live Migration only in periods of low traffic. vMotion during normal operation could cause noticeable service interruption and audio/voice quality degradation.
	High Availability (HA) Support	Yes
	Fault Tolerance (FT) Support	No
	Distributed Resource Scheduler (DRS) Support	Yes
	Site Recovery Manager (SRM) Support	Yes
	Backup with vStorage-APIs for Data Protection (Data Recovery Support)	Yes
	VMware Tools Support	Yes
	Virtual Appliance (vApp) Support	No

OpenScape Concierge V4Rx						
		Smallest	**Depl. 1**	**Depl. 2**	**Largest**	**External SQL Server Std./ Enterprise**
Depl. Scenarios	Depl. Scenario	Concierge Plus (with internal SQL Server Express)	Small Concierge Professional (with internal SQL Server Express)	Medium Concierge Professional (with internal SQL Server Std./Enterprise)	Large Concierge Professional (with external SQL Server Std./Enterprise)	For Deployments Largest
	Max Users	4	10	30	100	--
vCPU	vCPU	2	2	4	4	4
	vCPU Frequency (min)	2.662 GHz	2.662 GHz	2.662 GHz	2.662 GHz	TBA depending on performance tests
	vCPU Shares	High				
	vCPU Reservation.	750 MHz	1.0 GHz	2.5 GHz	2.662 GHz	TBA depending on performance tests
	vCPU Limit	Unlimited				
vRAM	vRAM	4 GB	4 GB	4 GB	4 GB	TBA depending on performance tests
	vRAM Shares	High				
	vRAM Reserv.	2 GB	2 GB	2 GB	2 GB	TBA depending on performance tests
	vRAM Limit	Unlimited	Unlimited	Unlimited	Unlimited	TBA depending on performance tests
vNIC	vNIC (No. Req'd)	1	1	1	1	1
	vNIC Type	VMXNET3	VMXNET3	VMXNET3	VMXNET3	VMXNET3
	vNIC Manual MAC	No	No	No	No	No
	Network Bandwidth (estimated reqm't)	20 Kbps	25 Kbps	40 Kbps	200 Kbps	5 Kbps per Concierge client
Storage (vDisk)	vDisk (No. Req'd)	1 per node	1 per node	1 per node	1 per node	1 per node
	vDisk Size	80 GB	80 GB	80 GB	80 GB	80 GB
		Note: vDisk Size is the total amount of storage needed for the operating system, the application, and the application data. Only a minimum level of logging is assumed for normal operation. If additional logging functionality is to be employed then the storage requirements should be increased accordingly.				
	vDisk Mode	Keep Defaults (which allows Snapshots)				
		Restrictions / Limitations: Snapshots are NOT to be taken on production systems during normal operation. Snapshots taken previously must NOT remain on a production system during normal operation. An active snapshot during normal operation could cause noticeable service interruption and audio/voice quality degradation. Please read section "General Statements and Best Practice Recommendations for Virtualization in the *"OpenScape Virtual Machine Resourcing and Configuration Guide"* for more details about snapshots.				
	vDisk Format	Thin	Thin	Thin	Thin	Thin
	Addt'l Storage	10 GB	10 GB	10 GB	10 GB	10 GB
	Storage Throughput (estimated reqm't)	15 KBps	25 KBps	40 KBps	80 KBps	TBA depending on performance test
		Note: The values can increase depending on log level, if logging is activated.				
	Storage IOPS(estimated reqm't)	20 IOPS	22 IOPS	30 IOPS	40 IOPS	TBA depending on performance test

5.11 OpenScape Contact Center

OpenScape Contact Center: There is no difference between HW requirements for virtual and non-virtual environment for the OpenScape Contact Center Application. For further information please contact Unify Service.

NOTICE: For more information about each released version, please refer to the product's Release Notes.

OpenScape Contact Center V10/V11		
General Product Info	Operating System for OSCC V10/ V11	For V10/V10 R1, please refer to latest issue of the Installation Guide of each specific version. For V11, the supported versions are: • Windows Server 2019 Standard or Datacenter • Windows Server 2016 Standard or Datacenter • Windows Server 2022 Standard or Datacenter For V10 R4, supported versions are: • Windows Server 2019 Standard or Datacenter • Windows Server 2016 Standard or Datacenter • Windows Server 2012 R2 Standard or Datacenter • Windows Server 2012 Standard or Datacenter **NOTE:** Windows Server 2019 and 2016 have .NET 4.x installed by default. Since, OSCC System Monitor requires .NET 3.5, for Windows 2019 and 2016, the .NET 3.5 must be installed on the server machine before installing OSCC. **NOTE:** Ensure that the latest Windows updates are installed.
	Native Redundancy Support	Yes
	Redundancy Strategy	Active/ standby with Microsoft clustering
	Voice/Video Media Terminating	No
	Voice/Video Signalling Traffic	CSTA
	Other real-time critical requirements	Yes, real-time contact center contact processing

OpenScape Contact Center V10/V11		
VMware Feature Compatibility	vMotion Support	Yes **Restrictions / Limitations:** While a virtual machine transfer between two physical machines is being performed using VMotion, we recommend that the OpenScape Contact Center system be under a maximum load of no more than 50 active users. In this condition, no system load issue should occur during OpenScape Contact Center system migration.
	High Availability (HA) Support	Yes
	Fault Tolerance (FT) Support	No
	Site Recovery Manager (SRM) Support	Yes, covered under VMware policy
	Backup with vStorage-APIs for Data Protection	No
	VMware Tools Support	Yes
	Virtual Appliance (vApp) Support	No

5.11.1 OpenScape Contact Center V10/V10R1

OpenScape Contact Center V10/V10R1 - Main Server

OpenScape Contact Center V10/V10R1 - Main Server			
		Small and Medium deployments	**Large deployments**
Depl. Scenarios	Depl. Scenario	**Depl. 1**	**Depl. 2**
	Number of Nodes	1	1
	Max Users	Up to 750 active users	More than 750 and up to 1,500 active users
vCPU	vCPU	4	8
	vCPU Shares	High	
	vCPU Reserv.	Must calculate # vCPU × physical CPU Freq	
	vCPU Limit	Unlimited	

OpenScape Contact Center V10/V10R1 - Main Server			
		Small and Medium deployments	**Large deployments**
vRAM	vRAM (if Application Server is not installed on Main Server machine)	8 GB	8 GB
	vRAM (if Application Server is installed on Main Server machine, memory must be reserved for Application Server)	12 GB	16 GB
	vRAM Shares	High	
	vRAM Reserv. (if Application Server is not installed on Main Server machine)	8 GB	8 GB
	vRAM Reserv. (if Application Server is installed on Main Server machine)	12 GB	16 GB
	vRAM Limit	Unlimited	
vNIC	vNIC (No. Req'd)	1	1
	vNIC Type	VMXNET3	VMXNET3
	vNIC Manual MAC	Parameter manual MAC is set to NO, so it is allowed to get the MAC automatically from VMware.	
		If the parameter is set to Y, please refer to "OpenScape Solution Set V10, How to check MAC Addresses for Virtual Systems, Quick Reference Guide" on E-doku.	
	Network Bandwidth (estimated reqm't, if Application Server is not installed on Main Server Machine)	18 Mbps	24 Mbps
	Network Bandwidth (estimated reqm't, if Application Server is installed on Main Server Machine)	36 Mbps	74 Mbps

OpenScape Contact Center V10/V10R1 - Main Server			
		Small and Medium deployments	**Large deployments**
Storage (vDisk)	vDisk (No. Req'd)	1	1
	vDisk Size	120 GB - 1 TB (**See Note 2**)	120 GB - 1 TB (**See Note 2**)
		vDisk Size is the total amount of storage needed for the operating system, the application, and the application data.	
		NOTE 2: When running OpenScape Contact Center in a virtualized environment, a minimum of 120 GB is required for the operating system, OpenScape Contact Center software, and initial Informix database files. If you require additional storage for any other purpose, you must add correspondingly sufficient disk space.	
	vDisk Mode	Keep Defaults (which allows Snapshots)	
	vDisk Format	Thick Provision Eager Zeroed	
	Addt'l Storage	No	No
	Storage Throughput (estimated reqm't)	57 Mbps	57 Mbps
	Storage IOPS (estimated reqm't)	200	200

OpenScape Contact Center V10/V10R1 - Application Server

OpenScape Contact Center V10/V10R1 - Application Server			
		Small and Medium deployments	**Large deployments**
Depl. Scenarios	Depl. Scenario	Depl. 1	Depl. 2
	Number of Nodes	1	1
	Max Users	Up to 750 active users	More than 750 and up to 1,500 active users
vCPU	vCPU	2	4
	vCPU Shares	High	
	vCPU Reserv.	Must calculate # vCPU × physical CPU Freq	
	vCPU Limit	Unlimited	
vRAM	vRAM	4 GB	8 GB
	vRAM Shares	High	
	vRAM Reserv.	4 GB	8 GB
	vRAM Limit	Unlimited	

OpenScape Contact Center V10/V10R1 - Application Server			
		Small and Medium deployments	**Large deployments**
vNIC	vNIC (No. Req'd)	1	1
	vNIC Type	VMXNET3	VMXNET3
	vNIC Manual MAC	Parameter manual MAC is set to NO, so it is allowed to get the MAC automatically from VMware.	
		If parameter is set to Y, please refer to "OpenScape Solution Set V10, How to check MAC Addresses for Virtual Systems, Quick Reference Guide" on e-doku.	
	Network Bandwidth (estimated reqm't)	36 Mbps	74 Mbps
Storage (vDisk)	vDisk (No. Req'd)	1	1
	vDisk Size	100 GB - 1 TB (See Note 2)	100 GB - 1 TB (See Note 2)
		vDisk Size is the total amount of storage needed for the operating system, the application, and the application data.	
		NOTE 2: When running OpenScape Contact Center in a virtualized environment, a minimum of 100 GB is required for the operating system, OpenScape Contact Center software, and initial Informix database files. If you require additional storage for any other purpose, you must add correspondingly sufficient disk space.	
	vDisk Mode	Keep Defaults (which allows Snapshots)	
	vDisk Format	Thick Provision Eager Zeroed	
	Addt'l Storage	No	No
	Storage Throughput (estimated reqm't)	57 Mbps	57 Mbps
	Storage IOPS (estimated reqm't)	200	200

5.11.2 OpenScape Contact Center V10R4

OpenScape Contact Center V10R4 - Main Server

OpenScape Contact Center V10R4 - Main Server			
		Small and Medium deployments	**Large deployments**
Depl. Scenarios	Depl. Scenario	**Depl. 1**	**Depl. 2**
	Number of Nodes	1	1
	Max Users	Up to 750 active users. If Agent Portal Web is used, please refer to Application Server deployment on table below. (**See Note 4**)	More than 750 and up to 1,500 active users If Agent Portal Web is used, please refer to Application Server deployment on table below. (**See Note 4**)
vCPU	vCPU	4	8
	vCPU Shares	High	
	vCPU Reserv.	Must calculate # vCPU × physical CPU Freq	
	vCPU Limit	Unlimited	
vRAM	vRAM (if Application Server is not installed on Main Server machine)	8 GB (**See Note 3**)	8 GB (**See Note 3**)
	vRAM (if Application Server is installed on Main Server machine, memory must be reserved for Application Server)	8 GB + Application Server used memory (see Application Server deployment on table below) (**See Note 3**)	8 GB + Application Server used memory (see Application Server deployment on table below) (**See Note 3**)
	vRAM Shares	High	
	vRAM Reserv. (if Application Server is not installed on Main Server machine)	8 GB	8 GB
	vRAM Reserv. (if Application Server is installed on Main Server machine)	8 GB + Application Server used memory (see Application Server deployment on table below)	8 GB + Application Server used memory (see Application Server deployment on table below)
	vRAM Limit	Unlimited	

OpenScape Contact Center V10R4 - Main Server			
		Small and Medium deployments	**Large deployments**
vNIC	vNIC (No. Req'd)	1	1
	vNIC Type	VMXNET3	VMXNET3
	vNIC Manual MAC	Parameter manual MAC is set to NO, so it is allowed to get the MAC automatically from VMware.	
		If the parameter is set to Y, please refer to "OpenScape Solution Set V10, How to check MAC Addresses for Virtual Systems, Quick Reference Guide" on E-doku.	
	Network Bandwidth (estimated reqm't, if Application Server is not installed on Main Server Machine)	18 Mbps	24 Mbps
	Network Bandwidth (estimated reqm't, if Application Server is installed on Main Server Machine)	36 Mbps	74 Mbps
Storage (vDisk)	vDisk (No. Req'd)	1	1
	vDisk Size	120 GB - 1 TB (**See Note 2**)	120 GB - 1 TB (**See Note 2**)
		vDisk Size is the total amount of storage needed for the operating system, the application, and the application data.	
	vDisk Mode	Keep Defaults (which allows Snapshots)	
	vDisk Format	Thick Provision Eager Zeroed	
	Addt'l Storage	No	No
	Storage Throughput (estimated reqm't)	57 Mbps	57 Mbps
	Storage IOPS (estimated reqm't)	200	200

OpenScape Contact Center V10R4 - Application Server

OpenScape Contact Center V10R4 - Application Server			
		Small and Medium deployments	**Large deployments**
Depl. Scenarios	Depl. Scenario	Depl. 1	Depl. 2
	Number of Nodes	1	1
	Max Users	300 with high combination of features 750 with low combination of features (See Note 1)	600 with high combination of features 1500 with low combination of features (See Note 1)
vCPU	vCPU Number	2	4
	vCPU Shares	High	
	vCPU Reserv.	Must calculate # vCPU × physical CPU Freq	
	vCPU Limit	Unlimited	
vRAM	vRAM	8 GB (See Note 3)	16 GB (See Note 3)
	vRAM Shares	High	
	vRAM Reserv.	8 GB	16 GB
	vRAM Limit	Unlimited	
vNIC	vNIC (No. Req'd)	1	1
	vNIC Type	VMXNET3	VMXNET3
	vNIC Manual MAC	Parameter manual MAC is set to NO, so it is allowed to get the MAC automatically from VMware.	
		If the parameter is set to Y, please refer to "OpenScape Solution Set V10, How to check MAC Addresses for Virtual Systems, Quick Reference Guide" on E-doku.	
	Network Bandwidth (estimated reqm't)	36 Mbps	74 Mbps
Storage (vDisk)	vDisk (No. Req'd)	1	1
	vDisk Size	100 GB - 1 TB (See Note 2)	100 GB - 1 TB (See Note 2)
		vDisk Size is the total amount of storage needed for the operating system, the application, and the application data.	

OpenScape Contact Center V10R4 - Application Server			
		Small and Medium deployments	**Large deployments**
Storage (vDisk)	vDisk Mode	Keep Defaults (which allows Snapshots)	
	vDisk Format	Thick Provision Eager Zeroed	
	Addt'l Storage	No	No
	Storage Throughput (estimated reqm't)	57 Mbps	57 Mbps
	Storage IOPS (estimated reqm't)	200	200

NOTE 1: For configuration of Deployments of the tables above, consider the limits for the features below:

Feature	Low	High
Team List	Up to 20 entries (300 agents with 20 entries each)	Up to 75 agents with 150 entries and 375 agents with 20 entries
Agent having Avatar	Up to 300 agents	Up to 450 agents
OpenMedia Connectors	Up to 10	Up to 99

In addition:

- If "chat between agents" feature is not used, please disable it from all agents' user permissions.
- For more than 300 active users, its recommended to increase maxThreads from default 150 to 650.

In this case, do the following:

1. Stop Application Server service or tomcat.
2. Navigate to "<Application Server installation folder>\ApacheWebServer\conf" and open server.xml.
3. Search and edit MaxThread like below:

" <Connector port="443"
protocol="org.apache.coyote.http11.Http11NioProtocol"
sslImplementa-
tionName="org.apache.tomcat.util.net.jsse.JSSEImplemen-
tation"
maxThreads="650" SSLEnabled="true" scheme="https"
secure="true"
clientAuth="false" sslProtocol="TLS"
keystoreFile="${catalina.base}\conf\keystore" keysto-
rePass="changeme" />

4. Save the file and start Application Server.

NOTE 2: When running OpenScape Contact Center or OpenScape Contact Center Application Server in a virtualized environment, a minimum of 100 GB is required for the operating system, OpenScape Contact Center software, Application Server software and initial Informix database files. If you require additional storage for any other purpose, you must add correspondingly sufficient disk space.

NOTE 3: When vRAM is reserved for the application purposes mentioned above, also consider 2 GB memory that shall be additionally reserved for the Operating System use.

NOTE 4: Nomenclature "small, medium and large deployment" is related to Application Server only. For example, we can have an environment with more 600 hundred users, using one Machine with OSCC + App Server, and other machines with additional App Servers.

5.11.3 OpenScape Contact Center V11

OpenScape Contact Center V11 - Main Server

OpenScape Contact Center V11 - Main Server			
		Small and Medium deployments	**Large deployments**
Depl. Scenarios	Depl. Scenario	**Depl. 1**	**Depl. 2**
	Number of Nodes	1	1
	Max Users	Up to 750 active users. If Agent Portal Web is used, please refer to Application Server deployment on table below. (**See Note 4**)	More than 750 and up to 1,500 active users If Agent Portal Web is used, please refer to Application Server deployment on table below. (**See Note 4**)
vCPU	vCPU	4	8
	vCPU Shares	High	
	vCPU Reserv.	Must calculate # vCPU × physical CPU Freq	
	vCPU Limit	Unlimited	
vRAM	vRAM (if Application Server is not installed on Main Server machine)	8 GB GB (**See Note 3**)	8 GB GB (**See Note 3**)
	vRAM (if Application Server is installed on Main Server machine, memory must be reserved for Application Server)	8 GB + Application Server used memory (see Application Server deployment on table below) (**See Note 3**)	8 GB + Application Server used memory (see Application Server deployment on table below) (**See Note 3**)
	vRAM Shares	High	
	vRAM Reserv. (if Application Server is not installed on Main Server machine)	8 GB	8 GB
	vRAM Reserv. (if Application Server is installed on Main Server machine)	8 GB + Application Server used memory (see Application Server deployment on table below)	8 GB + Application Server used memory (see Application Server deployment on table below)
	vRAM Limit	Unlimited	

OpenScape Contact Center V11 - Main Server			
		Small and Medium deployments	**Large deployments**
vNIC	vNIC (No. Req'd)	1	1
	vNIC Type	VMXNET3	VMXNET3
	vNIC Manual MAC	Parameter manual MAC is set to NO, so it is allowed to get the MAC automatically from VMware.	
		If the parameter is set to Y, please refer to "OpenScape Solution Set V10, How to check MAC Addresses for Virtual Systems, Quick Reference Guide" on E-doku.	
	Network Bandwidth (estimated reqm't, if Application Server is not installed on Main Server Machine)	18 Mbps	24 Mbps
	Network Bandwidth (estimated reqm't, if Application Server is installed on Main Server Machine)	36 Mbps	74 Mbps
Storage (vDisk)	vDisk (No. Req'd)	1	1
	vDisk Size	120 GB - 1 TB (**See Note 2**)	120 GB - 1 TB (**See Note 2**)
		vDisk Size is the total amount of storage needed for the operating system, the application, and the application data.	
	vDisk Mode	Keep Defaults (which allows Snapshots)	
	vDisk Format	Thick Provision Eager Zeroed	
	Addt'l Storage	No	No
	Storage Throughput (estimated reqm't)	57 Mbps	57 Mbps
	Storage IOPS (estimated reqm't)	200	200

OpenScape Contact Center V11 - Application Server

OpenScape Contact Center V11 - Application Server			
		Small and Medium deployments	**Large deployments**
Depl. Scenarios	Depl. Scenario	Depl. 1	Depl. 2
	Number of Nodes	1	1
	Max Users	300 with high combination of features 750 with low combination of features (See Note 1)	600 with high combination of features 1500 with low combination of features (See Note 1)
vCPU	vCPU Number	2	4
	vCPU Shares	High	
	vCPU Reserv.	Must calculate # vCPU × physical CPU Freq	
	vCPU Limit	Unlimited	
vRAM	vRAM	8 GB (See Note 3)	16 GB (See Note 3)
	vRAM Shares	High	
	vRAM Reserv.	8 GB	16 GB
	vRAM Limit	Unlimited	
vNIC	vNIC (No. Req'd)	1	1
	vNIC Type	VMXNET3	VMXNET3
	vNIC Manual MAC	Parameter manual MAC is set to NO, so it is allowed to get the MAC automatically from VMware.	
		If the parameter is set to Y, please refer to "OpenScape Solution Set V10, How to check MAC Addresses for Virtual Systems, Quick Reference Guide" on E-doku.	
	Network Bandwidth (estimated reqm't)	36 Mbps	74 Mbps
Storage (vDisk)	vDisk (No. Req'd)	1	1
	vDisk Size	100 GB - 1 TB (See Note 2)	100 GB - 1 TB (See Note 2)
		vDisk Size is the total amount of storage needed for the operating system, the application, and the application data.	

OpenScape Contact Center V11 - Application Server			
		Small and Medium deployments	**Large deployments**
Storage (vDisk)	vDisk Mode	Keep Defaults (which allows Snapshots)	
	vDisk Format	Thick Provision Eager Zeroed	
	Addt'l Storage	No	No
	Storage Throughput (estimated reqm't)	57 Mbps	57 Mbps
	Storage IOPS (estimated reqm't)	200	200

NOTE 1: For configuration of Deployments of the tables above, consider the limits for the features below:

Feature	Low	High
Team List	Up to 20 entries (300 agents with 20 entries each)	Up to 75 agents with 150 entries and 375 agents with 20 entries
Agent having Avatar	Up to 300 agents	Up to 450 agents
OpenMedia Connectors	Up to 10	Up to 99

In addition:

- If "chat between agents" feature is not used, please disable it from all agents' user permissions.
- For more than 300 active users, its recommended to increase maxThreads from default 150 to 650.

In this case, do the following:

1. Stop Application Server service or tomcat.
2. Navigate to "<Application Server installation folder>\ApacheWebServer\conf" and open server.xml.
3. Search and edit MaxThread like below:

" <Connector port="443"
protocol="org.apache.coyote.http11.Http11NioProtocol"
sslImplementa-
tionName="org.apache.tomcat.util.net.jsse.JSSEImplemen-
tation"
maxThreads="650" SSLEnabled="true" scheme="https"
secure="true"
clientAuth="false" sslProtocol="TLS"
keystoreFile="${catalina.base}\conf\keystore" keysto-
rePass="changeme" />

4. Save the file and start Application Server.

NOTE 2: When running OpenScape Contact Center or OpenScape Contact Center Application Server in a virtualized environment, a minimum of 100 GB is required for the operating system, OpenScape Contact Center software, Application Server software and initial Informix database files. If you require additional storage for any other purpose, you must add correspondingly sufficient disk space.

NOTE 3: When vRAM is reserved for the application purposes mentioned above, also consider 2 GB memory that shall be additionally reserved for the Operating System use.

NOTE 4: Nomenclature "small, medium and large deployment" is related to Application Server only. For example, we can have an environment with more 600 hundred users, using one Machine with OSCC + App Server, and other machines with additional App Servers.

5.12 OpenScape Contact Media Service

5.12.1 OpenScape Contact Media Service V10

OpenScape Contact Media Service V10		
General Product Info	Operating System	Please see the Release Note
	Native Redundancy Support	Yes
	Redundancy Strategy	Active/ active or Active/ standby
	Voice/Video Media Terminating	Yes
	Voice/Video Signalling Traffic	Yes
	Other real-time critical requirements	Yes
VMware Feature Compatibility	vMotion Support	Yes, covered under VMware policy
	High Availability (HA) Support	Yes
	Fault Tolerance (FT) Support	No
	Site Recovery Manager (SRM) Support	Yes, covered under VMware policy
	Backup with vStorage-APIs for Data Protection	No
	VMware Tools Support	No
	Virtual Appliance (vApp) Support	No

OpenScape Contact Media Service V10				
		IVR / Announcements	WebRTC Agent Portal Web	Recorder

OpenScape Contact Media Service V10					
Depl. Scenarios	Depl. Scenario	Single deployment	Single deployment	Single deployment	Single deployment
	Number of Nodes	1	1	1	1
	Max Users	Up to 200 IVR ports	Up to 300 IVR ports (**Note 1**)	300 ports (**Note 1**)	300 ports (**Note 1**)
vCPU	vCPU	2	4	4	4
	vCPU Shares	High	High	High	High
	vCPU Reserv.	Must calculate # vCPU × physical CPU Freq	Must calculate # vCPU × physical CPU Freq	Must calculate # vCPU × physical CPU Freq	Must calculate # vCPU × physical CPU Freq
	vCPU Limit	Unlimited	Unlimited	Unlimited	Unlimited
vRAM	vRAM	4 GB	8 GB	8 GB	8 GB
	vRAM Shares	High	High	High	High
	vRAM Reserv.	4 GB	8 GB	8 GB	8 GB
	vRAM Limit	Unlimited	Unlimited	Unlimited	Unlimited
vNIC	vNIC (No. Req'd)	1	1	1	1
	vNIC Type	Flexible	Flexible	Flexible	Flexible
	vNIC Manual MAC	Parameter Manual MAC is set to NO, so it is allowed to get the MAC automatically from VMware.	Parameter Manual MAC is set to NO, so it is allowed to get the MAC automatically from VMware.	Parameter Manual MAC is set to NO, so it is allowed to get the MAC automatically from VMware.	Parameter Manual MAC is set to NO, so it is allowed to get the MAC automatically from VMware.
		If the parameter is set to Y, please refer to "OpenScape Solution Set V10, How to check MAC Addresses for Virtual Systems, Quick Reference Guide" on e-doku.	If the parameter is set to Y, please refer to "OpenScape Solution Set V10, How to check MAC Addresses for Virtual Systems, Quick Reference Guide" on e-doku.	If the parameter is set to Y, please refer to "OpenScape Solution Set V10, How to check MAC Addresses for Virtual Systems, Quick Reference Guide" on e-doku.	If the parameter is set to Y, please refer to "OpenScape Solution Set V10, How to check MAC Addresses for Virtual Systems, Quick Reference Guide" on e-doku.
	Network Bandwidth (estimated reqm't)	80 kbps per port in each direction for G.711 48 kbps per port in each direction for G.729	80 kbps per port in each direction for G.711 48 kbps per port in each direction for G.729	80 kbps per port in each direction for G.711 48 kbps per port in each direction for G.729	80 kbps per port in each direction for G.711 48 kbps per port in each direction for G.729
Storage (vDisk)	vDisk (No. Req'd)	1	1	1	1
	vDisk Size	160 GB	160 GB	160 GB	160 GB
		Not applicable	Not applicable	Not applicable	Not applicable
		vDisk Size is the total amount of storage needed for the operating system, the application, and the application data.	vDisk Size is the total amount of storage needed for the operating system, the application, and the application data.	vDisk Size is the total amount of storage needed for the operating system, the application, and the application data.	vDisk Size is the total amount of storage needed for the operating system, the application, and the application data.
	vDisk Mode	Keep Defaults (which allows Snapshots)	Keep Defaults (which allows Snapshots)	Keep Defaults (which allows Snapshots)	Keep Defaults (which allows Snapshots)
	vDisk Format	Thick Provision Eager Zeroed	Thick Provision Eager Zeroed	Thick Provision Eager Zeroed	Thick Provision Eager Zeroed
	Addt'l Storage	No	No	No	No
	Storage Throughput (estimated reqm't)	Close to 0 unless logging is enabled	Close to 0 unless logging is enabled	Close to 0 unless logging is enabled	Close to 0 unless logging is enabled
	Storage IOPS(estimated reqm't)	200	200	200	200

Note 1: A combination of features is possible if the total number of ports is not higher than the Max Users. For example, it is possible to have a combination of 100 IVR, 100 WebRTC and 100 Recorder ports.

5.12.2 OpenScape Contact Media Service V11

OpenScape Contact Media Service V11		
General Product Info	Operating System	Please see the Release Note
	Native Redundancy Support	Yes
	Redundancy Strategy	Active/ active or Active/ standby
	Voice/Video Media Terminating	Yes
	Voice/Video Signalling Traffic	Yes
	Other real-time critical requirements	Yes
VMware Feature Compatibility	vMotion Support	Yes, covered under VMware policy
	High Availability (HA) Support	Yes
	Fault Tolerance (FT) Support	No
	Site Recovery Manager (SRM) Support	Yes, covered under VMware policy
	Backup with vStorage-APIs for Data Protection	No
	VMware Tools Support	No
	Virtual Appliance (vApp) Support	No

OpenScape Contact Media Service V11						
		IVR / Announcements		WebRTC Agent Portal Web	Recorder	Dialer
Depl. Scenarios	Depl. Scenario	Single deployment	Single deployment	Single deployment	Single deployment	Single deployment
	Number of Nodes	1	1	1	1	1
	Max Users	Up to 200 IVR ports	Up to 300 IVR ports (**Note 1**)	300 ports (**Note 1**)	300 ports (**Note 1**)	300 ports (**Note 1**)
vCPU	vCPU	2	4	4	4	4
	vCPU Shares	High	High	High	High	High
	vCPU Reserv.	Must calculate # vCPU × physical CPU Freq	Must calculate # vCPU × physical CPU Freq	Must calculate # vCPU × physical CPU Freq	Must calculate # vCPU × physical CPU Freq	Must calculate # vCPU × physical CPU Freq
	vCPU Limit	Unlimited	Unlimited	Unlimited	Unlimited	Unlimited
vRAM	vRAM	4 GB	8 GB	8 GB	8 GB	8 GB
	vRAM Shares	High	High	High	High	High
	vRAM Reserv.	4 GB	8 GB	8 GB	8 GB	8 GB
	vRAM Limit	Unlimited	Unlimited	Unlimited	Unlimited	Unlimited

OpenScape Contact Media Service V11						
vNIC	vNIC (No. Req'd)	1	1	1	1	1
	vNIC Type	Flexible	Flexible	Flexible	Flexible	Flexible
	vNIC Manual MAC	Parameter Manual MAC is set to NO, so it is allowed to get the MAC automatically from VMware.	Parameter Manual MAC is set to NO, so it is allowed to get the MAC automatically from VMware.	Parameter Manual MAC is set to NO, so it is allowed to get the MAC automatically from VMware.	Parameter Manual MAC is set to NO, so it is allowed to get the MAC automatically from VMware.	Parameter Manual MAC is set to NO, so it is allowed to get the MAC automatically from VMware.
		If the parameter is set to Y, please refer to "OpenScape Solution Set V10, How to check MAC Addresses for Virtual Systems, Quick Reference Guide" on e-doku.	If the parameter is set to Y, please refer to "OpenScape Solution Set V10, How to check MAC Addresses for Virtual Systems, Quick Reference Guide" on e-doku.	If the parameter is set to Y, please refer to "OpenScape Solution Set V10, How to check MAC Addresses for Virtual Systems, Quick Reference Guide" on e-doku.	If the parameter is set to Y, please refer to "OpenScape Solution Set V10, How to check MAC Addresses for Virtual Systems, Quick Reference Guide" on e-doku.	If the parameter is set to Y, please refer to "OpenScape Solution Set V10, How to check MAC Addresses for Virtual Systems, Quick Reference Guide" on e-doku.
	Network Bandwidth (estimated reqm't)	80 kbps per port in each direction for G.711 48 kbps per port in each direction for G.729	80 kbps per port in each direction for G.711 48 kbps per port in each direction for G.729	80 kbps per port in each direction for G.711 48 kbps per port in each direction for G.729	80 kbps per port in each direction for G.711 48 kbps per port in each direction for G.729	80 kbps per port in each direction for G.711 48 kbps per port in each direction for G.729
Storage (vDisk)	vDisk (No. Req'd)	1	1	1	1	1
	vDisk Size	160 GB	160 GB	160 GB	160 GB	160 GB
		Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
		vDisk Size is the total amount of storage needed for the operating system, the application, and the application data.	vDisk Size is the total amount of storage needed for the operating system, the application, and the application data.	vDisk Size is the total amount of storage needed for the operating system, the application, and the application data.	vDisk Size is the total amount of storage needed for the operating system, the application, and the application data.	vDisk Size is the total amount of storage needed for the operating system, the application, and the application data.
	vDisk Mode	Keep Defaults (which allows Snapshots)	Keep Defaults (which allows Snapshots)	Keep Defaults (which allows Snapshots)	Keep Defaults (which allows Snapshots)	Keep Defaults (which allows Snapshots)
	vDisk Format	Thick Provision Eager Zeroed	Thick Provision Eager Zeroed	Thick Provision Eager Zeroed	Thick Provision Eager Zeroed	Thick Provision Eager Zeroed
	Addt'l Storage	No	No	No	No	No
	Storage Throughput (estimated reqm't)	Close to 0 unless logging is enabled	Close to 0 unless logging is enabled	Close to 0 unless logging is enabled	Close to 0 unless logging is enabled	Close to 0 unless logging is enabled
	Storage IOPS(estimated reqm't)	200	200	200	200	200

Note 1: A combination of features is possible if the total number of ports is not higher than the Max Users. For example, it is possible to have a combination of 100 IVR, 100 WebRTC and 100 Recorder ports.

5.13 OpenScape DLS

OpenScape DLS V10		
General Product Info	Operating System	Please see the Release Note
	Native Redundancy Support	No
	Redundancy Strategy	-
	Voice/Video Media Terminating	No
	Voice/Video Signalling Traffic	No
	Other real-time critical requirements	No
VMware Feature Compatibility	vMotion Support	Yes
	High Availability (HA) Support	Yes
	Fault Tolerance (FT) Support	No
	Site Recovery Manager (SRM) Support	SRM is offered as a PSR
	Backup with vStorage-APIs for Data Protection	No
	vSphere Replication	No
	VMware Tools Support	Yes
	Virtual Appliance (vApp) Support	No

INFO: The DLS performance is measured on the basis of the number of user logons /hour (20K) rather than the number of users.

OpenScape DLS V10								
		Smallest	**Depl. 1**	**Depl. 2**	**Depl. 3**	**Depl. 4**	**Depl. 5**	**Largest**
Depl. Scenarios	Depl. Scenario							
	Number of Nodes							
	Max Users	Min # of users	5,000	10,000	20,000	50,000	up to 100,000 5 logons/second	Max # of users
							PSS only	
vCPU	vCPU	2	2	2	3	4	4	
	vCPU Shares	Normal	Normal	Normal	Normal	Normal	Normal	
	vCPU Reserv.	0	0	0	0	0	0	
	vCPU Limit	Unlimited	Unlimited	Unlimited	Unlimited	Unlimited	Unlimited	
vRAM	vRAM	4 GB	6 GB	6 GB	6 GB	8 GB	8 GB	
	vRAM Shares	Normal	Normal	Normal	Normal	Normal	Normal	
	vRAM Reserv.	4 GB	6 GB	6 GB	6 GB	8 GB	8 GB	
	vRAM Limit	Unlimited	Unlimited	Unlimited	Unlimited	Unlimited	Unlimited	
vNIC	vNIC (No. Req'd)	2	2	2	2	2	2	
		1 vNIC is sufficient for single-node DLS deployments.						
	vNIC Type	VMXNET3	VMXNET3	VMXNET3	VMXNET3	VMXNET3	VMXNET3	
	vNIC Manual MAC	Yes	Yes	Yes	Yes	Yes	Yes	
		If parameter is set to Y, please refer to "OpenScape Solution Set V10, How to check MAC Addresses for Virtual Systems, Quick Reference Guide" on e-doku.						
	Network Bandwidth (estimated reqm't)							
Storage (vDisk)	vDisk (No. Req'd)	1	1	1	1	1	1	
	vDisk Size	80 GB	80 GB	80 GB	80 GB	80 GB	80 GB	
		vDisk Size is the total amount of storage needed for the operating system, the application, and the application data.						
	vDisk Mode	Keep Defaults (which allows Snapshots)						
	vDisk Format	any	any	any	any	any	any	
	Addt'l Storage							
	Storage Throughput (estimated reqm't)							
	Storage IOPS(estimated reqm't)							

5.14 OpenScape Enterprise Express

5.14.1 OpenScape Enterprise Express V9

For OpenScape Enterprise Express V9 deployment tables please refer to *OpenScape Solution Set V9, Virtual Machine Resourcing and Configuration Guide*.

5.14.2 OpenScape Enterprise Express V10

- Virtual Machine HW version is provisioned according to ESXi version.

  IMPORTANT: Please consult individual application documentation for the newer VM HW Versions.

- Figures below are based on a typical Enterprise Feature set: CPU, NW, and Disk usage may vary based on call load and Feature mix.
- VMs created (independently of the deployment method) must be manually configured for 100% CPU and RAM reservations using the vSphere client.

<table>
<tr><th colspan="8">OpenScape Enterprise Express V10</th></tr>
<tr><th colspan="8">Solution based on OpenScape Voice Standard Duplex</th></tr>
<tr><th colspan="2">Virtual Machine</th><th>OSV Dublex Node 1</th><th>OSV Dublex Node 2</th><th>UC</th><th colspan="2">Windows Apps Server 1</th><th>Windows Apps Server 2</th></tr>
<tr><th colspan="2">Deployment Scenario</th><th>OSV Dublex</th><th>OSV Dublex</th><th>UC Open-fire Com-poser</th><th>OSCC (Depl. 1) XPR (Depl. 4) Concierge (Plus)</th><th>XPR (Depl. 4) Concierge (Plus)</th><th>DLS (Depl. 1/2) OSTM (Low-End)</th></tr>
<tr><td rowspan="4">vCPU</td><td>vCPU</td><td rowspan="15">Please check 5.20 OpenScape Voice
(Depl. 2)</td><td rowspan="15">Please check 5.20 Open-Scape Voice
(Depl. 2)</td><td rowspan="15">Please check 5.18 OpenScape UC Applica-tion (Small Deploy-ment)</td><td>8</td><td>5</td><td>4</td></tr>
<tr><td>vCPU Shares</td><td colspan="3">High</td></tr>
<tr><td>vCPU Reserv.</td><td colspan="3">must calculate # vCPU x physical CPU Freq.</td></tr>
<tr><td>vCPU Limit</td><td colspan="3">Unlimited</td></tr>
<tr><td rowspan="4">vRAM</td><td>vRAM</td><td>16</td><td>7</td><td>10</td></tr>
<tr><td>vRAM Shares</td><td colspan="3">High</td></tr>
<tr><td>vRAM Reserv.</td><td>16</td><td>7</td><td>10</td></tr>
<tr><td>vRAM Limit</td><td colspan="3">Unlimited</td></tr>
<tr><td rowspan="4">vNIC</td><td>vNIC (No. Req’d)</td><td colspan="3">2</td></tr>
<tr><td>vNIC Type</td><td colspan="3">VMXNET3 & E1000e</td></tr>
<tr><td rowspan="2">vNIC Manual MAC</td><td colspan="3">Yes</td></tr>
<tr><td colspan="3">NOTE: IIf parameter is set to Y, please refer to "Open-Scape Solution Set V10, How to check MAC Addresses for Virtual Systems, Quick Reference Guide" on e-doku..</td></tr>
<tr><td>Network Bandwidth (estimated reqm’t)</td><td>49 Mbps</td><td>13 Mbps</td><td>1 Gbps Network Connection Recom-mended</td></tr>
<tr><td rowspan="7">Storage (vDisk)</td><td>vDisk (No. Req’d)</td><td colspan="3">1</td></tr>
<tr><td>vDisk Size</td><td>500 GB</td><td>400 GB</td><td>100 GB</td></tr>
<tr><td>vDisk Mode</td><td colspan="3">Keep Defaults (which allows Snapshots)</td></tr>
<tr><td>vDisk Format</td><td colspan="3">Thick Provision Eager Zeroed</td></tr>
<tr><td>Additional Storage</td><td colspan="2">N/A</td><td>200 GB</td></tr>
<tr><td>Storage Throughput (estimated reqm’t)</td><td>60 Mbps</td><td>2215 Kbps</td><td>N/A</td></tr>
<tr><td>Storage IOPS (estimated reqm’t)</td><td colspan="3">N/A</td></tr>
</table>

OpenScape Enterprise Express V10						
Solution based on OpenScape Integrated Simplex						
Virtual Machine		**OpenScape Integrated Simplex**	**Composer**	**Windows Apps Server 1**		**Windows Apps Server 2**
Deployment Scenario		**Virtualized Integrated Simplex**	**Composer (Depl. 1)**	**OSCC (Depl. 1) XPR (Depl. 4) Concierge (Plus)**	**XPR (Depl. 4) Concierge (Plus)**	**OSTM (Low-End)**
vCPU	vCPU	Please check 5.20 OpenScape Voice (Depl. Virtualized Integrated Simplex)	Please check 5.9 OpenScape Composer (Depl. 1)	8	5	2
	vCPU Shares			High		
	vCPU Reserv.			must calculate # vCPU x physical CPU Freq.		
	vCPU Limit			Unlimited		
vRAM	vRAM			16	7	4
	vRAM Shares			High		
	vRAM Reserv.			16	7	4
	vRAM Limit			Unlimited		
vNIC	vNIC (No. Req'd)			2		
	vNIC Type			VMXNET3 & E1000e		
	vNIC Manual MAC			Yes		
				NOTE: IIf parameter is set to Y, please refer to "OpenScape Solution Set V10, How to check MAC Addresses for Virtual Systems, Quick Reference Guide" on e-doku..		
	Network Bandwidth (estimated reqm't)			49 Mbps	13 Mbps	1 Gbps Network Connection Recommended
Storage (vDisk)	vDisk (No. Req'd)			1		
	vDisk Size			500 GB	400 GB	100 GB
	vDisk Mode			Keep Defaults (which allows Snapshots)		
	vDisk Format			Thick Provision Eager Zeroed		
	Additional Storage			N/A		200 GB
	Storage Throughput (estimated reqm't)			60 Mbps	2215 Kbps	N/A
	Storage IOPS (estimated reqm't)			N/A		

5.15 OpenScape Fault Management

OpenScape Fault Management V9/V10/V11		
General Product Info	Operating System	Please see the Release Note
	Native Redundancy Support	No
	Redundancy Strategy	-
	Voice/Video Media Terminating	No
	Voice/Video Signalling Traffic	No
	Other real-time critical requirements	No
VMware Feature Compatibility	vMotion Support	Yes **Restrictions / Limitations:** vMotion should not be used during business hours on high system load
	High Availability (HA) Support	Yes
	Fault Tolerance (FT) Support	No
	Site Recovery Manager (SRM) Support	Yes **Note:** All VMware requirements (incl. Hardware) and best practices have to be fulfilled. The network between the data center sites has to be a transparent layer 2 network which provides identical environments in both locations.
	Backup with vStorage-APIs for Data Protection	Yes **Note:** vStorage APIs can be used as an additional backup layer for image level backups that allow to restore virtual disk contents after a disk failure fast. The standard backup mechanisms normally used in physical deployments have to be applied in addition
	VMware Tools Support	Yes **Note:** Installation of VMware Tools is recommended.
	Virtual Appliance (vApp) Support	No

OpenScape Fault Management V9/V10/V11						
		Smallest	**Depl. 1**	**Medium**	**Depl. 3-5**	**Largest**
Depl. Scenarios	Depl. Scenario	Single Node		Single Node		Single Node
	Number of Nodes	1		1		1
	Max Users	unlimited Users unlimited FM Ports up to 2.500 Network IP-Nodes up to 100 SM IP-Nodes (requires 2 separate system management agents) including up to 5,000 Performance Management end points, handled by internal or external PM agent		unlimited Users unlimited FM Ports up to 5.000 Network IP-Nodes up to 200 SM IP-Nodes (requires 4 separate system management agents) including up to 10,000 Performance Management end points, handled by internal or external PM agent		unlimited Users unlimited FM Ports up to 25.000 Network IP-Nodes up to 2.000 SM IP-Nodes (requires 40 separate system management agents) including up to 50,000 Performance Management end points, handled by 5 external PM agents (1 per 10,000 end points)
vCPU	vCPU	1		2		4
	vCPU Shares	Normal		Normal		Normal
	vCPU Reserv.	0		0		0
		Issues resulting from CPU contention cannot be addressed towards the application				
	vCPU Limit	Unlimited		Unlimited		Unlimited
vRAM	vRAM	6 GB		8 GB		16 GB
	vRAM Shares	Normal		Normal		Normal
	vRAM Reserv.	6 GB		8 GB		16 GB
	vRAM Limit	unlimited		unlimited		unlimited
vNIC	vNIC (No. Req'd)	1		1		1
	vNIC Type	VMXNET3		VMXNET3		VMXNET3
	vNIC Manual MAC	Yes		Yes		Yes
		If parameter is set to Y, please refer to "OpenScape Solution Set V10, How to check MAC Addresses for Virtual Systems, Quick Reference Guide" on e-doku.				
	NOTE:	No, if remote CLA is used		No, if remote CLA is used		No, if remote CLA is used
	Network Bandwidth (estimated reqm't)	480 Kbps		480 Kbps		480 Kbps
Storage (vDisk)	vDisk (No. Req'd)	1		1		1
	vDisk Size	100 GB		200 GB		500 GB
		vDisk Size is the total amount of storage needed for the operating system, the application, and the application data.				
	vDisk Mode	Keep Defaults (which allows Snapshots)		Keep Defaults (which allows Snapshots)		Keep Defaults (which allows Snapshots)
	vDisk Format	thick lazy-zeroed		thick lazy-zeroed		thick lazy-zeroed
	Addt'l Storage	No		No		No
	Storage Throughput (estimated reqm't)	2000 Kbps		3600 Kbps		3600 Kbps
	Storage IOPS(estimated reqm't)	32 IOPS		57 IOPS		57 IOPS

5.16 OpenScape Media Server

OpenScape Media Server V9		
General Product Info	Operating System	Please see the Release Note
	Native Redundancy Support	Yes
	Redundancy Strategy	N+1
	Voice/Video Media Terminating	Yes
	Voice/Video Signalling Traffic	Yes
	Other real-time critical requirements (see note)	Yes
VMware Feature Compatibility	vMotion Support	Yes **Restrictions / Limitations:** Only at times with low system usage since voice quality will suffer for a short time during motion
	High Availability (HA) Support	Yes
	Fault Tolerance (FT) Support	No
	Site Recovery Manager (SRM) Support	Yes
	Backup with vStorage-APIs for Data Protection	Yes
	VMware Tools Support	Yes
	Virtual Appliance (vApp) Support	No

INFO: Other real-time critical requirements: Refer to OpenScape Media Server Administrator Documentation for details.

OpenScape Media Server V9							
		Smallest	**Depl. 1**	**Depl. 2**	**Depl. 3**	**Depl. 4**	**Largest**
Depl. Scenarios	Depl. Scenario	OSV Simplex (all in one: UC/ MGCP etc)	OSV Duplex (Single MS image for MGCP)	OSV Duplex (2 MS images for MGCP)	Single MS image for OSC-UC (UCAS Large-Deployment)	Single-MS node for NGCP/UC	Multi-Node MS for MGCP+UC (UCAS Large-Deployment)
	Number of Nodes	1	1	2	1	1	N (up to 4)
	Max Users	Depends on used audio/codec and on used HW (there is a load -formular available					
vCPU	vCPU	≥ 4 vCPU	≥ 4 vCPU	≥ 4 vCPU	≥ 4 vCPU	≥ 4 vCPU	12 vCPU
	vCPU Shares	Normal	Normal	Normal	Normal	Normal	Normal
	vCPU Reserv.	Must calculate #vCPU x physical CPU Freq					
	vCPU Limit	Unlimited					
vRAM	vRAM	≥ 8 GB	≥ 8 GB	≥ 8 GB	≥ 8 GB	≥ 8 GB	≥ 8 GB
	vRAM Shares	Normal					
	vRAM Reserv.	≥ 8 GB	≥ 8 GB	≥ 8 GB	≥ 8 GB	≥ 8 GB	≥ 8 GB
	vRAM Limit	Unlimited					
vNIC	vNIC (No. Req'd)	1	1	1	1	1	1
	vNIC Type	VMXNET3	VMXNET3	VMXNET3	VMXNET3	VMXNET3	VMXNET3
		IMPORTANT: If the ESXi installed is higher than ESXi V4.1 **AND** lower than ESXi V5.0 (821926), then E1000 must be used even though it is is less efficient.. If VMXNET3 is used instead then UDP packets ≤ 40 bytes will be dropped and the application may be unable to communicate with the VM. For further information, refer to: https://kb.vmware.com/selfservice/microsites/search.do?language=en_US&cmd=displayKC&externalId=2019944					
	vNIC Manual MAC	No	No	No	No	No	No
		If parameter is set to Y, please refer to "OpenScape Solution Set V10, How to check MAC Addresses for Virtual Systems, Quick Reference Guide" on e-doku.					
	Network Bandwidth (estimated reqm't)	Depends on load and used codec: 1 G711 ≈ 100 Kbit; 1 H264 Chn ≈ 2 Mbit/sec					
Storage (vDisk)	vDisk (No. Req'd)	1	1	1	1	1	1
	vDisk Size	≥ 80 GB	≥ 80 GB	≥ 80 GB	≥ 80 GB	≥ 80 GB	≥ 80 GB
		vDisk Size is the total amount of storage needed for the operating system, the application, and the application data.					
	vDisk Mode	Keep Defaults (which allows Snapshots)					
	vDisk Format	Thick Lazy-Zeroed	Thick Lazy-Zeroed	Thick Lazy-Zeroed	Thick Lazy-Zeroed	Thick Lazy-Zeroed	Thick Lazy-Zeroed
	Addt'l Storage	No	No	No	No	No	No
	Storage Throughput (estimated reqm't)	Depends on Media-App and Load: ~8 KB/sec per Audio Channel for VoicePortal; 0 for Conferencing					
	Storage IOPS (estimated reqm't)	Not important for MS (it is not worth mentioning)					

5.17 OpenScape Mobile Facade Server

Remark: these values are a recommendation based on theoretical considerations. They should be used as a starting point. The resource actual virtual machine resource consumption should be closely monitored during the initial deployment phase to confirm that they are suitable/sufficient.

OpenScape Mobile Façade Server V7 R1		
General Product Info	Operating System	Please see the Release Note
	Native Redundancy Support	Yes
	Redundancy Strategy	N+1
	Voice/Video Media Terminating	No
	Voice/Video Signalling Traffic	No
	Other real-time critical requirements	No
VMware Feature Compatibility	vMotion Support	PSR
	High Availability (HA) Support	Yes
	Fault Tolerance (FT) Support	No
	Site Recovery Manager (SRM) Support	No
	Backup with vStorage-APIs for Data Protection	PSR
	VMware Tools Support	Yes
	Virtual Appliance (vApp) Support	No

OpenScape Façade Server V7 R1						
		Smallest	**Depl. 1**	**Depl. 2**	**Depl. 3**	**Largest**
Depl. Scenarios	Depl. Scenario	Any				
	Number of Nodes	n				
	Max Users	n*5,000				
vCPU	vCPU	4				
	vCPU Shares	Medium				
	vCPU Reserv.	0 GHz				
	vCPU Limit	Unlimited				
vRAM	vRAM	4 GB				
	vRAM Shares	Normal				
	vRAM Reserv.	4 GB				
	vRAM Limit	Unlimited				
vNIC	vNIC (No. Req'd)	1				
	vNIC Type	VMXNET3				
	vNIC Manual MAC	No				
		If parameter is set to Y, please refer to "OpenScape Solution Set V10, How to check MAC Addresses for Virtual Systems, Quick Reference Guide" on e-doku.				
	Network Bandwidth (estimated reqm't)	Unknown				
Storage (vDisk)	vDisk (No. Req'd)	1				
	vDisk Size	40 GB				
		vDisk Size is the total amount of storage needed for the operating system, the application, and the application data.				
	vDisk Mode	Keep Defaults (which allows Snapshots)				
	vDisk Format	any				
	Addt'l Storage	none				
	Storage Throughput (estimated reqm't)	low				
	Storage IOPS(estimated reqm't)	low				

5.18 OpenScape Session Border Controller (SBC)

VMware Metrics

The following table and notes show the metrics for support of up to 32,000 OpenScape SBC SIP registered users.

Deployment Scenario	Smallest	Config 1	Config 2	Largest
Metric	**250 (Note 1)**	**6,000 (Note 1)**	**20,000 (Note 1)**	**32,000 (Note 1)**
Max. registered hosted remote OpenScape Branch users (Note 2) (without Digest Authentication or TLS; Throttling does not apply) (Note 13)	250 (Note 3)	6,000 (Note 3)	20,000 (Note 3)	32,000 (Note 3)
Max. registered SIP Remote Users (Note 2), eg, home workers (without Digest Authentication, Throttling, or TLS)	250 (Note 3)	6,000 (Note 3)	20,000 (Note 3)	32,000 (Note 3)
Max. simultaneous SIP signaling calls / SBC sessions (Note 4)	250	1,400	2,500	32,000 (Note 12)
Max. simultaneous RTP media streams (full-calls) anchored through OpenScape SBC (without Media Transcoding) (Notes 5, 6, 7,8)	250	1,400	2,500	3,500
Max. simultaneous SRTP secure media streams (either MIKEY0 or SDES) terminated/mediated by SBC (without Media Transcoding)	200	1,120	2,000	2,800
Number of simultaneous SIP Service Providers (SSP)	10 (Note 9)	10 (Note 9)	10 (Note 9)	10 (Note 9)
Busy Hour Call Attempts (full calls) (Note 10)	1,800	23,400	39,600	39,600
Max. peak half-calls (Note 10) per second (without Digest Authentication, Throttling, or TLS)	1 (Note 10)	13 (Note 10)	22 (Note 10)	22 (Note 10)
Registration refresh requests per second (randomized registration steady state condition)	1	4	12	15
Steady state call completion rate	99.99%	99.99%	99.99%	99.99%
Time to recover to steady state operation (99.99% call completion) following simultaneous restart of all endpoint devices (Note 11)	<15 min.	<15 min.	<15 min.	<15 min.

The following notes provide details for the VMware Metrics:

1. Network interface switch speed is set to 1 Gigabit Ethernet.
2. For keysets, each keyset line appearance is counted as one registered user.
3. Subscriber registration interval 3600 seconds. Lower intervals could cause flood of registration and impact SBC and its limits.
4. Add the following penalty (or penalties*) to get the actual registered SIP users limit. To get new numbers, apply penalty1 and on the new numbers apply penalty2.
   - Digest Authentication penalty: 25%
   - Throttling Penalty (600 seconds - reducing this value introduces more penalty): 60%

   * To determine cumulative penalties apply penalty1 and on the new number apply penalty2.
   ** Throttling penalties are not applicable to hosted remote Branch users.
5. An SBC Session is defined as a SIP signaled call with an access-side signaling leg and a core-side signaling leg. A typical voice call between a local OpenScape Voice user and a Remote User registered via the SBC, or to a SIP Trunk connected via the SBC requires one SBC session. A typical video call requires two SBC sessions; one for the video connection and another for the audio connection. An additional 20% penalty on OpenScape SBC capacity should be added for a video connection versus an audio connection due to the extra SIP INFO messages that are exchanged during a video call.
6. Each RTP stream (full-call) anchored through the central OpenScape SBC consists of two half-calls travelling in opposite direction. For example, two half-calls are used when a remote user registered via the SBC is connected to another remote user registered via the SBC, or to a SIP Trunk connected via the SBC. A single half-call is used when a local subscriber registered directly with the OpenScape Voice server is connected to a remote user registered via the SBC, or to a SIP Trunk connected via the SBC.
7. The RTP packet performance (e.g., packet loss) is influenced by several factors:

a) Hardware BIOS settings relating to performance & power saving,
b) Hardware BIOS hyper-threading,
c) VM guest settings hyper-threaded core sharing,
d) VM guest memory (RAM),
e) VM guest OS NIC rx ring buffer size

8. RTP packetization time/size. For better performance, choose BIOS performance over power-saving, disable HT, no HT core sharing. Multiple, active VM's and smaller vRAM allocations may decrease RTP packet loss
9. Up to 10 SSP simultaneous SIP trunk interfaces are supported. These interfaces can connect to the same or different SSPs assuming the IP addresses on the SSP side are different. The SSP connection can point to the same or different IP addresses on the OpenScape SBC.
10. A "half call" is a call from either Access side (WAN) to core-side (LAN) or from core-side (LAN) to access-side (WAN). A "full call" consists of two half call legs. i.e. a call being initiated by the Access side (WAN) going to core-side (LAN) and then coming back to the Access side (WAN).
11. Apply the following penalty (or penalties*) to determine the actual OpenScape SBC maximum calls per second limit when the following functions are enabled:

    a) Digest Authentication penalty: 30%
    b) Throttling penalty** (600 seconds throttling interval): 40%
    c) TLS penalty** (600 seconds keep alive interval; no throttling): 50%

    * To determine cumulative penalties apply penalty1 and on the new number apply penalty2
    **Throttling and TLS penalties are not applicable to hosted remote Branch users.
12. When restarting, SIP endpoint devices are required to comply with procedures specified in RFC3261 and OSCAR Chapter 11: Best Practices. With a simultaneous restart of all endpoint devices, when a user becomes successfully registered, that user shall immediately be able to originate and receive calls with a call completion rate of at least 99.99%.
13. The maximum number of simultaneous SBC sessions in the high-capacity model is for signaling-only sessions. If media anchoring, trans-coding, trans-rating or any other feature is in use that requires the media to flow through the SBC, then the maximum number of simultaneous SIP sessions reverts to its old value of 3,500.
14. Throttling is a mechanism used to keep a NAT/firewall pinhole open for the subscriber's SIP signaling connection for a subscriber that is behind a far-end NAT/firewall. In order to do this, REGISTER messages coming from these subscribers responded back with a small expiry interval (configurable, default 60 seconds) to force the subscribers to re-register causing the pinhole in the NAT device to remain open.

VMware Resources

OpenScape SBC V10		
General Product Info	Operating System	Please see the Release Note
	Native Redundancy Support	Yes
	Redundancy Strategy	Active/ Standby
	Voice/Video Media Terminating	Yes
	Voice/Video Signalling Traffic	Yes
	Other real-time critical requirements	No
VMware Feature Compatibility	vMotion Support	Yes **Restrictions / Limitations:** It is recommended to perform a Live Migration only in periods of low traffic, otherwise noticeable service interruption might occur.
	High Availability (HA) Support	Yes
	Fault Tolerance (FT) Support	No
	Site Recovery Manager (SRM) Support	No
	Backup with vStorage-APIs for Data Protection	No
	VMware Tools Support	Yes
	Virtual Appliance (vApp) Support	Yes

OpenScape SBC V10					
		Smallest	**Config. 1**	**Config. 2**	**Largest**
Depl. Scenarios	Depl. Scenario	Single or redundant node			
	Number of Nodes	1-2	1-2	1-2	1-2
	Max Users	250	6,000	20,000	32,000
vCPU	vCPU	2	4	6	8
	vCPU Shares	High			
	vCPU Reserv. [1]	Must calculate # vCPU × physical CPU Freq			
	vCPU Limit	Unlimited			
vRAM	vRAM	4 GB	4 GB	6 GB	6 GB
	vRAM Shares	Normal			
	vRAM Reserv.	4 GB	4 GB	6 GB	6 GB
	vRAM Limit	Unlimited			
vNIC	vNIC (No. Req'd)	2	2	2	2
		Note: The default value is 2, but it is possible to configure up to 6 vNICs.			
	vNIC Type	VMXNET3	VMXNET3	VMXNET3	VMXNET3
	vNIC Manual MAC	Yes, only for local license file			
		If parameter is set to Y, please refer to "OpenScape Solution Set V10, How to check MAC Addresses for Virtual Systems, Quick Reference Guide" on e-doku.			
	Network Bandwidth Capacity (estimated requirement)	Core side (eth0) 100 KB/sec Access side (eth1) 16000 KB/sec	Core side (eth0) 500 KB/sec Access side (eth1) 60,000 KB/sec	Core side (eth0) 1,000 KB/sec Access side (eth1) 120,000 KB/sec	Core side (eth0) 1,000 KB/sec Access side (eth1) 120,000 KB/sec
Storage (vDisk)	vDisk (No. Req'd)	1	1	1	1
	vDisk Size	40 GB	40 GB	60 GB	60 GB
		vDisk Size is the total amount of storage needed for the operating system, the application, and the application data.			
	vDisk Mode	Keep Defaults (which allows Snapshots)			
	vDisk Format	Thick Lazy-Zeroed			
	Addt'l Storage	5 GB	5 GB	5 GB	5 GB
	Storage Throughput (estimated reqm't)	30 KBps	400 KBps	600 KBps	600 KBps
	Storage IOPS (estimated reqm't)	5	20	30	30

1 OpenScape Branch and OpenScape SBC are considered critical real time applications. Therefore, the CPU reservation settings should be adjusted to allow as much CPU speed as possible.
The performance tests executed on V10 used a SR250 server with four cores running at 3.5 GHz, with a **SPECint_base2017** value of 9.77. This is the recommended value for achieving the specified performance figures.
If the selected host processor has a **SPECint_base2017** value lower than the recommended one or the reservation settings cannot allocate the host CPU frequency for all required cores, then the reservation values can be lowered. In this case, the customer/service shall monitor closely the OpenScape Branch/SBC CPU usage to avoid performance bottlenecks. Alarms should be set for conditions and the recommented solution is to increase the host CPU capacities or reduce the resources for other non-critical applications running on same host.

NOTICE: For the OpenScape Session Border Controller (SBC) until V10R0 the vRAM of the VMware virtual machine is specified according to the following table:

		Smallest	Config. 1	Config. 2	Largest
vRAM	vRAM	2 GB	2 GB	4 GB	4 GB
	vRAM Shares	Normal			
	vRAM Reserv.	2 GB	2 GB	4 GB	4 GB
	vRAM Limit	Unlimited			

5.19 OpenScape UC Application

OpenScape UC + CMP + MS: This is a package that includes OpenScape UC Application, CMP and Media Server for the UC users and features.

Although the Media Server used for OpenScape UC Application can be the same Media Server for OpenScape Voice, the hardware requirements for the voice users must be separately entered into the table.

E/A Cockpit: Each E/A Cockpit user requires about 5 times more resources than a standard OpenScape UC user. Therefore you have to use the following equation to find the new number of UC users and then look-up back into the right table column:

Number of UC users (including E/A cockpit) ≥ UC users + E/A cockpit users * 5.

OpenScape UC Application V10		
General Product Info	Operating System	Please see the Release Note
	Native Redundancy Support	Yes
	Redundancy Strategy	vSphere HA
	Voice/Video Media Terminating	Yes
	Voice/Video Signalling Traffic	Yes
	Other real-time critical requirements	No
VMware Feature Compatibility	vMotion Support	Yes **Restrictions / Limitations:** not recommended during "busy hours"
	High Availability (HA) Support	Yes
	Fault Tolerance (FT) Support	No
	Site Recovery Manager (SRM) Support	No. - SRM is offered as a PSR w/ PSS involvement only
	Backup with vStorage-APIs for Data Protection	Yes
	VMware Tools Support	Yes
	Virtual Appliance (vApp) Support	Yes

OpenScape UC Application V9		
	Integrated Deployment	
Depl. scenario	Num. of Computers	1
	Max Users	1,250
For details see column "OpenScape Integrated Simplex" in Section 5.20 "OpenScape Voice".		

OpenScape UC Application V10		
Small Deployment		
Depl. scenario	Num. of Computers	1
	Max Users	2,500
vCPU	vCPU	8
	vCPU Shares	High
	vCPU Reserv.	Must calculate # vCPU × physical CPU Freq
	vCPU Limit	Unlimited
vRAM	vRAM	24 GB
	vRAM Shares	High
	vRAM Reserv.	8 GB
	vRAM Limit	Unlimited
vNIC	vNIC (No. Req'd)	1
	vNIC Type	VMXNET3
	vNIC Manual MAC	Yes
		If parameter is set to Y, please refer to "OpenScape Solution Set V10, How to check MAC Addresses for Virtual Systems, Quick Reference Guide" on e-doku.
	Network Bandwidth (estimated reqm't)	TBD
Storage (vDisk)	vDisk (No. Req'd)	1
	vDisk Size	300 GB
	vDisk Mode	Independent persistent is recommended - Snapshots allowed if observing guidelines documented in Section 3.5 General Statements and Best Practice Recommendations for Virtualization at Unify.
	vDisk Format	Any thick
	Addt'l Storage	No
	Storage Throughput (estimated reqm't)	TBD
	Storage IOPS (estimated reqm't)	Total IOPS ≈ 0.02 IOPS × <number of UC Application users> This approximation only applies if you use the default logging settings.

OpenScape UC Application V10				
Large Deployment				
		Application Computer	**Front-end Computer**	**Media Server Computer**
Depl. scenario	Num. of Computers	1	1 to 4 (2)	1 to 4 (2)
	Max Users	15,000 (1)	5,000 per computer	5,000 per computer(3) 2,500 per computer(4)
		(1) In case of an external Unified Messaging solution.		
		(2) In full configuration a computer system as redundancy.		
		(3) If the voice and conference portal are used in parallel without Media Sever operation for OpenScape Voice **OR** if no video conferences are used.		
		(4) If video conferences are used also.		
vCPU	vCPU	8 per computer		
	vCPU Shares	High		
	vCPU Reserv.	Must calculate # vCPU × physical CPU Freq		
	vCPU Limit	Unlimited		
vRAM	vRAM	24 GB	12 GB per computer	
	vRAM Shares	High		
	vRAM Reserv.	24 GB	12 GB	
	vRAM Limit	Unlimited		
vNIC	vNIC (No. Req'd)	1 per computer		
	vNIC Type	VMXNET3		
	vNIC Manual MAC	Yes		
		If parameter is set to Y, please refer to "OpenScape Solution Set V10, How to check MAC Addresses for Virtual Systems, Quick Reference Guide" on e-doku.		
	Network Bandwidth (estimated reqm't)	TBD		
Storage (vDisk)	vDisk (No. Req'd)	1	1 per computer	
	vDisk Size	300 GB		
	vDisk Mode	Independent persistent is recommended - Snapshots allowed if observing guidelines documented in Section 3.5 General Statements and Best Practice Recommendations for Virtualization at Unify.		
	vDisk Format	Any thick		
	Addt'l Storage	No		
	Storage Throughput (estimated reqm't)	TBD		
	Storage IOPS (estimated reqm't)	Total IOPS ≈ 0.02 IOPS × <number of UC Application users> This approximation only applies if you use the default logging settings.		

OpenScape UC Application V10					
Very Large Deployment					
		Application Computer (per cluster)	**Front-end Computer (per cluster)**	**Media Server Computer (per cluster)**	**Openfire Server**
Depl. scenario	Num. of Computers	1	1 to 4 (1)	1 to 5 (2)	min. 1
	Max Users	40,000	15,000 per computer	10,000 per computer	≈ 100,000
		(1) In full configuration a computer system as redundancy.			
		(2) In full configuration a computer system for increased video performance and a computer system as redundancy.			
vCPU	vCPU	8		12	4
	vCPU Shares	High			
	vCPU Reserv.	Must calculate # vCPU × physical CPU Freq			
	vCPU Limit	Unlimited			
vRAM	vRAM	24 GB	12 GB		8 GB
	vRAM Shares	High			
	vRAM Reserv.	24 GB	12 GB		8 GB
	vRAM Limit	Unlimited			
vNIC	vNIC (No. Req'd)	1 per node			
	vNIC Type	VMXNET3			
		IMPORTANT: If the ESXi installed is higher than ESXi V4.1 **AND** lower than ESXi V5.0 (821926), then E1000 must be used even though it is is less efficient. If VMXNET3 is used instead, then UDP packets ≤ 40 bytes will be dropped and the application may be unable to communicate with the VM. For further information, refer to: https://kb.vmware.com/selfservice/microsites/search.do?language=en_US&cmd=displayKC&externalId=2019944			
	vNIC Manual MAC	Yes			
		If parameter is set to Y, please refer to "OpenScape Solution Set V10, How to check MAC Addresses for Virtual Systems, Quick Reference Guide" on e-doku.			
	Network Bandwidth (estimated reqm't)	TBD			

OpenScape UC Application V10					
Very Large Deployment					
		Application Computer (per cluster)	**Front-end Computer (per cluster)**	**Media Server Computer (per cluster)**	**Openfire Server**
Storage (vDisk)	vDisk (No. Req'd)	1	1 per computer		1
	vDisk Size	300 GB			min. 100 GB
					In case syncUC functionality is required for the Openfire server, it is necessary to create two LVM partitions, 100 GB each.
	vDisk Mode	Independent persistent is recommended - Snapshots allowed if observing guidelines documented in Section 3.5 General Statements and Best Practice Recommendations for Virtualization at Unify			
	vDisk Format	Any thick			
	Addt'l Storage	No			
	Storage Throughput (estimated reqm't)	TBD			
	Storage IOPS (estimated reqm't)	Total IOPS ≈ 0.02 IOPS × <number of UC Application users> This approximation only applies if you use the default logging settings.			TBD

5.20 OpenScape UC – Openfire Server

These values are a recommendation based on theoretical considerations. They should be used as a starting point. The virtual machine resource consumption should be closely monitored during the initial deployment phase to confirm there are suitable/sufficient resources.

NOTICE: The resources listed in this section can also be used in case a stand-alone Openfire Server is set up in Small or Large UC deployments.

OpenScape UC Application V10 – OpenFire Server		
General Product Info	Operating System	Please see the Release Note
	Native Redundancy Support	No
	Redundancy Strategy	vSphere HA
	Voice/Video Media Terminating	No
	Voice/Video Signalling Traffic	No
	Other real-time critical requirements	No
VMware Feature Compatibility	vMotion Support	Yes **Restrictions / Limitations:** not recommended during "busy hours"
	High Availability (HA) Support	Yes
	Fault Tolerance (FT) Support	No
	Site Recovery Manager (SRM) Support	No. **Note:** SRM is offered as a PSR w/ PSS involvement only
	Backup with vStorage-APIs for Data Protection	Yes
	VMware Tools Support	Yes
	Virtual Appliance (vApp) Support	No

OpenScape UC Application V10 – OpenFire Server		
		Depl. 1
Depl. Scenarios	Depl. Scenario	
	Number of Nodes	1
	Max Users	Total number of UC users
vCPU	vCPU	4
	vCPU Shares	High
	vCPU Reserv.	Must calculate # vCPU × physical CPU Freq
	vCPU Limit	Unlimited
vRAM	vRAM	8 GB
	vRAM Shares	High
	Note: If the Chat History feature is enabled, then the RAM must be upgraded to 16 GB.	
	vRAM Reserv.	8 GB
	vRAM Limit	Unlimited
vNIC	vNIC (No. Req'd)	1
	vNIC Type	VMXNET3
	vNIC Manual MAC	No
	Network Bandwidth (estimated reqm't)	TBD
Storage (vDisk)	vDisk (No. Req'd)	1
	vDisk Size	100 GB minimum
		vDisk Size is the total amount of storage needed for the operating system, the application, and the application data. In case syncUC functionality is required for the Openfire server, it is necessary to create two LVM partitions, 100 GB each.
	vDisk Mode	Independent persistent recommended - Snapshots allowed if observing guidelines documented in Section 3.5 "General Statements and Best Practice Recommendations for Virtualization at Unify".
	vDisk Format	any thick
	Addt'l Storage	No
	Storage Throughput (estimated reqm't)	TBD
	Storage IOPS (estimated reqm't)	TBD

5.21 OpenScape Voice

Virtualization Environment Setup:

- Both nodes of a cluster (duplex OSV system) must be installed as virtual machines. A cluster configuration where one node is deployed as native hardware and the other as a virtual machine is not supported.
- A detailed guideline for installing an OpenScape Voice (OSV) image onto a VMware ESXi virtualized platform is found in the OpenScape Voice V9 Service Manual: Installation & Upgrades.
- The virtualization dimensioning specifications listed in this section (e.g. number of vCPUs, vCPU reservation, etc.) are tested and recommended by Unify. Configurations using different specifications which are not tested, may result in an unstable system and are not recommended. (e.g. since a vCPU is a process for the VM host, using more vCPUs than the recommended, adds overhead to the ESXi (VMkernel) in order to keep up with the increased number of processes). Please address those cases with a PSR.

> ***IMPORTANT:*** The virtual SCSI controller must be adapted BEFORE saving the VM. Please refer to the Virtual Machine Disk Requirements section of *OpenScape Voice V10, Service Manual: Installation and Upgrades, Installation Guide*.

Migrations:

Detailed information for Migrations to OpenScape Voice V10 is found in the OpenScape Voice V10 Service Manual: Installation & Upgrades under Section "Migrations to OpenScape voice V10".

For information regarding the hardware platforms that support upgrades and migrations to, please refer to Section "Overview of Upgrades and Migrations to OpenScape Voice V9" found in the OpenScape Voice V10 Service Manual: Installation & Upgrades.

Knowledge of the VMware environment is a prerequisite for this migration. If the hardware of the source release is reused for this migration scenario, before the OSV Image can be installed the ESXi must be installed and the virtual environment configuration built. This will extend the system down time.

Service considerations:

In a virtualized environment configuration, care must be taken that the customer has two support contracts: one with Unify and one with VMware.

If the customer opens a ticket with the Unify Service Desk, the ticket will be accepted and evaluated to determine the root cause (whether the problem is with a Unify product or with VMware). This can require

the involvement of several levels in the Unify support organization including GO and GVS.

If the root cause analysis has determined that the error is on the Unify side, GVS will provide a bug fix. If it is in VMware software, the ticket will be routed back to the customer who will then be asked to open a ticket with VMware.

OpenScape Voice Deployment:

Virtualization is supported for Integrated Simplex simplex and standard duplex (collocated and geographically separated) configurations. Supports 2 node clustering in co-location and network geographical separation. The co-located OSV can be deployed on 1 (both nodes on same physical host) or 2 hosts. A geo-separated OSV should be deployed on 2 hosts.

OpenScape Voice (2 nodes):

The hardware requirement presented in the table is for two OpenScape Voice nodes. In virtual environments you can install them on the same host/ server, but for obvious reasons it is recommended to install it on separate servers.

The simplex / entry option is not available for virtual environment.

The following additional notes have to be taken into account for this product:

- OSV figures in the table indicate requirements for each node
- OSV figures in the table are based on a typical Enterprise Feature set and call load.
- OSV figures in the table are based on V7 default RTT trace settings (24-7 extern)/distributed registration/Nodes on Separate servers/ Active-Standby mode
- OSV nodes are recommended to reside on separate physical servers for HW redundancy.
- OSV uses additional disk space (on the server/SAN) to hold things like images, patch sets, mass provisioning files, restore CD, vApp, CDC ISO, etc)
- The VMware manual MAC is no longer used to lock OSV license files for Virtual deployments starting with OSV V7. Use the CLS to calculate the Advanced Locking ID for OSV license files for OSV V8 Virtual deployments.
- OSV Backup and Restore procedures are recommended to be used versus snapshots
- OSV NW and Disk usage may vary based on call usage and Feature mix
- OSV cps (Calls per Second) formula = # of users×(5/3600×5) (5 calls per user per hour with a loading factor of 5 for features). Ex.: 1000 users = 6.94 cps.

- OSV NW Total Bandwidth KB/s Requirement formula = cps×26.
- OSV X-channel Bandwidth KB/s Requirement formula = cps×13 (Note: starting in V6 cross channel compression is turned on by default)
- OSV HD KB/s formula = cps×3.33
- In case the OSV nodes are hosted on different servers, each one should get its own CPU reservation value calculated using the formula

  `# vCPU × physical CPU Freq`, even if the physical CPUs are different.

OpenScape Voice V10			OpenScape Integrated Simplex V10
General Product Info	Operating System	Please see the Release Note	Please see the Release Note
	Native Redundancy Support	Yes	No
	Redundancy Strategy	Active/ Active or Active/ Standby	VMWare
	Voice/Video Media Terminating	No	Yes
	Voice/Video Signalling Traffic	Yes	Yes
	Other real-time critical requirements	No	No
VMware Feature Compatibility	vMotion Support	Yes	Yes
		Restrictions / Limitations: (vMotion during normal operation would cause some call loss (.5 to 1s second). vMotion impact during SW update/upgrade, node reboot, registration flood is tbd.)	
	High Availability (HA) Support	Yes	Yes
	Fault Tolerance (FT) Support	No	No
	Site Recovery Manager (SRM) Support	No. - SRM is supported indirectly by deploying one OSV node at the Protected site and the other OSV node at the Recovery Site	No
	Backup with vStorage-APIs for Data Protection	VMware VDR is supported **Note:** OSV Backup and Restore procedures are recommended to be used as a first line of defense against data loss.	VMware VDR is supported
	VMware Tools Support	Yes	Yes
	Virtual Appliance (vApp) Support	Yes	No

		OpenScape Voice			OpenScape Integrated Simplex	OpenScape Virtual Standard Duplex Large
		Depl. 1	**Depl. 2**	**Largest**		
Depl. Scenarios	Depl. Scenario	OSV Duplex	OSV Duplex	OSV Duplex	Virtualized Integrated Simplex	Virtualized Standard Duplex Large
	Number of Nodes	2	2	2	1	2
	Max Users	≤ 5,000*	≤ 10,000*	Max Users	5,000 Voice users, of which no more than 1250 may also be UC users	200,000 Voice users, of which 100.000 can be registered at any time
		*This number may be lower under high load, heavy feature usage or high level of tracing.				
vCPU	vCPU	4	4	8	8	8
	Physical CPU requirement	SPECint_base2006 = 36.6 www.spec.org/cpu2006				
	vCPU Shares	High				
	vCPU Reservations	Must calculate # vCPU × physical CPU Freq				
	vCPU Limit	Unlimited				
vRAM	vRAM	9 GB	9 GB	9 GB	10 GB	12 GB
	vRAM Shares	Normal				
	vRAM Reserv.	9 GB	9 GB	9 GB	10 GB	12 GB
	vRAM Limit	Unlimited				
vNIC	vNIC (No. Req'd)	4	4	4	4	4
	vNIC Type	VMXNET3	VMXNET3	VMXNET3	VMXNET3	VMXNET3
		Note: For new installations VMXNET3 has to be used. For existing OSV deployments with E1000 it is requested to change to VMXNET3. The method with the detailed steps is documented in the OpenScape Voice Installation and Upgrades Guide, Appendix "T" Change E1000 to VMXNET3 network adapters.				
	vNIC Manual MAC	No	No	No	No	No
		If parameter is set to Y, please refer to "OpenScape Solution Set V10, How to check MAC Addresses for Virtual Systems, Quick Reference Guide" on e-doku.				
	Network Bandwidth (estimated reqm't)	887 KBps Includes 468 for x-channel	1774 KBps includes 936 for x-channel	8873 KBps includes 4680 for x-channel	3000 KBps	3000 KBps

		OpenScape Voice			OpenScape Integrated Simplex	OpenScape Virtual Standard Duplex Large
		Depl. 1	**Depl. 2**	**Largest**		
Storage (vDisk)	vDisk (No. Req'd)	1 per node	1 per node	1 per node	1	1 per node
	vDisk Size	140 GB	140 GB	140 GB	140 GB	140 GB
		vDisk Size is the total amount of storage needed for the operating system, the application, and the application data.				
	vDisk Mode	Keep Defaults (which allows Snapshots)				
		Note: The Virtual disk mode setting "Independent" disallows the creation of Snapshots of a virtual machine. For a customer environment, it is recommended the Mode settings are NOT selected. This is the default configuration. Note: Snapshots are not to be used in a production environment except during initial installation process (e.g., as a backup in case there is a problem with a mass provisioning script). All snapshots are to be removed once the OSV VM is placed into production.				
		Additional information: Mode Independent persistent will leave changes permanently written to disk. Mode Independent Non-persistent writes data to disk but the data will be eliminated on restart (good for a training, lab, or demo environment).				
	vDisk Format	Thick Lazy-Zeroed				
	Addt'l Storage	10 GB	10 GB	10 GB	10 GB	10 GB
	Storage Throughput (estimated reqm't)	116 KBps	231 KBps	1157 KBps	250 KBps	250 KBps
	Storage IOPS (estimated reqm't)	TBD	TBD	TBD	75 IOPS	75 IOPS

5.22 OpenScape Voice Survival Authority

Survivable Authority (SA): SA must be located at a point on the IP network where it can communicate with both OpenScape Voice nodes. SA is included in the package together with CMP; therefore it does not require extra CPU power, RAM and HD.

OpenScape Voice Survival Authority V10		
General Product Info	Operating System	Please see the Release Note
	Native Redundancy Support	No
	Redundancy Strategy	-
	Voice/Video Media Terminating	No
	Voice/Video Signalling Traffic	No
	Other real-time critical requirements	No
VMware Feature Compatibility	vMotion Support	Yes
	High Availability (HA) Support	Yes **Restrictions / Limitations:** Don't move SA to a device/location that is suspect to a failure that impacts one OSV node, but not its partner
	Fault Tolerance (FT) Support	Yes, but not needed
	Site Recovery Manager (SRM) Support	Yes **Restrictions / Limitations:** Only if SA and both OSV cluster nodes are in the same site and recovered together
	Backup with vStorage-APIs for Data Protection	Yes, but not needed, - SA data are static
	VMware Tools Support	Yes
	Virtual Appliance (vApp) Support	No

OpenScape Voice Survival Authority V10						
		Smallest	**Depl. 1**	**Depl. 2**	**Depl. 3**	**Largest**
Depl. Scenarios	Depl. Scenario	Single Node				
	Number of Nodes	1				
	Max Users	Any # of Users				
vCPU	vCPU	1				
	vCPU Shares	Low				
	vCPU Reserv.	Must calculate # vCPU × physical CPU Freq				
	vCPU Limit	Unlimited				
vRAM	vRAM	0.5 GB				
	vRAM Shares	Low				
	vRAM Reserv.	0.5 GB				
	vRAM Limit	Unlimited				
vNIC	vNIC (No. Req'd)	1				
	vNIC Type	VMXNET3				
	vNIC Manual MAC	No				
		If parameter is set to Y, please refer to "OpenScape Solution Set V10, How to check MAC Addresses for Virtual Systems, Quick Reference Guide" on e-doku.				
	Network Bandwidth (estimated reqm't)	5 KBps				
Storage (vDisk)	vDisk (No. Req'd)	1				
	vDisk Size	4 GB				
		vDisk Size is the total amount of storage needed for the operating system, the application, and the application data.				
	vDisk Mode	Keep Defaults (which allows Snapshots)				
	vDisk Format	Thick Lazy-Zeroed				
	Addt'l Storage	No				
	Storage Throughput (estimated reqm't)	2 KBps				
	Storage IOPS (estimated reqm't)	TBD.				

5.23 OpenScape Web Collaboration

Remark: these values are a recommendation based on theoretical considerations. They should be used as a starting point. The resource actual virtual machine resource consumption should be closely monitored during the initial deployment phase to confirm that they are suitable/sufficient.

It is recommended to outsource the SQL-DB to an extra SQL-Server in case of a deployment with up to 1,000 users.

OpenScape Web Collaboration V7		
General Product Info	Operating System	Windows Server 2012 R2 Windows Server 2016 Windows Server 2019 Windows Server 2022
	Native Redundancy Support	Yes, with PSR
	Redundancy Strategy	N+1
	Voice/Video Media Terminating	No
	Voice/Video Signalling Traffic	No
	Other real-time critical require-ments	Yes
VMware Feature Compatibility	vMotion Support	PSR
	High Availability (HA) Support	Yes
	Fault Tolerance (FT) Support	No
	Site Recovery Manager (SRM) Sup-port	No
	Backup with vStorage-APIs for Data Protection	PSR
	VMware Tools Support	Yes
	Virtual Appliance (vApp) Support	No

OpenScape Web Collaboration V7			
		Smallest	**n*1000**
Depl. Scenarios	Depl. Scenario	single-node	multi-node
	Number of Nodes	1	n
	Max Users	1,000	n×1,000
vCPU	vCPU	4	n×8
	vCPU Shares	High	
	vCPU Reserv.	Must calculate # vCPU × physical CPU Freq	
	vCPU Limit	Unlimited	
vRAM	vRAM	4 GB	n×8 GB
	vRAM Shares	Normal	
	vRAM Reserv.	4 GB	n×8 GB
	vRAM Limit	Unlimited	
vNIC	vNIC (No. Req'd)	1	n×1
	vNIC Type	VMXNET3	VMXNET3
	vNIC Manual MAC	No	No
	Network Bandwidth (estimated reqm't)	Unknown	Unknown
Storage (vDisk)	vDisk (No. Req'd)	1	n×1
	vDisk Size	140 GB	n×140 GB
		vDisk Size is the total amount of storage needed for the operating system, the application, and the application data.	
	vDisk Mode	Independent persistent recommended - Snapshots allowed if observing guidelines documented in Section 3.5 General Statements and Best Practice Recommendations for Virtualization at Unify.	
	vDisk Format	any	any
	Addt'l Storage	none	none
	Storage Throughput (estimated reqm't)	low	low
	Storage IOPS (estimated reqm't)	low	low

5.24 OpenScape Xpert – MLC (Multi Line Controller)

OpenScape Xpert - MLC		
General Product Info	Operating System	Please see the Release Note
VMware Feature Compatibility	High Availability (HA) Support	Yes
	Fault Tolerance (FT) Support	Yes (only 1 vCPU)
	VMWare Tools	Yes, recommended.
	vMotion Support	Yes, only in non-working hours & idle load. Otherwise could result in voice interruptions and/or call loss.
	DRS	Only in “Manual/Partially automated” modes. “Fully automated” is not supported
	Storage vMotion	No (could result in call loss)
	Storage DRS (sDRS)	Only in “Manual Mode” for “initial placement”
	Suspend	No
	Snapshot	With running VMs: not supported
	Storage APIs/VDP	No
	SRM	No
	App HA	No
	vSphere Replication	No
	vApp	No
	VM Hardware version	Supported: 10,11,13

OpenScape Xpert - SM				
		MLC, 1 Core	**MLC, 2 Core**	**MLC, 4 Core**
Depl. Scenario	Max connected TTs	≤ 250	≤ 250	≤ 250
	Max parallel RTP streams	≤ 250 (with FT) ≤ 300 (without FT)	≤ 500	≤ 600
vCPU	vCPU cores	1	2	4
	vCPU Shares	High	High	High
	vCPU Reserv.	2,5 GHz	5 GHz	10 GHz
	vCPU Limit	Unlimited	Unlimited	Unlimited
vRAM	vRAM	2 GB	2 GB	2 GB
	vRAM Shares	Normal		
	vRAM Reserv.	2 GB	2 GB	2 GB
	vRAM Limit	Unlimited	Unlimited	Unlimited
vNIC	vNIC (No. Req'd)	1	1	1
	vNIC Type	VMXNET3	VMXNET3	VMXNET3
	req Bandwidth	90 Kbps / one G.711 stream	90 Kbps / one G.711 stream	90 Kbps / one G.711 stream
Storage (vDisk)	vDisk (No. Req'd)	1	1	1
	vDisk Size	40 GB	40 GB	40 GB
	vDisk Shares	High	High	High
	vDisk Format	Thick Lazy-Zeroed	Thick Lazy-Zeroed	Thick Lazy-Zeroed
	Storage Throughput (estimated)	2000 KBps (under heavy load, for logging)	2000 KBps (under heavy load, for logging)	2000 KBps (under heavy load, for logging)

5.25 OpenScape Xpert – SM (System Manager)

OpenScape Xpert - SM		
General Product Info	Operating System	Please see the Release Note
VMware Feature Compatibility	High Availability (HA) Support	Yes
	Fault Tolerance (FT) Support	No
	VMWare Tools	Yes, recommended
	vMotion Support	Yes, but only in non-working hours and under idle load. Otherwise could result in voice interruptions and/or call loss
	DRS	Only in "Manual/Partially automated" modes. "Fully automated" is not supported
	Storage vMotion	No (could result in call loss)
	Storage DRS (sDRS)	Only in "Manual Mode" for "initial placement"
	Suspend	No
	Snapshot	With running VMs: not supported
	Storage APIs/VDP	No
	SRM	No
	App HA	No
	vSphere Replication	No
	vApp	No
	VM Hardware version	Supported: 10,11,13

OpenScape Xpert - SM				
		SM (50 TTs)	**SM (900 TTs)**	**SM (2000 TTs)**
Depl. Scenario	Max connected TTs	50	900	2000
vCPU	vCPU cores	2	4	6
	vCPU Shares	Normal	High	High
	vCPU Reserv.	2.5 GHz	10 GHz	10 GHz
	vCPU Limit	Unlimited		
vRAM	vRAM	4 GB	4 GB	6GB
	vRAM Shares	Normal		
	vRAM Reserv.	2 GB	All locked	
	vRAM Limit	Unlimited		
vNIC	vNIC (No. Req'd)	1	1	1
	vNIC Type	VMXNET3	VMXNET3	VMXNET3
Storage (vDisk)	vDisk (No. Req'd)	1	1	1
	vDisk Size	60 GB	100 GB	100 GB
	vDisk Shares	Normal	High	High
	vDisk Format	Thick Lazy-Zeroed	Thick Lazy-Zeroed	Thick Lazy-Zeroed

5.26 OpenScape Xpert – Master Trading Turret

OpenScape Xpert - Master TT		
General Product Info	Operating System	Please see the Release Note
VMware Feature Compatibility	High Availability (HA) Support	Yes
	Fault Tolerance (FT) Support	No
	VMWare Tools	Yes, recommended
	vMotion Support	Yes, but only in non-working hours and under idle load. Otherwise could result in voice interruptions and/or call loss
	DRS	Only in "Manual/Partially automated" modes. "Fully automated" is not supported
	Storage vMotion	No (could result in call loss)
	Storage DRS (sDRS)	Only in "Manual Mode" for "initial placement"
	Suspend	No
	Snapshot	With running VMs: not supported
	Storage APIs/VDP	No
	SRM	No
	App HA	No
	vSphere Replication	No
	vApp	No
	VM Hardware version	Supported: 10,11,13

OpenScape Xpert - Master TT		
vCPU	vCPU cores	2
	vCPU Shares	Normal
	vCPU Reserv.	2,5 GHz
	vCPU Limit	Unlimited
vRAM	vRAM	2 GB
	vRAM Shares	Normal
	vRAM Reserv.	All locked
	vRAM Limit	Unlimited
vNIC	vNIC (No. Req'd)	1
	vNIC Type	VMXNET3
Storage (vDisk)	vDisk (No. Req'd)	1
	vDisk Size	50 GB
	vDisk Shares	Normal
	vDisk Format	Thick Lazy-Zeroed

5.27 OpenScape Xpressions

OpenScape Xpressions V7 R1 FR5		
General Product Info	Operating System	Please see the Release Note
	Native Redundancy Support	Yes
	Redundancy Strategy	Active/ standby using Windows Server Cluster for kernel N+1 redundancy for satellites.
	Voice/Video Media Terminating	Yes
	Voice/Video Signalling Traffic	Yes
	Other real-time critical requirements	No
VMware Feature Compatibility	vMotion Support	Yes **Restrictions / Limitations:** not recommended during "busy hours"
	High Availability (HA) Support	Yes
	Fault Tolerance (FT) Support	No
	Site Recovery Manager (SRM) Support	No. SRM is offered with PSS/Customer Solution Lab (CSL) involvement only.
	Backup with vStorage-APIs for Data Protection	Yes
	VMware Tools Support	Yes
	Virtual Appliance (vApp) Support	No

OpenScape Xpressions V7 R1 FR5									
		Smallest	**Depl. 1**	**Depl. 2**	**Depl. 3**	**Depl. 4**	**Depl. 5**	**Depl. 6**	**Largest**
Depl. Scenarios	Depl. Scenario	single-node	single-node	single-node	single-node	single-node	multi-node	multi-node	multi-node
	Number of Nodes	1	1	1	1	1	kernel +	kernel +	kernel +
							2 satellites	3 satellites	4 satellites
	Max Users	up to 100	up to 300	up to 1,000	up to 3000	up to 5000	up to 10,000	via PSR only: up to 15,000	via PSR only: up to 18,000
vCPU	vCPU-kernel	1	1	1	2	3	2	3	4
	vCPU-satellites						2 × 2	3 × 2	4 × 2
	vCPU Shares	N/A CPU is 100% reserved							
	vCPU Reserv-kernel	Must calculate # vCPU × physical CPU Freq							
	vCPU Reserv-satellites	-					Must calculate # vCPU × physical CPU Freq		
	vCPU Limit	Unlimited							

OpenScape Xpressions V7 R1 FR5									
		Smallest	**Depl. 1**	**Depl. 2**	**Depl. 3**	**Depl. 4**	**Depl. 5**	**Depl. 6**	**Largest**
vRAM	vRAM	3 GB	3 GB	3 GB	3 GB	3 GB	3 GB	4 GB	6 GB
	Satellites						2 × 2 GB	3 × 2 GB	4 × 2 GB
	vRAM Shares	High							
	vRAM Reserv.	3 GB	3 GB	3 GB	3 GB	3 GB	3 GB	4 GB	6 GB
	Satellites						2 × 2 GB	3 × 2 GB	4 × 2 GB
	vRAM Limit	Unlimited							
vNIC	vNIC (No. Req'd)	1	1	1	1 each	1 each	1 each	1 each	1 each
	vNIC Type	VMXNET3	VMXNET3	VMXNET3	VMXNET3	VMXNET3	VMXNET3	VMXNET3	VMXNET3
	vNIC Manual MAC	Yes (due to Licensing)	Yes	Yes	Yes	Yes	Yes	Yes	Yes
		If parameter is set to Y, please refer to "OpenScape Solution Set V10, How to check MAC Addresses for Virtual Systems, Quick Reference Guide" on e-doku.							
	Satellites						No for satellite	No for satellites	No for satellites
	Network Bandwidth (estimated reqm't)	not available	1,300 kbps	3,000 kbps	6,400 kbps	12,000 kbps	86,000 kbps	160,000 kbps	not available
Storage (vDisk)	vDisk (No. Req'd)	1	1	1	1	1	1 + 2 × 1	1 + 3 × 1	1 + 4 × 1
	vDisk Size	16 GB	40 GB	85 GB	220 GB	360 GB	690 GB	1,030 GB	1,400 GB
		vDisk Size is the total amount of storage needed for the operating system, the application, and the application data.							
	Satellites						2 × 20 GB	3 × 20 GB	4 × 20 GB
	vDisk Mode	Keep Defaults (which allows Snapshots)							
	vDisk Format	any thick	any thick	any thick	any thick	any thick	any thick	any thick	any thick
	Addt'l Storage	No	No	No	No	No	No	No	No
	Storage Throughput (estimated reqm't)	N/A	260 kBps	800 kBps	1,250 kBps	2,200 kBps	3,900 kBps	5,100 kBps.	not available
	Storage IOPS (estimated reqm't)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

5.28 SESAP SW-Suite

SESAP: You have to consider one per OpenScape UC Suite solution sold to a customer.

SESAP SW-Suite V2		
General Product Info	Operating System	Please see the Release Note
	Native Redundancy Support	No
	Redundancy Strategy	-
	Voice/Video Media Terminating	No
	Voice/Video Signalling Traffic	No
	Other real-time critical requirements	No
VMware Feature Compatibility	vMotion Support	Yes
	High Availability (HA) Support	Yes
	Fault Tolerance (FT) Support	No
	Site Recovery Manager (SRM) Support	No
	Backup with vStorage-APIs for Data Protection	Yes
	VMware Tools Support	Yes
	Virtual Appliance (vApp) Support	No

SESAP SW-Suite V2								
		Smallest	**Depl. 1**	**Depl. 2**	**Depl. 3**	**Depl. 4**	**Depl. 5**	**Largest**
Depl. Scenarios	Depl. Scenario		Single node			Single node	Single node	
	Number of Nodes		1			1	1	
	Max Users		300	1,000	3,000	5,000	10,000	
vCPU	vCPU		1			1	2	
	vCPU Shares		Normal			Normal	Normal	
	vCPU Reserv.		0 MHz			0 MHz	0 MHz	
	vCPU Limit		Unlimited			Unlimited	Unlimited	
vRAM	vRAM		4 GB			6 GB	8 GB	
	vRAM Shares		Normal			Normal	Normal	
	vRAM Reserv.		0 MB			0 MB	0 MB	
	vRAM Limit		Unlimited			Unlimited	Unlimited	
vNIC	vNIC (No. Req'd)		1			1	1	
	vNIC Type		VMXNET3			VMXNET3	VMXNET3	
	vNIC Manual MAC		Yes			Yes	Yes	
		If parameter is set to Y, please refer to "OpenScape Solution Set V10, How to check MAC Addresses for Virtual Systems, Quick Reference Guide" on e-doku.						
	Network Band-width (estimated reqm't)		TBD.			TBD.	TBD.	
Storage (vDisk)	vDisk (No. Req'd)		1			1	1	
	vDisk Size		100 GB			1500 GB	2000 GB	
		vDisk Size is the total amount of storage needed for the operating system, the application, and the application data.						
	vDisk Mode		Keep Defaults (which allows Snapshots)					
	vDisk Format		thin			thin	thin	
	Addt'l Storage		0 GB			0 GB	0 GB	
	Storage Through-put (estimated reqm't)		TBD.			TBD.	TBD.	
	Storage IOPS(esti-mated reqm't)		TBD.			TBD.	TBD.	

5.29 OpenScape Trace Manager

OpenScape Trace Manager V8		
General Product Info	Operating System	Please see the Release Note
	Native Redundancy Support	No
	Redundancy Strategy	-
	Voice/Video Media Terminating	No
	Voice/Video Signalling Traffic	No
	Other real-time critical requirements	No
VMware Feature Compatibility	vMotion Support	Yes
	High Availability (HA) Support	Yes
	Fault Tolerance (FT) Support	No
	Site Recovery Manager (SRM) Support	SRM is offered as a PSR
	Backup with vStorage-APIs for Data Protection	No
	VMware Tools Support	Yes. Tools are neither delivered nor installed with the product
	Virtual Appliance (vApp) Support	No

OpenScape Trace Manager V8			
		Low-End	**Recommended**
Depl. Scenarios	Depl. Scenario	Can be co-hosted	Dedicated Server
	Number of Nodes	1	1
	Calls per Seconds loads	<= 2 CPS	<= 10 CPS
vCPU	vCPU	2	4
	vCPU Shares	Normal	Normal
	vCPU Reserv.	0	0
	vCPU Limit	Unlimited	Unlimited
vRAM	vRAM	4 GB	8 GB
	vRAM Shares	Normal	Normal
	vRAM Reserv.	4 GB	12 GB
	vRAM Limit	Unlimited	Unlimited
vNIC	vNIC (No. Req'd)	1	1
		If parameter is set to Y, please refer to *OpenScape Solution Set V10, How to check MAC Addresses for Virtual Systems, Quick Reference Guide* on E-doku	
	vNIC Type	VMXNET3	VMXNET3
	vNIC Manual MAC	No	No
	Network Bandwidth (estimated reqm't)	1 Gbps Network Connection Recommended	

OpenScape Trace Manager V8			
		Low-End	**Recommended**
Storage (vDisk)	vDisk (No. Req'd)	2	2
	vDisk Size	150 GB (OS & OSTM DBs)	300 GB (OS & OSTM DBs)
	vDisk Mode	Keep Defaults (which allows Snapshots)	
	vDisk Format	any	any
	Addt'l Storage	500 GB (Trace File Storage)	>= 1 TB (Trace File Storage)
	Storage Throughput (estimated reqm't)		

NOTICE: Using a RAM Drive Storage for Performance Solutions requires 32 GB of RAM.

OpenScape Trace Manager V8		
General Product Info	Operating System	Please see the Release Note
	Native Redundancy Support	No
	Redundancy Strategy	-
	Voice/Video Media Terminating	No
	Voice/Video Signalling Traffic	No
	Other real-time critical requirements	No
VMware Feature Compatibility	vMotion Support	Yes
	High Availability (HA) Support	Yes
	Fault Tolerance (FT) Support	No
	Site Recovery Manager (SRM) Support	SRM is offered as a PSR
	Backup with vStorage-APIs for Data Protection	No
	VMware Tools Support	Yes. Tools are neither delivered nor installed with the product
	Virtual Appliance (vApp) Support	No

OpenScape Trace Manager V8			
		Low-End	**Recommended**
Depl. Scenarios	Depl. Scenario	Can be co-hosted	Dedicated Server
	Number of Nodes	1	1
	Calls per Seconds loads	<= 2 CPS	<= 10 CPS
vCPU	vCPU	2	4
	vCPU Shares	Normal	Normal
	vCPU Reserv.	0	0
	vCPU Limit	Unlimited	Unlimited

OpenScape Trace Manager V8			
		Low-End	**Recommended**
vRAM	vRAM	4 GB	8 GB
	vRAM Shares	Normal	Normal
	vRAM Reserv.	4 GB	12 GB
	vRAM Limit	Unlimited	Unlimited
vNIC	vNIC (No. Req'd)	1	1
		If parameter is set to Y, please refer to *OpenScape Solution Set V10, How to check MAC Addresses for Virtual Systems, Quick Reference Guide* on E-doku	
	vNIC Type	VMXNET3	VMXNET3
	vNIC Manual MAC	No	No
	Network Bandwidth (estimated reqm't)	1 Gbps Network Connection Recommended	
Storage (vDisk)	vDisk (No. Req'd)	2	2
	vDisk Size	150 GB (OS & OSTM DBs)	300 GB (OS & OSTM DBs)
	vDisk Mode	Keep Defaults (which allows Snapshots)	
	vDisk Format	any	any
	Addt'l Storage	500 GB (Trace File Storage)	>= 1 TB (Trace File Storage)
	Storage Throughput (estimated reqm't)		

NOTICE: Using a RAM Drive Storage for Performance Solutions requires 32 GB of RAM.

6 Virtualization of First Response

6.1 OpenScape Border Controller Function(BCF)

VMware Metrics

The following table and notes show the metrics for support of up to 32,000 OpenScape SBC SIP registered users.

Deployment Scenario	OS BCF 250	OS BCF 6000	OS BCF 6000
Metric	**250 (Note 1)**	**6,000 (Note 1)**	**20,000 (Note 1)**
Max. registered SIP Remote Users (Note 2), eg, home workers (without Digest Authentication and Throttling (Note 3))	250 (Note 4)	6,000 (Note 4)	20,000 (Note 4)
Max. simultaneous SIP signaling calls / BCF sessions (half-calls) (Note 6)	150	1,040	1,760
Max. simultaneous RTP media streams (full-calls) anchored through OpenScape BCF (Notes 6, 7,8)	75	510	850
Number of simultaneous SIP Service Providers (SSP)	10 (Note 9)	10 (Note 9)	10 (Note 9)
Avg.half-calls (Note 10) per sec.:	Total: <1	Total: 3	Total: 4
• Off-net IP-trunk, incoming	<0.15	0.5	0.75
• Off-net IP-trunk, outgoing	<0.15	0.5	0.75
• On-net = 'line to line', originating	<0.35	1	1.25
• On-net = 'line to line', terminating	<0.35	1	1.25
Busy Hour Call Attempts (full calls) (Note 10)	1,500	23,400	39,600
Max. peak half-calls (Note 10) per second (without Digest Authentication and Throttling)	1	13)	22
Registration refresh requests per second (randomized registration steady state condition)	<1	4	12
Steady state call completion rate	99.99%	99.99%	99.99%

The following notes provide details for the VMware Metrics:

1. Network interface switch speed is set to 1 Gigabit Ethernet.
2. For keysets, each keyset line appearance is counted as one registered user.
3. Throttling is a mechanism used to keep a NAT/firewall pinhole open for the subscriber's SIP signaling connection for a subscriber that is behind a far-end NAT/firewall. In order to do this, REGISTER coming in from the subscribers are responded back with the small expiry interval (configurable, default 60secs) to force the subscribers to re-register causing the pin-hole in the NAT device to remain open.
4. Add the following penalty (or penalties*) to get the actual registered SIP users limit. To get new numbers, apply penalty1 and on the new numbers apply penalty 2.
   - Digest Authentication penalty: 25%
   - Throttling Penalty (600 seconds - reducing this value introduces more penalty): 60%

   * To determine cumulative penalties apply penalty1 and on the new number apply penalty2.
   ** Throttling penalties are not applicable to hosted remote Branch users.
5. An BCF Session is defined as a SIP signaled call with an access-side signaling leg and a core-side signaling leg. A typical voice call between a local OpenScape Voice user and a Remote User registered via the BCF, or to a SIP Trunk connected via the BCF requires one BCF session. A typical video call requires two BCF sessions; one for the video connection and another for the audio connection. An additional 20% penalty on OpenScape BCF capacity should be added for a video connection versus an audio connection due to the extra SIP INFO messages that are exchanged during a video call.

6. Each RTP stream (full-call) anchored through the central OpenScape BCF consists of two half-calls travelling in opposite direction. For example, two half-calls are used when a remote user registered via the SBC is connected to another remote user registered via the BCF, or to a SIP Trunk connected via the BCF. A single half-call is used when a local subscriber registered directly with the OpenScape Voice server is connected to a remote user registered via the BCF, or to a SIP Trunk connected via the BCF.
7. The RTP packet performance (e.g., packet loss) is influenced by several factors:
   a) Hardware BIOS settings relating to performance & power saving,
   b) Hardware BIOS hyper-threading,
   c) VM guest settings hyper-threaded core sharing,
   d) VM guest memory (RAM),
   e) VM guest OS NIC rx ring buffer size
8. RTP packetization time/size. For better performance, choose BIOS performance over power-saving, disable HT, no HT core sharing. Multiple, active VM's and smaller vRAM allocations may decrease RTP packet loss
9. Up to 10 SSP simultaneous SIP trunk interfaces are supported. These interfaces can connect to the same or different SSPs assuming the IP addresses on the SSP side are different. The SSP connection can point to the same or different IP addresses on the OpenScape BCF.
10. A "half call" is a call from either Access side (WAN) to core-side (LAN) or from core-side (LAN) to access-side (WAN). A "full call" consists of two half call legs. i.e. a call being initiated by the Access side (WAN) going to core-side (LAN) and then coming back to the Access side (WAN).

VMware Resources

OpenScape BCF				
Deployment		**OS BCF 250**	**OS BCF 6000**	**OS BCF 20000**
Depl. Scenarios	Depl. Scenario	Single or redundant node		
	Number of Nodes	1-2 active-standby	1-2 active-standby	1-2 active-standby
	Max Users	250	6,000	20,000
Server	Each BCF node			
Guest OS	OpenSUSE 13 (configure as "Other 2.6x Linux (32-Bit)"			
Realtime Application	Yes **Note:** Resources need to be reserved for Real time apps otherwise availability cannot be guaranteed			
IOPS – Input/ output operations per second (Storage I/ O)		7 I/O per second actual usage	20 I/O per second actual usage	30 I/O per second actual usage
	Note: (VMware Resource Management Guide) Before using Storage I/O Control on data stores that are backed by arrays with automated storage tiering capabilities, check the VMware Storage/SAN Compatibility Guide to verify whether your automated tiered storage array has been certified to be compatible with Storage I/O Control.			
vCPU	vCPU	2 1 virtual socket	4 2 virtual sockets	8 2 virtual sockets
	vCPU Shares	High		
	vCPU Reserv.	5,000 MHz	10,000 MHz	20,000 MHz
	vCPU Limit	5,000 MHz	10,000 MHz	20,000 MHz
vRAM	vRAM	2 GB	2 GB	4 GB
	vRAM Shares	Normal		
	vRAM Reserv.	2 GB	2 GB	4 GB
	vRAM Limit	2 GB	2 GB	4 GB

OpenScape BCF				
Deployment		**OS BCF 250**	**OS BCF 6000**	**OS BCF 20000**
vNIC	vNIC (No. Req'd)	2	2	2
	vNIC Type	VMXNET3	VMXNET3	VMXNET3
	vNIC Manual MAC	Yes, only for local license file		
		If parameter is set to Y, please refer to "OpenScape Solution Set V10, How to check MAC Addresses for Virtual Systems, Quick Reference Guide" on e-doku.		
	Network Bandwidth Capacity (estimated requirement)	Core side (eth0) 100 KB/sec Access side (eth1) 16000 KB/sec	Core side (eth0) 500 KB/sec Access side (eth1) 60,000 KB/sec	Core side (eth0) 1,000 KB/sec Access side (eth1) 120,000 KB/sec
Storage (vDisk)	vDisk (No. Req'd)	1	1	1
	vDisk Size	40 GB	40 GB	60 GB
		vDisk Size is the total amount of storage needed for the operating system, the application, and the application data.		
	vDisk Mode	Keep Defaults (which allows Snapshots)		
	vDisk Format	Thick Lazy-Zeroed		
	Addt'l Storage	5 GB	5 GB	5 GB
	Storage Throughput (estimated reqm't)	100 KBps	400 KBps	600 KBps
	Storage IOPS (estimated reqm't)	5	20	30
VMware VMotion supported **(*)**		Yes	Yes	Yes
VMware High Availability supported		Yes	Yes	Yes
VMware Fault Tolerance supported		No	No	No
VMware Site Recover Manager (SRM) supported		No	No	No
VMware Tools supported **(**)**		Yes	Yes	Yes
VMware Distributed Resource Scheduler supported		Yes	Yes	Yes
VMware Data Recovery (VDR) supported		No	No	No
VMXNET3 virtual network adapter supported **Note:** If supported please reference product specific installation/configuration documentation section for VMXNET		No	No	No

***** It is recommended to perform a Live Migration only in periods of low traffic, otherwise noticeable service interruption might occur.

****** Yes with the following exceptions: No gcc toolchain and kernel headers, not possible to build custom modules, see installation guide for more details.

Overhead Requirements for Hosting OpenScape BCF

The following table lists the overhead requirements per physical server hosting OpenScape BCF.

Hardware	Description	Type
HD	VMWare system disk overhead	17 GB
HD	Overhead for swap space for all unreserved VM memory	This value cannot be strictly defined because it is based on other VMs the customer may host on the physical server that are not configured to reserve all their (VM) memory
RAM	VMware system overhead	2.5 GB
CPU	VMware system overhead	See the vSphere Resource Management Guide

6.2 OpenScape Emergency Service Routing Proxy (ESRP)

OpenScape ESRP			OpenScape Integrated Simplex V10
General Product Info	Operating System	SLES 12	SLES 12 64-bit
	Native Redundancy Support	Yes	No
	Redundancy Strategy	Active/ Active or Active/ Standby	VMWare
	Voice/Video Media Terminating	No	Yes
	Voice/Video Signalling Traffic	Yes	Yes
	Other real-time critical requirements	No	No
VMware Feature Compatibility	vMotion Support	Yes	Yes
		Restrictions / Limitations: (vMotion during normal operation would cause some call loss (.5 to 1s second). vMotion impact during SW update/upgrade, node reboot, registration flood is tbd.)	
	High Availability (HA) Support	Yes	Yes
	Fault Tolerance (FT) Support	No	No
	Site Recovery Manager (SRM) Support	No. - SRM is supported indirectly by deploying one OSV node at the Protected site and the other OSV node at the Recovery Site	No
	Backup with vStorage-APIs for Data Protection	VMware VDR is supported **Note:** OSV Backup and Restore procedures are recommended to be used as a first line of defense against data loss.	VMware VDR is supported
	VMware Tools Support	Yes	Yes
	Virtual Appliance (vApp) Support	Yes	No

		OpenScape ESRP			OpenScape Integrated Simplex	OpenScape Virtual Standard Duplex Large
		Depl. 1	**Depl. 2**	**Largest**		
Depl. Scenarios	Depl. Scenario	OSV Duplex	OSV Duplex	OSV Duplex	Virtualized Integrated Simplex	Virtualized Standard Duplex Large
	Number of Nodes	2	2	2	1	2
	Max Users	≤ 5,000*	≤ 10,000*	Max Users	5,000 Voice users, of which no more than 1250 may also be UC users	200,000 Voice users, of which 100.000 can be registered at any time
		*This number may be lower under high load, heavy feature usage or high level of tracing.				
vCPU	vCPU	4	4	8	8	8
	vCPU Shares	High				
	vCPU Reservations	Must calculate # vCPU × physical CPU Freq				
	vCPU Limit	Unlimited				
vRAM	vRAM	9 GB	9 GB	9 GB	10 GB	12 GB
	vRAM Shares	Normal				
	vRAM Reserv.	9 GB	9 GB	9 GB	10 GB	12 GB
	vRAM Limit	Unlimited				
vNIC	vNIC (No. Req'd)	4	4	4	4	4
	vNIC Type	VMXNET3	VMXNET3	VMXNET3	VMXNET3	VMXNET3
		Note: For new installations VMXNET3 has to be used. For existing OS ESRP deployments with E1000 it is requested to change to VMXNET3. The method with the detailed steps is documented in the OpenScape ESRP Installation and Upgrades Guide, Appendix "T" Change E1000 to VMXNET3 network adapters.				
	vNIC Manual MAC	No	No	No	No	No
		If parameter is set to Y, please refer to "OpenScape Solution Set V10, How to check MAC Addresses for Virtual Systems, Quick Reference Guide" on e-doku.				
	Network Bandwidth (estimated reqm't)	887 KBps Includes 468 for x-channel	1774 KBps includes 936 for x-channel	8873 KBps includes 4680 for x-channel	3000 KBps	3000 KBps

		OpenScape ESRP			OpenScape Integrated Simplex	OpenScape Virtual Standard Duplex Large
		Depl. 1	**Depl. 2**	**Largest**		
Storage (vDisk)	vDisk (No. Req'd)	1 per node	1 per node	1 per node	1	1 per node
	vDisk Size	140 GB	140 GB	140 GB	140 GB	140 GB
		vDisk Size is the total amount of storage needed for the operating system, the application, and the application data.				
	vDisk Mode	Keep Defaults (which allows Snapshots)				
		Note: The Virtual disk mode setting "Independent" disallows the creation of Snapshots of a virtual machine. For a customer environment, it is recommended the Mode settings are NOT selected. This is the default configuration. Note: Snapshots are not to be used in a production environment except during initial installation process (e.g., as a backup in case there is a problem with a mass provisioning script). All snapshots are to be removed once the ESRP VM is placed into production.				
		Additional information: Mode Independent persistent will leave changes permanently written to disk. Mode Independent Non-persistent writes data to disk but the data will be eliminated on restart (good for a training, lab, or demo environment).				
	vDisk Format	Thick Lazy-Zeroed				
	Addt'l Storage	10 GB	10 GB	10 GB	10 GB	10 GB
	Storage Throughput (estimated reqm't)	116 KBps	231 KBps	1157 KBps	250 KBps	250 KBps
	Storage IOPS (estimated reqm't)	TBD	TBD	TBD	75 IOPS	75 IOPS

6.3 OpenScape Media Service Bridge Function (MSBF)

OpenScape MSBF		
General Product Info	Operating System	• SLES 12 SP4/SP5 (64 Bit) • SLES 12 with limitations
	Native Redundancy Support	Yes
	Redundancy Strategy	N+1
	Voice/Video Media Terminating	Yes
	Voice/Video Signalling Traffic	Yes
	Other real-time critical requirements (see note)	Yes
VMware Feature Compatibility	vMotion Support	Yes **Restrictions / Limitations:** Only at times with low system usage since voice quality will suffer for a short time during motion
	High Availability (HA) Support	Yes
	Fault Tolerance (FT) Support	No
	Site Recovery Manager (SRM) Support	Yes
	Backup with vStorage-APIs for Data Protection	Yes
	VMware Tools Support	Yes
	Virtual Appliance (vApp) Support	No

OpenScape MSBF		
Depl. Scenarios	Depl. Scenario	Standalone UC Media Server
	Number of Nodes	N (up to 4), More is also possible
	Max Users	Depends on used audio/codec and on used HW (there is a load -formular available)
vCPU	vCPU	≥ 4 vCPU, Depends on load
	vCPU Shares	Normal
	vCPU Reserv.	Must calculate #vCPU x physical CPU Freq
	vCPU Limit	Unlimited
vRAM	vRAM	≥ 8 GB
	vRAM Shares	Normal
	vRAM Reserv.	≥ 8 GB
	vRAM Limit	Unlimited
vNIC	vNIC (No. Req'd)	1
	vNIC Type	VMXNET3[1]
	vNIC Manual MAC	No
		If parameter is set to Y, please refer to "OpenScape Solution Set V10, How to check MAC Addresses for Virtual Systems, Quick Reference Guide" on e-doku.
	Network Bandwidth (estimated reqm't)	Depends on load and used codec: 1 G711 ≈ 100 Kbit; 1 H264 Chn ≈ 2 Mbit/sec
Storage (vDisk)	vDisk (No. Req'd)	1
	vDisk Size	≥ 80 GB
		vDisk Size is the total amount of storage needed for the operating system, the application, and the application data.
	vDisk Mode	Keep Defaults (which allows Snapshots)
	vDisk Format	Thick Lazy-Zeroed
	Addt'l Storage	No
	Storage Throughput (estimated reqm't)	Depends on Media-App and Load: ~8 KB/sec per Audio Channel for VoicePortal; 0 for Conferencing
	Storage IOPS (estimated reqm't)	Not important for MS (it is not worth mentioning)

1 If the ESXi installed is higher than ESXi V4.1 AND lower than ESXi V5.0 (821926), then E1000 must be used even though it is is less efficient. If VMXNET3 is used instead then UDP packets = 40 bytes will be dropped and the application may be unable to communicate with the VM.For further information, refer to:
https://kb.vmware.com/selfservice/microsites/search.do?language=en_US&cmd=displayKC&externalId=2019944

INFO: A guidance to design an OpenScape MSBF system is that:
An OpenScape MSBF on an 8 core and 16 GB RAM virtual machine can support 500 G.711 audio (or text) channels

with about 60% load. However this changes significantly with different codecs, video or other modifications.

6.4 OpenScape Policy Store Service (PSS)

OpenScape PSS		
General Product Info	Operating System	Ubuntu 20.04 LTS (Focal Fossa)
	Native Redundancy Support	No
	Redundancy Strategy	-
	Voice/Video Media Terminating	No
	Voice/Video Signalling Traffic	No
	Other real-time critical requirements	No
VMware Feature Compatibility	vMotion Support	Yes
	High Availability (HA) Support	No
	Fault Tolerance (FT) Support	No
	Site Recovery Manager (SRM) Support	No
	Backup with vStorage-APIs for Data Protection	No
	vSphere Replication	No
	VMware Tools Support	Yes
	Virtual Appliance (vApp) Support	No

OpenScape PSS				
Node Types		**Controller**	**Masters**	**Workers**
Depl. Scenarios	Number of Nodes	1	3	2
	Max Users			
vCPU	vCPU	2	2 each	4 each
	vCPU Shares	Normal		
	vCPU Reserv.	0	0	0
	vCPU Limit	Unlimited		
vRAM	vRAM	2 GB	2 GB each	4 GB each
	vRAM Shares	Normal		
	vRAM Reserv.	2 GB	2 GB each	4 GB each
	vRAM Limit	Unlimited		
vNIC	vNIC (No. Req'd)	1	1	1
	vNIC Type	VMXNET3	VMXNET3	VMXNET3
	vNIC Manual MAC	No	No	No
	Network Bandwidth (estimated reqm't)			
Storage (vDisk)	vDisk (No. Req'd)	1	1 each	1 each
	vDisk Size	40 GB	40 GB each	50 GB each
	vDisk Mode	Keep Defaults (which allows snapshots)		
	vDisk Format	any	any	any
	Addt'l Storage			
	Storage Throughput (estimated reqm't)			
	Storage IOPS (estimated reqm't)			

6.5 GEMMA

Minimum requirements:

To support a small PSAP (~25 call takers) with a maximum capacity of 2 cps (calls per sec) for the SBA mode, the following are needed:

- 4 vCPUs HA (High Availability configuration is enabled, which implies a total of 4 vCPUs active + 4 vCPUs standby = 8 vCPUs total)
- 8 GB RAM HA (High Availability configuration is enabled, which implies a total of 8 GB RAM active + 8 GB RAM standby = 16 GB RAM)
- 500 GB SSD Storage

- 750 GB Backup

Recommended requirements:

- 4 vCPUs (less than 750 active users) or 8 vCPUs (more than 750 active users)
- 12 GB RAM (= 4 GB RAM for OSCC Application Server / REST SDK + 8 GB RAM for OSCC Main Server)
- 1 TB Storage