



SKALA-R Hyperconvergence Reference Architecture for Parallels Remote Application Server

*Reducing cost, complexity, and hardware footprint to deliver
virtual applications and desktops*

Table of Contents

Table of Contents.....	2
Executive Summary	3
Target Audience.....	4
Purpose	4
Solution Overview.....	5
SKALA-R Platform.....	5
Parallels Remote Application Server (RAS).....	7
Parallels Remote Application Server Designer	7
Solution Components and Terminology	9
Architecture Overview	10
Logical Solutions Diagram.....	10
VM Deployment.....	11
Hardware Specifications	12
Software Configuration.....	13
Parallels Remote Application Server Virtual Desktop Types	13
Prerequisites and Assumptions	13
Firewall Ports	14
Validation Testing	15
Hardware Used for Testing.....	16
VM Templates.....	16
VM Sizing	16
RAS Configuration Details.....	16
Application Considerations	17
Results.....	18
Summary.....	19
Resources and Additional Links	20

Executive Summary

Application and desktop publishing can help many large-scale businesses and organizations simplify application and image management, improve data security, and enable remote connectivity from any device, anywhere while keeping costs to a minimum. However, the initial up-front cost of implementing the hardware, such as servers, robust storage, and networking required to support hundreds or thousands of concurrent users, can be substantial. Additionally, most traditional application and desktop publishing technology is very complex, requiring several weeks to implement and full-time or third-party dedicated system administrators to manage.

Considering the initial capital expense and overall complexity involved with implementing a traditional virtualization solution, it's no wonder that many cost-conscious customers, particularly small and medium-sized businesses, have failed to adopt this traditional approach. However, with the emergence of software-defined, hyperconverged platforms, such as the SKALA-R platforms, and affordable comprehensive virtual desktop and application publishing solutions using Remote Desktop Session Hosts (RDSH) such as Parallels® Remote Application Server (RAS), the cost and complexity of application and desktop publishing has been greatly reduced.

Stress and validation test were performed on Parallels RAS on the SKALA-R hyperconverged solution with the aim of highlighting the optimal configuration for the integration of components that make up the overall solution. Compared to traditional solutions, implementing Parallels RAS along with a hyperconverged infrastructure can save most organizations up to 70% in overall infrastructure and annual licensing costs.



Figure 1 – Parallels Remote Application Server: Access from any device

Target Audience

This document is intended for IT decision makers as well as architects and implementation personnel who want to understand a Parallels and SKALA-R approach to application and desktop virtualization and benefit from a pretested solution. The reader should have a solid understanding of application and desktop virtualization, familiarity with both Parallels RAS and the SKALA-R hyperconverged system along with their related technologies including Rosplatforma hypervisor, network, hardware components, and Microsoft® services as Active Directory®, DNS, DHCP, and Microsoft Windows Server® operating systems. In addition, readers should be aware of sizing/characterization concepts and any limitations surrounding client virtualization environments.

Purpose

The purpose of this document is to describe a Reference Configuration of Parallels RAS on a SKALA-R hyperconverged system. This is to highlight recognizable benefits to technical audiences by providing a deployment configuration and information that describes the architecture for this Parallels solution that is based on Parallels RAS hosted shared applications and desktops running on Remote Desktop Session Host (RSDH), on the SKALA-R platform running on Rosplatforma to support the server virtualized environment.

This Reference Configuration describes the solution testing that was performed in January 2017.

Solution Overview

SKALA-R Platform

SKALA-R is the first Russian hyperconverged platform that delivers a pre-configured complex including hardware and software for information virtualization, control, and security.

Hyperconverged platform SKALA-R can be used for a wide range of applications such as ERP systems, databases, ECM systems, VDI solutions, analytical systems, e-mail and communication systems, backup systems, etc.

For specialized applications, you can use a certain series of SKALA-R. For example, for highload analysis applications, there is a series of SKALA-R that allows you to perform calculations on the specialized GPU.

SKALA-R uses virtualization technology from Rosplatforma. The decision to use R-Virtualization was made due to the balance between cost, functionality, and security of this hypervisor compared with similar products. The price of R-Virtualization is about 30% lower than functional analogs.

In addition, R-Virtualization initially tightly integrated with software-defined storage, R-Storage. R-Storage allows you to quickly and easily create a distributed performance, fault-tolerance storage with tiering from commodity servers with local disks.

A hyperconverged platform is important to control as a whole solution. To do this, SKALA-R uses a specialized monitoring system, IBS Monitoring. IBS Monitoring is able to monitor performance, transactions, services, events, data, interfaces, and interconnection systems; you need to configure it only once to work with your software.

IBS Monitoring can be used as a source of consolidated information for large "umbrella" monitoring. Included connectors allow you to connect our monitoring to IBM Tivoli, HP OpenView, Microsoft SCOM, Zabbix, and other systems.

IBS is a major Russian developer of complex IT solutions founded in 1992. The Company transforms the expertise of its team and understanding of IT industry trends into new ideas to help its clients increase their competitive advantage and achieve cutting-edge results. The solutions developed by IBS support the businesses of major companies, internet-services and governmental agencies; this is how we contribute to better the lives of millions of people.

IBS is one of the leading IT service companies in Russia. According to IDC, the company is in the top 10 in Russia in terms of revenue from system integration and a leader in consulting, software customization, as well as IT infrastructure hosting.

IBS offers services in system integration, business application implementation, IT infrastructure design and installation, software development, creation of systems for Big Data gathering and analysis, and outsourcing. The Company delivers tailor-made solutions based on commercial IT platforms and delivers original infrastructure products (SKALA-R hyper-converged platform), business applications (asset

management and business analysis management systems), cloud services, as well as IT and business process outsourcing.

The following table highlights SKALA-R available platforms:

SKALA-R Series 300 Universal	SKALA-R Series 500 High Load	SKALA-R Series 700 Super calculator
Universal platform for applications that do not require significant computational resources and large storage capacity (database, Exchange, VDI, and so on); built on 2-processor servers in a 2U form.	The platform is optimized for applications that use significant computing resources but not demanding storage capacity; built on 2-processor servers in a 1U form factor.	Specialized platform for applications requiring an extremely large amount of computing power and large storage capacity; built on 4-processor servers in a 2U form factor.

Key features of hyperconverged platform SKALA-R:

- Cost effectiveness: Price of SKALA-R is significantly lower than existing analogs
- Fault tolerance: Virtualization environment provides multiple copies of data and automatically restores virtual machines
- Built-in backup system
- Limitless scalability
- Equipment and tech provided by global scale producers
- Adaptation to Russian legislation
- Guaranteed deployment within a few hours
- Can be installed in unprepared areas
- Unified control and monitoring interface
- Common proactive support service operating 24/7 across Russia

Parallels Remote Application Server (RAS)

IBS is a major Russian developer of complex IT solutions founded in 1992. The Company transforms the expertise of its team and understanding of IT industry trends into new ideas to help its clients increase their competitive advantage and achieve cutting-edge results. The solutions developed by IBS support the businesses of major companies, internet-services and governmental agencies; this is how we contribute to better the lives of millions of people.

IBS is one of the leading IT service companies in Russia. According to IDC, the company is in the top 10 in Russia in terms of revenue from system integration and a leader in consulting, software customization, as well as IT infrastructure hosting.

IBS offers services in system integration, business application implementation, IT infrastructure design and installation, software development, creation of systems for Big Data gathering and analysis, and outsourcing. The Company delivers tailor-made solutions based on commercial IT platforms and delivers

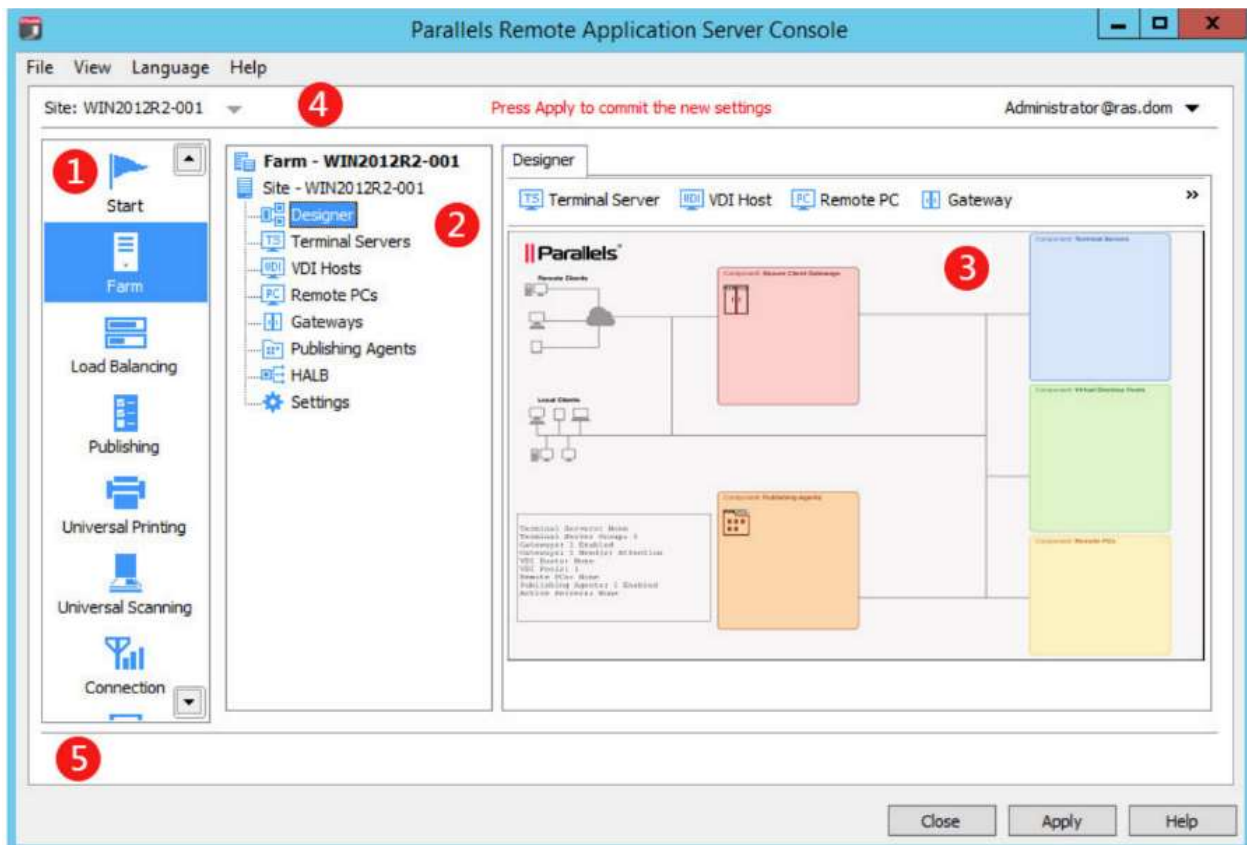
original infrastructure products (SCALA-R hyper-converged platform), business applications (asset management and business analysis management systems), cloud services, as well as IT and business process outsourcing.

Parallels Remote Application Server (RAS)

Parallels RAS was specifically designed with hyperconverged platforms in mind. It delivers virtual desktops and applications from a centralized location, providing continuous availability from any device running on virtually any platform, resource-based load balancing, universal printing and scanning, and complete end-to-end reporting and network transparency. Parallels RAS is easy to install and configure, enhancing the native Microsoft Remote Desktop Services. By centralizing virtual application and desktop control, Parallels RAS enables IT staff to provide seamless mobile access while increasing security and reducing IT costs. Parallels RAS is a comprehensive all-in-one solution that can provide any organization with a simple turnkey solution and implementation methodology.

Parallels Remote Application Server Designer

Parallels Remote Application Server Designer is an automated tool that shows the solution topology, including Publishing Agents, Gateways, Remote Desktop Session Hosts (RDSH), and other components. This is found in the Parallels Remote Application Server Console, which is an application installed on the Remote Application Server that provides a centralized graphical user interface and enables configuration and maintenance of Parallels Remote Application Server as shown below.



Key Elements of the Parallels Remote Application Server Console as shown in the figure above:

1

This section lists categories. Selecting a category will populate the right pane with elements relevant to this category.

2

This section becomes available only for the Farm and the Publishing categories. The navigation tree allows you to browse through the objects related to that category.

This section displays the selected object or category properties, such as servers in a farm or published application properties.

4






This information bar displays the site you are currently logged into and the user account being used for the connection. Please also note the "Press Apply to commit the new settings" message in the middle (in red). The message is displayed when you made changes to one or more objects/items, but did not commit them to Parallels Remote Application Server. Click the Apply button (at the bottom of the screen) to commit the changes. If there are no currently pending changes, the message is not displayed.

5

The information bar at the bottom of the screen is used to display the most recent console notification (if one is available).

Solution Components and Terminology

The components used for Parallels RAS on the SKALA-R hyperconverged system are described in the following table:

Component	Icon	Description
Farm		<p>A farm is a collection of RAS components maintained as a logical entity with a unique database and licensing. A Remote Application Server farm can contain multiple sites, which can be administered by different administrators.</p>
Site		<p>A site is a managing entity usually based on a physical location. Each site consists of at least a Publishing Agent, a Secure Client Gateway (or multiple gateways), and agents installed on Terminal Servers, VDIs, and PCs.</p>
Master & Secondary Publishing Agents		<p>A Publishing Agent is a required component in every site of a RAS farm that provides access to published applications and desktop load balancing. It also keeps the farm configuration database and farm licensing if it has a master role in the first site of the farm. High availability is accessible by adding multiple (ideally not more than three) publishing agents in each site which will broker user connections in active/active.</p>
Primary & Secondary Parallels Secure Client Gateways (w/ HTML5 node)		<p>The Parallels Secure Client Gateway is a required component of Parallels RAS. It tunnels all traffic between itself and the Parallels Client into SSL and forwards Microsoft Remote Desktop Protocol (RDP) traffic to the Publishing Agent and HTML5 Client, which is also hosted on it. Several Secure Client Gateways can work in high availability mode with the Parallels high availability load balancer (HALB).</p>
Microsoft Remote Desktop Session Hosts		<p>The Parallels Terminal Server Agent is an application installed on a Microsoft Remote Desktop Session Host that enables publishing of the host resources (applications and desktops). The Terminal Server Agent collects information needed by the Publishing Agent from the Microsoft RDSH and transmits to it when required.</p>

Architecture Overview

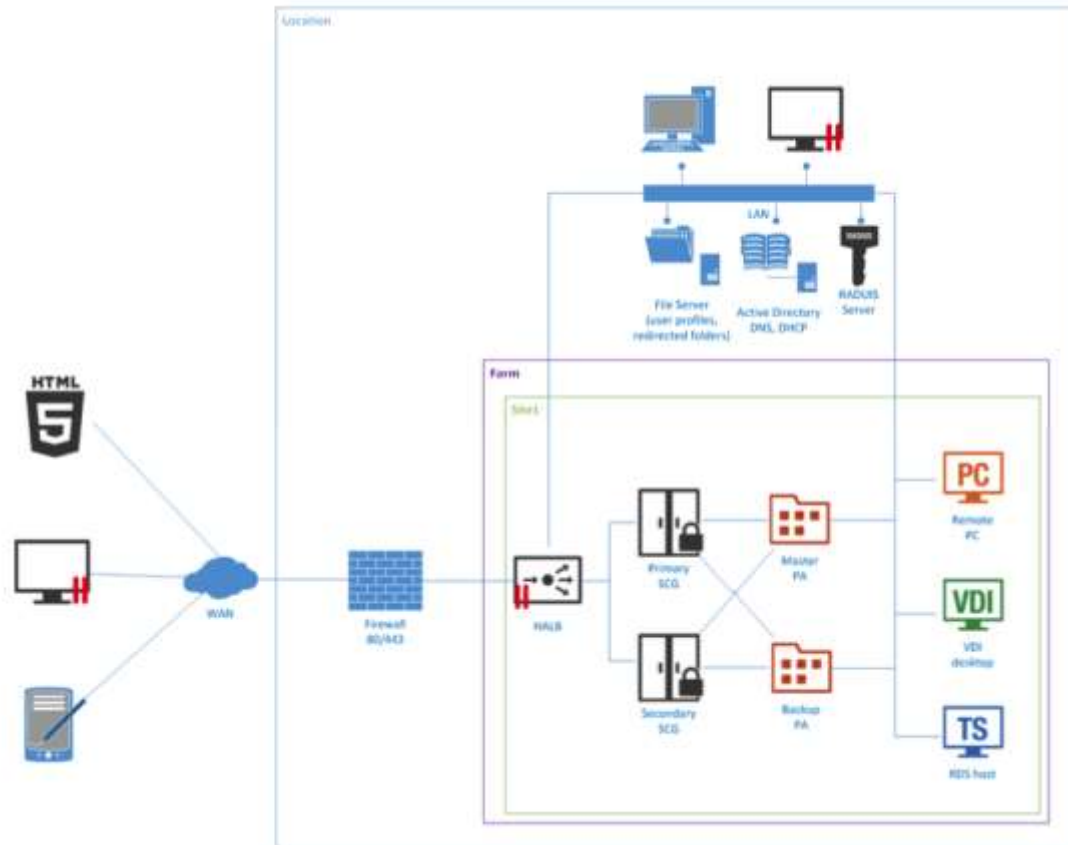
One of the aims of evaluating Parallels RAS hosted on the SKALA-R hyperconverged system is to be able to provide IT organizations the ability to:

1. Experience high-performance applications and virtual desktops on a variety of endpoint devices, including thin clients, Windows® workstations, Macintosh® computers, tablets, and other mobile devices running on iOS and Android™, Linux® machines, and Chromebook™.
2. Gain understanding of how Parallels RAS components interact with virtualization infrastructures.
3. Learn how application and desktop virtualization can ease application and OS management, deployment, and upgrades.
4. Gain understanding of how RAS can easily integrate with and extend the value of existing investments in your current infrastructure.
5. Objectively compare Parallels RAS from an application and desktop publishing perspective with other solutions in the marketplace.

Logical Solutions Diagram

This solution is ideal for high availability environments hosting up to 1,500 concurrent users spread on four nodes securely connected using Secured Socket Layer (SSL) mode. Each client gateway instance should optimally handle up to 500 concurrent users. This can be scaled horizontally accordingly.

Both LAN and WAN users connect to the virtual address of a high availability and load balancing virtual appliance in an internal network. Figure 5 below maps out a typical deployment hosted on SKALA-R systems serving all on-premise Parallels RAS modules.



VM Deployment

SKALA-R - Rosplatforma				
Node 1	Node2	Node3	Node4	Windows OS
DC1/DNS1/DHCP	DC2/DNS2/DHCP2	SCG3	SCG4	Windows 2012 R2
PA1	PA2	TS/RDSH	TS/RDSH	Windows 2012 R2
SCG1	SCG2	TS/RDSH	TS/RDSH	Windows 2012 R2
SQL	SQL	TS/RDSH	TS/RDSH	Windows 2012 R2
FS1	FS2	TS/RDSH	TS/RDSH	
TS/RDSH	TS/RDSH	TS/RDSH	TS/RDSH	Windows 2012 R2
TS/RDSH	TS/RDSH	TS/RDSH	TS/RDSH	Windows 2012 R2
TS/RDSH	TS/RDSH	TS/RDSH	TS/RDSH	Windows 2012 R2
TS/RDSH	TS/RDSH	TS/RDSH	TS/RDSH	Windows 2012 R2
TS/RDSH	TS/RDSH	TS/RDSH	TS/RDSH	Windows 2012 R2

TS/RDSH	TS/RDSH	TS/RDSH	TS/RDSH	Windows 2012 R2
TS/RDSH	TS/RDSH	TS/RDSH	TS/RDSH	Windows 2012 R2
TS/RDSH	TS/RDSH	TS/RDSH	TS/RDSH	Windows 2012 R2
TS/RDSH	TS/RDSH	TS/RDSH	TS/RDSH	Windows 2012 R2
TS/RDSH	TS/RDSH	TS/RDSH	TS/RDSH	Windows 2012 R2

Hardware Specifications

SKALA-R hardware specifications are shown in the tables below:

Compute	
Intel(R) Xeon(R) CPU E5-2680 v3 @ 2.50GHz	
CPU(s)	48
Core(s) per socket	12
Socket (S)	2

Network	
Mellanox SX1012	

Storage	
HGST HUC101890CSS204 2.5" 900 GB	2
HGST HUS724020ALS640 3.5" 2000 GB	1
Seagate ST1000NX0333 2.5" 1000 GB	1
Toshiba MG03ACA1 3.5" 1000 GB	4
HGST HUSMM1620ASS204 200 GB	3
INTEL SSDSC2BB12 2.5" 120 GB	1
HGST HUC101860CSS204 2.5" 600GB	4

	SKALA-R Series 300 Universal	SKALA-R Series 500 High Load	SKALA-R Series 700 Super calculator
Place for installation disks (on the server)	24	8	24
The number of servers (nodes)	From 4	From 4	From 4
In the complex	Bare metal hypervisor, software defined storage, management and monitoring system, warranty and technical support 9 × 5 × next working day for the whole complex		
Options	Classical storage (up to 500 TB), advanced backup, fault tolerance (uninterruptible power supply)		

Software Configuration

Parallels RAS was designed to support two common virtualization methods. The architecture for each application and desktop type is described to support over 1,500 concurrent users using:

- Hosted Shared Applications
- Hosted Shared Desktops

Parallels Remote Application Server Virtual Desktop Types

This Parallels solution document references Parallels Remote Application Server hosted desktops and applications as discussed below:

- **Hosted Shared Desktops** on Remote Desktop Session Host (RDSH): A Windows Remote Desktop Session (RDS) Host using Parallels Remote Application Server to deliver hosted shared desktops in a locked down, streamlined, and standardized manner with a core set of applications. Using a published desktop on the Remote Desktop Session Host, users are presented a desktop interface similar to a Windows 7 look and feel. Each user runs in a separate session on the RDS server.
- **Hosted Shared Applications** on Remote Desktop Session Host (RDSH): A Windows Remote Desktop Session (RDS) Host using Parallels Remote Application Server to deliver hosted shared applications in a locked down, streamlined, and standardized manner.

Prerequisites and Assumptions

The following assumptions have been made:

- Required Parallels and Microsoft licenses and agreements are available.
- Required power, cooling, rack, and datacenter space is available.
- There are no network constraints that would prevent the successful deployment of this design.
- Microsoft Windows Active Directory Domain services are available.
- Microsoft SQL Database platform is available (optional for reporting).
- MS Windows Server 2012 R2 w/ 2 virtual processors w/ a minimum of 4 GB of virtual hardware memory.
 - Local administrator credentials must be available.
 - Must be able to install RDS.
 - Must be able to access the Internet.
- Extra virtual IP address needed for HALB (High Availability Load Balancer) - optional
- A current and supported version of Parallels RAS must be deployed to ensure all features and components of the solution are at a supported level; refer to the following link for the latest Parallels Remote Application Server client download. Alternatively, Parallels offers HTML5 access without local software installed.
- The User layer in the context of this document is for reference only. User analysis, definition, and segmentation for the use of VDI desktop types is out of scope for this document.
- Firewall ports opened as shown in the following section.

Firewall Ports

Component	Ports	Protocols
Firewall (Remote Install Push/Takeover of Software)	135, 445, 49179	TCP
HALB	112	VRRP
HALB	31006	TCP, UDP
Secure Gateway, HALB	80, 443	TCP, UDP
Secure Gateway, HALB, Terminal Server Agent, Guest Agent, Remote PC agent	3389	TCP, UDP
Secure Gateway	20000, 20020	
Publishing Agent	20001, 20002	TCP
Terminal Server Agent, Publishing Agent	20003	UDP
Secure Gateway, HALB, Publishing Agent (RAS Console and Client Manager, including shadowing)	20009	TCP, UDP
Terminal Server Agent, Guest Agent, Remote PC agent	30004	TCP,UDP
Terminal Server Agent, Guest Agent, Remote PC agent	30005	TCP
VDI Agent	30006	TCP, UDP
VDI Agent	30008	TCP
Publishing Agent (RAS Console and Reporting)	30008	TCP
Parallels Client (Client Manager, shadowing)	50005	TCP

Validation Testing

The below Test plan was followed in order to get the desired results:

- Install Parallels RAS version 15.5 on available Server.
 - Reconfigure Self-Signed SSL.
 - Confirm usability of HTML5 Gateway.
 - Verify RAS Publishing Agent is running.
 - Verify RAS Redundancy Service is running.
 - Verify RAS Secure Client Gateway is running.
- Import Terminal Server into farm.
 - Verify Terminal Server Agent is running.
- Publish application that is already installed on the server (as identified in the section *Application Consideration*).
- Test the RAS Client.
- Test HTML5 Gateway.
- Test published application from mobile devices that we have available (Android & iOS).
- Publish Shared Desktops on Virtuozzo.
- Install second gateway.
 - Verify RAS Publishing Agent is running.
 - Verify RAS Redundancy Service is running.
- Install and configure HALB (optional).
 - Import HALB appliance.
 - Verify HALB is working.
- End-to-end user testing
- Client simulator to stress test Node 1 from a separate server

Hardware Used for Testing

Node1 (VMS) - Testing Server

A separate server should be implemented to run client simulator for stress testing.

VM Templates

Template 1 Windows 2012 R2 For generic-purpose VMs

Template 2 Windows 2012 R2 With applications for TS/RDSH

VM Sizing

Evaluation sizing as shown in the table below:

Server	HDD1	HDD2	RAM (GB)	vCPU
TS/RDSH (each)	60	20	16	4
DC/DNS/DHCP	60		4	2
FS (optional)	60	500	8	4
PA1	60		4-8	4
SCG1	60		4-8	4

RAS Configuration Details

Internal	Non-segregated network
Connection Mode	Direct SSL/ Gateway SSL
Certificates	Self-Signed
Storage	Local Storage

Application Considerations

Application Name	Architecture/Server OS	Delivery Method
Word 2016	Windows Server 2012 R2	Hosted on TS/RDSH
Excel® 2016	Windows Server 2012 R2	Hosted on TS/RDSH
PowerPoint® 2016	Windows Server 2012 R2	Hosted on TS/RDSH
IE11	Windows Server 2012 R2	Hosted on TS/RDSH
Google Chrome™	Windows Server 2012 R2	Hosted on TS/RDSH
Adobe Reader®	Windows Server 2012 R2	Hosted on TS/RDSH

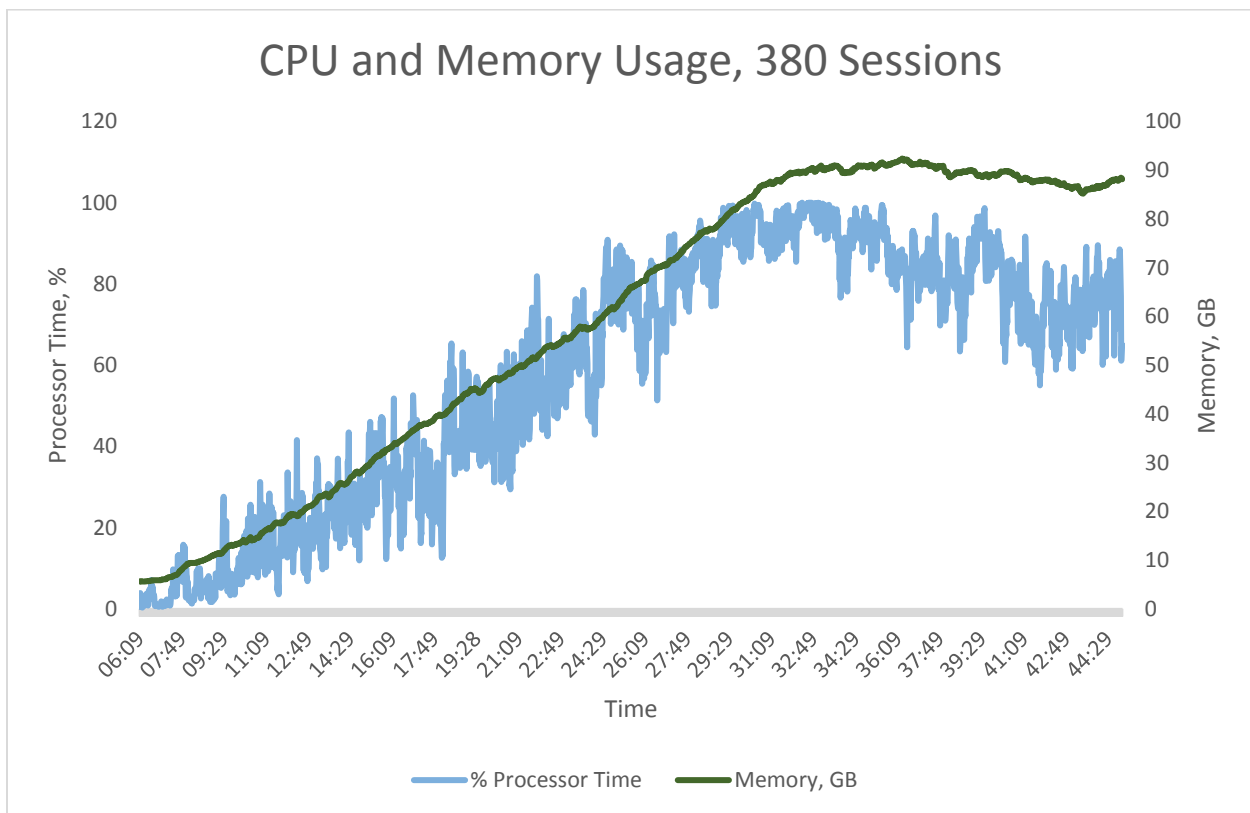
A Medium Workload User profile

Results

An in-house client simulator was used to simulate login, application listing, and opening of published desktop from the RDSH host. Inside every session, the client simulator launched scripts to emulate real user behavior. That script simulated a human performing clerical duties including creating, editing, and reading office documents, surfing the web, viewing online videos, opening PDF documents, and other activities with nine different applications. We believe that this workload would be similar to that of an average remote office user.

On one single node, Parallels RAS on the SKALA-R hyperconverged system with infrastructure components such as Microsoft Active Directory, DNS, File Services, and SQL servers was able to cater for 380 active concurrent sessions based on a knowledge worker user profile. These sessions were running on 10 RDSH with 4 vCPUs and 16 GB of RAM each.

The following graph shows CPU and memory usage during that test:



This means that 380 sessions could be successfully launched and handled on Node 1 and Node 2, which were also hosting other infrastructure components. As Node 3 and Node 4 were hosting only RDSH servers and a secure client gateway each, they were able to handle 418 concurrent users each. The table below highlights the final results:

Servers	Concurrent Users	No of TS/RDSH
Node1	380	10
Node2	380	10
Node3	418	11
Node4	418	11
Total	1596	

Summary

The decentralization of resources, including applications and devices, has caused customers to rethink how to deliver an optimal end-user experience. Beyond this, user behaviors have also changed, including where they work and on what device they prefer to work. SKALA-R and Parallels have addressed these challenges. This SKALA-R Configuration for Parallels Remote Application Server builds off the strength and versatility of the Remote Application Server technology. The SKALA-R hyperconvergent solution is ideally suited for the performance and scalability requirements of Parallels Remote Application Server deployments requiring architectural flexibility, performance, and rapid and simple scaling.

For customers looking to achieve superior VDI performance without the high cost and complexity of traditional hardware and software, the SKALA-R solution combined with Parallels Remote Application Server provides a turnkey approach. This combined solution provides businesses with a cost-effective methodology to scale their environments quickly and easily. Benefits are especially apparent for organizations looking to host between 500 and 1,500 concurrent users in an easy and efficient way while minimizing their hardware footprint. From the validation test, results show that one SKALA-R node hosting both RAS and Microsoft-related services was able to cater for 380 concurrent users averaging 38 knowledge users for each TS/RDSH.

When compared to the cost of traditional virtual desktop and application publishing solutions, Parallels RAS can reduce overall licensing costs by up to 70%, further increasing ROI. In a very short timeframe, IT managers can publish applications and desktops using intuitive configuration wizards, and manage RDSH and VDI-hosted sessions, all from a single pane of glass. Built-in high availability load balancing features provide continuous availability, resource-based load balancing, and complete end-to-end reporting. The Parallels RAS Client supports a wide range of Windows, Apple® Mac, Linux, Android and Google Chrome client operating systems, enabling end users to access any application or file, from any device, anywhere.

Resources and Additional Links

- Parallels
parallels.com
- Parallels Remote Application Server
parallels.com/products/ras/remote-application-server/
- Parallels Remote Application Server Trials
parallels.com/products/ras/download/choose-trial/
- Link(s) to Administrators Guide
download.parallels.com/ras/v15.5/docs/en_US/Parallels-RAS-v15-5-Administrators-Guide.pdf
- Link(s) to Solution Guides:
download.parallels.com/ras/docs/v15.5/en_US/Parallels-RAS-v15-5-Solutions-Guide.pdf