



Lenovo ThinkAgile CP Series: A fully featured turnkey private cloud, with fast deployment and easy management

Executive summary

Private cloud platforms typically require significant initial and ongoing investments in time, staff resources, and money. A new product from Lenovo can offer the benefits of the private cloud with much less time and effort, freeing up resources to tackle your organization's critical goals.

At Principled Technologies, we found Lenovo™ ThinkAgile™ CP offers the following benefits:

- **Rapid deployment:** ThinkAgile CP deployment required just a few hours, while application deployment took seconds
- **Simple management:** Common management tasks were completed in just a few steps by our IT generalist administrator
- **Key private cloud benefits**, including:
 - On-demand delivery of resources
 - Easy-to-use self-service experience—users can find a VM template in less than 22 seconds
 - Built-in, secure multi-tenancy
 - Orchestration of application delivery
 - Metering features to support chargeback—creating metering reports takes less than a minute of work

In this paper, we'll discuss some common challenges you may face with a traditional approach to the private cloud, and how Lenovo ThinkAgile CP can help you overcome them with easy deployment and simple management.

Crate to cloud in
about
**5 hours, 15
minutes**

On-demand, self-service
application delivery in
**under 30
seconds**

Maintenance
updates¹ with
**zero hands-on
effort**



Private cloud challenges and preparing to avoid them

Deploying private cloud platforms is rarely simple, even for experienced administrators. From staff and finances to complex infrastructure, the challenges of a traditional private cloud affect several areas of your organization. Let's discuss these challenges and how ThinkAgile CP can help you avoid the potential problems of private cloud deployment.

Your staff: Focus your IT on innovation rather than overhead

Navigating the design, procurement, and installation phases for a private cloud platform typically requires strategizing across teams in multiple technical domains. Server, virtualization, network, storage, service delivery, and DevOps teams may all be involved in designing, delivering, and maintaining a customized private cloud—and with each group comes new and different opinions. To succeed in the planning process, the teams need to use a cohesive approach to prioritization, design, integration, and software compatibilities. They'll also need to agree on the scope of IT resources and applications to deliver as a service, which is key to delivering true cloud agility. This process can take months, and at the end, you may need to hire and train teams for deployment and ongoing operations. Maintaining the cloud can also present recurring challenges as the group addresses software certifications, hardware compatibilities, and maintenance issues. Consider how these challenges may already exist in your organization and how they affect your new IT initiatives today.

ThinkAgile CP can help to mitigate many of these factors, providing a validated, turnkey cloud platform right out of the box. In our data center, ThinkAgile CP deployment services set up the Lenovo platform in less than a day, and the maintenance tasks we tested were quick and easy for our IT generalist to perform.

Your wallet: Invest IT dollars in growth instead of maintenance

In a 2016 survey from Deloitte, CIOs of private companies reported allocating the majority of their technology budgets (57 percent) to maintaining existing business operations rather than new projects and innovation.² Over a third of the executives who responded to a 2017 survey from BMC Software and Forbes Insights said they devoted more than 50 percent of their budget to maintenance.³ How much of your IT budget is allocated to everyday operations?

Your business could achieve significant benefits from a private cloud platform that is nearly maintenance-free.

By streamlining IT service delivery for your users, ThinkAgile CP could reduce a large portion of your ongoing IT costs.

Skills required to manage a DIY private cloud

A private cloud comprises networking, compute, storage, and specialized software. Lenovo ThinkAgile CP comes with these components bundled and ready to go, and the result is a turnkey platform where users can select their own application resources to use in just hours. Our experience reflects Lenovo's goal of making management easy for the user. We believe that the skillset required for ThinkAgile CP is generally equal to the skillset required for a public cloud platform.

But what if you choose to build your own private cloud? Your IT staff must account for networking, compute, storage, and software skills themselves. For networking, your DIY cloud team needs to understand basic concepts such as VLANs, DNS, and subnetting, but also more complex topics such as software-defined networking (SDN) with VMware® NSX or OpenStack® Neutron. For the compute layer, you'll need teams trained in performance monitoring and resource allocation. Your storage teams will need training in software-defined storage technologies such as Ceph or VMware vSAN™. These skills take years to mature, and that time will present an ongoing cost to your business for training and/or hiring.

Your technology: A turnkey private cloud platform

Some companies market cloud platforms that amount to a cluster of hypervisors, requiring your staff to assemble the components for the private cloud features you need. To use one of these virtualization platforms as a true private cloud platform, your staff must build additional multi-tenant self-service and automation in addition to supporting the virtualization platform itself. Your staff will also need to provide ongoing support for compatibility, certification, and testing as components and customizations change—and that's not accounting for the amount of work it takes to support your current infrastructure.

ThinkAgile CP is delivered as a pre-integrated, turnkey cloud platform. Lenovo's pre-validated platform ensures the components of ThinkAgile CP will work together to provide the cloud features of multi-tenancy, self-service, and end-to-end automation. This pre-integration and validation allows your IT staff to focus on key business objectives instead of dealing with compatibility issues and all of the cloud features of multi-tenancy, self-service, and end-to-end automation.

Putting it all together

Your business could grow if your IT resources were focused on mission-critical endeavors rather than servicing routine requests and maintenance. In the next few sections, we'll explore how Lenovo ThinkAgile CP could make this possible.



Lenovo ThinkAgile CP Series: Fast and easy deployment

Lenovo ThinkAgile CP Series aims to make having an on-premises private cloud platform as easy and hands-off as possible. This section outlines our experience in setting up and using the platform in our own data center.

After the hardware arrived at our doorstep, ThinkAgile CP deployment services came to set up the platform. The hardware came pre-cabled, so the **only work required was verification and site configuration**. The services team spent five hours and 15 minutes performing deployment tasks. Our IT generalist just needed to provide the deployment team with network information.



Access your private cloud from anywhere

Broad network access is a fundamental benefit of the cloud. When our deployment was complete, we had a web-based management portal we could access from any location—no VPN necessary. We accessed this portal from our desktop, laptop, and mobile devices and found it provided easy, on-the-go management.

Complete most
management
tasks in less than
30 seconds

Easy management with ThinkAgile CP

Our IT generalist acted as the cloud administrator and easily accomplished twelve common management tasks in just a few steps. Each task took less than a minute of his time, with **10 of 12 tasks requiring less than 30 seconds** to complete. However, many routine management tasks—such as adding or modifying VM networks, creating VM templates, and deploying VMs—can also be delegated to self-service users, empowering them with IT resources on demand rather than forcing them to wait for an administrator to get to their request.

As you read the following sections, consider the length of time your organization currently needs to deliver the same services on behalf of your application or line-of-business owners.

Managing multi-tenancy

IT as a service provides requestors with self-service access to obtain the compute, network, and storage resources their applications need. In ThinkAgile CP, administrators can provide this access by using virtual datacenters (VDC) to group users into tenant organizations and assign them pools of compute, storage, and networking capacity. Tenant users can self-provision and manage their own VMs from these resource pools, freeing up the IT staff's time.

Accomplishing these tasks in other environments might require separate tools, consoles, or plugins that only your IT staff can access, thus consuming more time. Not so with ThinkAgile CP. It took our IT generalist **three steps and just over 16 seconds** to create a VDC from within the management console, and **four steps and about 27 seconds** to create and apply a security policy to protect the networks assigned to the VDC. The VMs that self-service tenants provision will be protected by this network security policy, and users can further secure individual VMs with more policies.

Create a virtual datacenter in as little as 3 steps

Creating an additional virtual datacenter with differing resource capacities



Creating and applying a firewall rule



Self-service provisioning

In a traditional IT environment, the IT team will typically provision VMs with the necessary storage and networking upon request. The provisioning process may take significant time as the IT staff and requesting stakeholders collaborate on specific application requirements. The cloud offers an on-demand, self-service alternative that empowers users to provision and change their own IT resources at will. ThinkAgile CP can deliver these features directly to your application owners, freeing your IT staff from fielding routine provisioning requests so they can focus on more strategic IT goals.

ThinkAgile CP offers three ways to provision VMs: from scratch, from templates served by the curated application marketplace, or from custom templates the user's company designs.

We tested the template method and found discovering the right VM template in the marketplace was as easy as browsing a menu. Finding and downloading a new template took us just **six steps and a little over 21 seconds** in the application marketplace.

Find and download a new template in less than 22 seconds

Finding and downloading a new VM template from the application marketplace





Working with VMs

The ThinkAgile CP interface made it simple to provision and manage VMs through a dashboard. Deploying three VMs required just **six steps and less than 29 seconds**, and reallocating VM resources needed only **six steps and about 24 seconds**. You can also decommission a VM from the same screen, which required only **three steps and around 11 seconds**. With ThinkAgile CP, application owners and business users can manage their own VMs within their own virtual data centers, so your IT staff can stay focused on more strategic initiatives.

Complete each VM task in less than 29 seconds

Deploying a Windows® 10 VM



Reallocating resources on a VM



Decommissioning a VM



Complete metering and billing tasks in less than 1 minute

Metering and billing

Lenovo ThinkAgile CP offers a metering manager as a simple way to keep track of the resources your users consume. With the metering manager, you can generate reports that track usage and export the data as a CSV for use in your billing and chargeback process. Creating a new report required just **four steps and just over 58 seconds**, and exporting it required only **three steps and about 13 seconds** of our IT generalist's time.

Creating a new report



Exporting a report





Maintenance updates

We didn't need to do any real work to apply maintenance updates to ThinkAgile CP. We simply received a notification that an update would occur at a specified time with the option to reschedule if the update would require downtime. The complete ThinkAgile CP software stack—including the network interconnect software, hypervisor, and storage OS—received updates that took just **62 minutes and zero hands-on effort** from our IT generalist.

In a DIY private cloud environment, your staff would need to update hardware, firmware, and software while navigating multi-vendor interoperability rules. This may create unforeseen changes in your environment, causing multiple challenges for automation and self-service. You may also need to test these changes in a separate environment before implementing them in your platform. When the time for implementation arrives, you'll still need to coordinate the changes across multiple maintenance windows. Wouldn't a cloud platform that helps avoid these common challenges be an ideal solution for your organization?

Complete
maintenance
updates without
manual intervention

Save up to 62.8% of cloud costs with ThinkAgile CP versus the public cloud

Save up to
62%
of cloud costs with
Lenovo ThinkAgile CP

over three years versus
a public cloud

How do the costs of Lenovo ThinkAgile CP compare to those of a public cloud platform? We compared the costs associated with Lenovo ThinkAgile CP to those of a popular public cloud service: Amazon Web Services™ (AWS).

While ThinkAgile CP requires just a single up-front purchase, public cloud platforms typically employ a billing model that mixes up-front costs with ongoing payments for cloud services. Does that shift in billing models actually save money? Our range-based AWS cost analysis considers different performance levels, comparing equivalent numbers of VMs across the two platforms. We found that businesses with a large number of VMs could see **up to 62.8 percent savings with ThinkAgile CP.**

For more details about our cloud cost analysis, see [the science behind this report.](#)



Conclusion

When we tested Lenovo ThinkAgile CP, we found it offered a fully featured and pre-configured private cloud environment that did away with many of the management hassles that can accompany do-it-yourself platforms. In our hands-on experience, ThinkAgile CP was simple to set up. ThinkAgile CP deployment services installed the platform in a few hours, with minimal involvement from our team. The platform was also simple to manage and update, with most management tasks requiring just a few steps and less than a minute of time.

Think about your current cloud strategy. Without a ready-to-go platform, will your IT staff be able to deliver and maintain an easy-to-use self-service cloud in a timely, cost-effective manner? If you have doubts about your current approach, consider how your organization could benefit from the results we found in our ThinkAgile CP testing.

- 1 Here, we define “maintenance updates” as updates to the network interconnects, hypervisor, and storage software.
- 2 Khalid Kark, Anjali Shaikh, Caroline Brown, “Technology budgets: From value preservation to value creation,” accessed October 8, 2018 <https://www2.deloitte.com/insights/us/en/focus/cio-insider-business-insights/technology-investments-value-creation.html>
- 3 Stephen Watts, “IT Budgeting: Top Trends for 2017,” accessed October 17, 2018 <https://www.bmc.com/blogs/it-budget-trends/>

Read the science behind this report at <http://facts.pt/8na5km> ►

► View the original, English version of this report at <http://facts.pt/8j2vwr>



Facts matter.®

This project was commissioned by Lenovo.

Principled Technologies is a registered trademark of Principled Technologies, Inc. All other product names are the trademarks of their respective owners. For additional information, review the science behind this report.



The science behind the report:

Lenovo ThinkAgile CP Series: A fully featured turnkey private cloud, with fast deployment and easy management

This document describes what we tested, how we tested, and what we found. To learn how these facts translate into real-world benefits, read the report [“Lenovo ThinkAgile CP Series: A fully featured turnkey private cloud, with fast deployment and easy management”](#).

On August 31, 2018, we finalized the hardware and software configurations we tested. Updates for current and recently released hardware and software appear often, so unavoidably these configurations may not represent the latest versions available when this report appears. We concluded hands-on testing on September 5, 2018.

Cost analysis for a public cloud platform from Amazon

We calculated costs for Amazon EC2 instances that would match the CPU and memory requirements of VMs that ThinkAgile CP can support. We did not test performance of ThinkAgile CP, so our calculations are theoretical, based on CPU, RAM, and storage capacity of the ThinkAgile CP, assumptions about the workloads that the VMs would support, and decisions about the number of virtual CPUs each physical CPU could support. We compared the AWS cost to the \$492,501 discounted cost of ThinkAgile CP. That price, provided to us by Cloudistics, includes three-year 24x7x4 replacement service, software maintenance for three years, hardware installation, deployment services, and training.

100% three-year, all-up-front reserved cost of Lenovo ThinkAgile CP Series vs. Amazon Web Services™ (AWS)

40-to-60 m5Large:r5large mix	
vCPU to pCPU ratio	3:1
m5.large to r5.large ratio	40:60
Total number of Instances with 2vCPU at 80% capacity	192
AWS	\$602,476
Lenovo platform cost	\$492,501
Savings with Lenovo	\$109,975
Percent savings	18.3%

90% on-demand; remainder 3-year all-upfront reserved cost of Lenovo ThinkAgile CP Series vs Amazon AWS

	3:1	4:1	5:1	6:1	7:1	8:1
vCPU to pCPU ratio	3:1	4:1	5:1	6:1	7:1	8:1
m5.large / r5.large / c5.large mix	40:60:0	80:20:0	30:20:50	0:19:81	0:12:88	0:6:94
vCPU:pCPU	3:1	4:1	5:1	6:1	7:1	8
Total number of Instances with 2vCPU at 80% capacity	192	256	320	384	448	512
AWS	\$834,811	\$925,267	\$1,026,136	\$1,127,579	\$1,227,306	\$1,322,284
Lenovo platform cost	\$492,501	\$492,501	\$492,501	\$492,501	\$492,501	\$492,501
Savings with Lenovo	\$342,310	\$432,766	\$533,635	\$635,078	\$734,805	\$829,783
Percent savings	41.0%	46.8%	52.0%	56.3%	59.9%	62.8%

Usage scenario

We designed a scenario in which an enterprise is planning to run a mix of demanding workloads such as web servers, enterprise applications, and data analytics.

Workloads

We planned for a mix of three different workloads based on instance models available on AWS. The ThinkAgile CP Series runs Intel® Xeon® Scalable processors, so we chose from AWS instances that run on processors from the same family. The instances we selected use two virtual processors each because of the demanding nature of the applications described in the usage scenario—but they have different amounts of memory to accommodate the needs of different applications.

	Model	vCPU	Mem (GiB)
Compute optimized	c5.large	2	4
General purpose	m5.large	2	8
Memory optimized	r5.large	2	16

Available capacity of Lenovo ThinkAgile CP Series at 80% utilization

We sized the VM capacity of the Lenovo ThinkAgile CP Series based on an average of 80 percent utilization of the RAM and physical CPU.

	pCPU	RAM (GB)	Storage (TB)
4-Node Capacity	160	3072	89.6
80% capacity RAM and pCPU	128	2458	N/A

vCPU-to-pCPU ratios

Each VM requires one or more vCPUs. ESXi supports CPU over-committing, which is allocation of more virtual CPUs than the number physical CPUs available on the server. There is no consistent rule of thumb or best practice for a vCPU-to-pCPU ratio. A quick search can yield recommendations ranging from 1:1 to 20:1 or higher. We went with a middle range, modeling solutions based on virtual CPU to physical CPU ratios that range from 3:1 to 8:1.

Identifying a mix of instance types

Here are the steps we used to identify a mix of instance types that came close to an amount of memory and number of vCPUs equal to 80% capacity for RAM and pCPU on ThinkAgile CP Series:

- vCPU at 80% capacity – Our earlier calculation showed 128 pCPU available at 80 percent utilization. We multiplied the vCPU ratio by that value to get the number of vCPUs available at 80 percent capacity..
- Total VMs with two vCPUs – we divided those values by two, the number of vCPU per VM, to get a number of VMs. We priced that number of AWS instances.
- Percentage instance types, number instance types, and RAM usage – our earlier calculation showed 2458 GB RAM at 80 percent utilization. We created a mix of the three instance types that came close to using that memory amount and equaled the Total VMs with 2vCP. This mix is different for each vCPU count. There is enough memory capacity for the lower CPU counts to include all r5.large (16GB) and m5.large (8GB) instances. There is little more than 4 GB available on average for the 8 vCPU-to-1 pCPU instances, so its mix is almost entirely c5.large (4GB instances).

Ratio (vCPU:pCPU)	3	4	5	6	7	8
vCPU at 80% capacity	384	512	640	768	896	1024
Total VMs with 2vCPU at 80% capacity	192	256	320	384	448	512
Percentage instance types						
% m5.large (8GB)	40%	80%	30%	0%	0%	0%
% r5.large (16GB)	60%	20%	20%	19%	12%	6%
% c5.large (4GB)	0%	0%	50%	81%	88%	94%
Number instances types						
m5.large (8GB)	77	205	96	0	0	0
r5.large (16GB)	115	51	64	73	54	31
c5.large (4GB)	0	0	160	311	394	481
RAM usage						
m5.large (8GB)	616	1640	768	0	0	0
r5.large (16GB)	1840	816	1024	1168	864	496
c5.large (4GB)	0	0	640	1244	1576	1924
Total	2456	2456	2432	2412	2440	2420

Calculating costs

We used the AWS Simple Monthly Calculator to get estimates of three-year costs for each of the six vCPU:pCPU ratios we compared. This required us to make decisions about software, payment terms, and other calculator inputs:

- We chose instances with just Linux OS software
- We chose a usage of 80 percent utilized per month.
- We chose US East (Northern Virginia) for the location.
- We made 90-percent instances three-year on-demand and the rest three-year all-upfront reserved. You pay monthly based on a three-year contract for the on-demand; you pay upfront for the all-upfront reserved. The on-demand instances are more expensive but can be commissioned and decommissioned as needed. The reserved instances are best for long-term usage at a steady state. (table below shows the counts of instances based on those percentages. We also show prices for the 3 vCPU:1pCPU ratio using only the least expensive three-year all upfront reserved instances.
- To match the storage on ThinkAgile CP (which uses RAID50 with one hot spare per disk group), we included 90 x 1TB General Purpose SSD (gp2) Amazon EBS volumes totaling 90TB.
- We included business support in the platform.

We used the AWS Simple Monthly Calculator to get estimates of three-year costs for each of the six vCPU-to-pCPU ratios. Because we chose a mix of upfront and monthly billing options, the AWS Simple Monthly Calculator quoted an initial one-time payment and a monthly payment price. We calculated a three-year total price for the configuration we selected along with AWS Business support. We accessed the [AWS Simple Monthly Calculator](#) on 9/21/2018 for the six quotes that include three-year on-demand instances, and on 10/05/2018 for the quote with 00% all upfront reserved instances.

Ratio (vCPU:pCPU)	3	4	5	6	7	8
AWS price options on-demand						
m5.large	69	185	86	0	0	0
r5.large	104	46	58	66	49	28
c5.large	0	0	144	280	355	433
AWS price options up-front reserved						
m5.large	8	20	10	0	0	0
r5.large	11	5	6	7	5	3
c5.large	0	0	16	31	39	48
Estimate of bill						
Total one-time payment	\$23,669.47	\$27,707.65	\$32,701.34	\$36,822.98	\$41,002.40	\$46,053.87
Total monthly payment	\$22,531.72	\$24,932.20	\$27,595.41	\$30,298.78	\$32,952.88	\$35,450.84
3-year total	\$834,811.39	\$925,266.85	\$1,026,136.10	\$1,127,579.06	\$1,227,306.08	\$1,322,284.11

How we tested management tasks within the ThinkAgile CP Series platform

We tested a two-node Lenovo ThinkAgile CP Series for our use cases due to availability. This included 80 vCPU, 256 GB RAM, and 34TB storage. Note that a standard Lenovo ThinkAgile CP Series four-node model would typically have 160 vCPU, 3072 GB RAM, and 57TB Storage. The use cases cover only time and steps spent within the UI; therefore, performance between two-node and four-node is irrelevant in this study.

Results of our hands-on testing

The table below presents time and steps for our work with managing the ThinkAgile CP Series platform. We used a single IT generalist to complete all management tasks within the Lenovo ThinkAgile CP Series platform. The technician received a few hours of training from the Cloudistics engineers who came to our data center. The technician timed each task using a stopwatch. He performed each task three times. We report only the median time for each task.

Use case	Steps	Admin time (seconds)
Simple networking		
Creating an additional Virtual Datacenter with differing resource capacities	3	16.5
Adding a virtual network that has access to the internet	6	51.4
Creating and applying a firewall rule	4	27.2
Application provisioning and lifecycle activities		
Downloading a new Organization Template from the Cloudistics Marketplace	6	21.5
Deploying a Windows VM	6	28.6
Deploying three Windows VMs	6	28.6
Decommissioning a Windows VM	3	11.3
Reallocating VM resources	6	24.1
Allocating a new user	3	14.9
Metering and billing		
Creating a new report	4	58.5
Exporting a report	3	13.2
Simple infrastructure patching		
All patching	0 (Lenovo takes care of this)	0.0 (Lenovo takes care of this)

Simple networking, including multi-tenancy and daily networking maintenance operations

Creating an additional Virtual Datacenter with differing resource capacities

1. From the Cloudistics dashboard, click the + icon next to Infrastructure, and click New Virtual Datacenter from the dropdown.
2. Enter a Virtual Datacenter Name.
3. Review the CPU, Memory, and Storage Resource Summary to determine the resources available for allocation. Enter a number of CPU cores, gigabytes of Memory, and terabytes of Storage to allocate for the VDC, and click Create Virtual Datacenter.

Adding additional networks for virtual machines

Adding a virtual network that has access to the internet

1. From the Cloudistics dashboard, click Networks under Networking.
2. Click New Network, and click New VNET from the dropdown.
3. Enter a VNET Name, Network Address, Netmask, and Default Gateway.
4. Enter a DHCP range for the network.
5. Select the Virtual Datacenter where the new network function virtualization will be deployed. Leave the default 1 CPU, 1GB Memory provisioning. In the Outside Interface (Routing Service) section, select the VNET networking mode, and select the test network.
6. For the Firewall Settings, select the WEB Firewall Profile, and click Create VNET.

Creating and applying a firewall rule

1. From the Cloudistics dashboard, click Firewall Profiles under Networking.
2. Click New Firewall Profile.
3. Enter a Firewall Profile Name.
4. Under the Rules section, leave the default "Allow Incoming TCP" conditions, and leave the From Source IP Range field blank. Enter Source Port Range 443, Destination IP Range 198.168.0.100-198.168.0.150, and Destination Port Range 443. Click Create Firewall Profile.

Application provisioning and lifecycle activities

Downloading a new Organization Template from the Cloudistics Marketplace

1. From the Cloudistics dashboard, click Organization Templates.
2. Click the link to Cloudistics Marketplace.
3. Choose a new Operating System to download. For our test, we used Centos 7.4 (64-bit). Click the template icon.
4. Click the Download Template button to confirm the selection.
5. From the Download Template menu, select a Save Location. For our test, we selected the Main_VDC template location.
6. Leave the default Template Name, Description, CPU and Memory Provisioning, and Boot Order, and click Save Application Template. The Organization Template will begin downloading and be added to the inventory.

Deploying a Windows VM

1. From the Cloudistics dashboard, under Applications, click Organization Templates.
2. From the template menu, next to the Windows 10 Enterprise (64-bit) template, click New instance.
3. From the deployment screen, configure the virtual machine options. Enter an Instance Name.
4. Choose a Virtual Datacenter for deployment. Optionally choose an Application Group, and number of instances for deployment.
5. Leave the default Storage Pool and Migration Zone. Select VNET for Networking Mode, and choose a Network from the dropdown. Leave the Default Firewall Override and Mac Address options.
6. Leave the default Instance Settings, and click Create Instance.

Deploying three Windows VMs

1. From the Cloudistics dashboard, under Applications, click Organization Templates.
2. From the template menu, next to the Windows 10 Enterprise (64-bit) template, click New instance.
3. From the deployment screen, configure the virtual machine options. Enter an Instance Name.
4. Choose a Virtual Datacenter for deployment. Optionally choose an Application Group, and number of instances for deployment.
5. Leave the default Storage Pool and Migration Zone. Select VNET for Networking Mode, and choose a Network from the dropdown. Leave the Default Firewall Override and Mac Address options.
6. Leave the default Instance Settings, and click Create Instance.

Decommissioning a Windows VM

1. From the Cloudistics dashboard, under Applications, click All Instances.
2. Ensure the virtual machine is turned off. With the virtual machine turned off, click to highlight the virtual machine to be decommissioned.
3. Click the "..." icon, and click Delete from the dropdown. Click Delete Application Instances to confirm decommissioning. The virtual machine will be deleted.

Reallocating VM resources

1. From the Cloudistics dashboard, under Applications, click All Instances.
2. Ensure the virtual machine is shutdown. Click the "... " dropdown menu icon, hover over Edit Instance, and click Edit CPU Provisioning.
3. Change the CPU core count to 4, and click Save.
4. Click the "... " dropdown menu icon again, hover over Edit Instance, and click Edit Memory Provisioning.
5. Change the memory GiB count to 4, and click Save.
6. Select the Instance by clicking on its field, and click Start/resume to restart the virtual machine. Click Start/Resume Instances to confirm the action.

Allocating a new user

1. From the Cloudistics Dashboard, click User Management under General.
2. Click Invite User.
3. Enter an Email Address, and chose an Access Level. For our testing, we chose Infrastructure Viewer. Click Send invitation.

Metering and billing tasks

Creating a new report

1. From the Cloudistics Metering Manager dashboard, click + Add next to report.
2. Enter a report Name, choose a Scheduled Interval, choose a Report type, and choose an Output type. For our testing, we chose an Hourly interval, Detail report type, and Local Database Only.
3. Add a meter for each metric you wish to track. For our testing, we added a VCPU, RAM, and Storage Meter. For each Meter, enter a name, choose a metric, measurement (allocation or utilization), enter a rate, and rate interval.
4. Choose the applications to run the report on, and alternatively choose an entire Data Center. For our testing, we chose all deployed applications in our datacenter. Click Save to complete the report.

Exporting a report

1. From the Cloudistics Metering Manager dashboard, click Reports.
2. Click the Name of the test report.
3. Scroll to the Report Runs section. Click the XLS icon of the most recent report run to download the report as an Excel document.

► View the original, English version of this report at <http://facts.pt/8na5km>

Read the report at <http://facts.pt/8j2vwr> ►

This project was commissioned by Lenovo.



Facts matter.®

Principled Technologies is a registered trademark of Principled Technologies, Inc. All other product names are the trademarks of their respective owners.

DISCLAIMER OF WARRANTIES; LIMITATION OF LIABILITY:

Principled Technologies, Inc. has made reasonable efforts to ensure the accuracy and validity of its testing, however, Principled Technologies, Inc. specifically disclaims any warranty, expressed or implied, relating to the test results and analysis, their accuracy, completeness or quality, including any implied warranty of fitness for any particular purpose. All persons or entities relying on the results of any testing do so at their own risk, and agree that Principled Technologies, Inc., its employees and its subcontractors shall have no liability whatsoever from any claim of loss or damage on account of any alleged error or defect in any testing procedure or result.

In no event shall Principled Technologies, Inc. be liable for indirect, special, incidental, or consequential damages in connection with its testing, even if advised of the possibility of such damages. In no event shall Principled Technologies, Inc.'s liability, including for direct damages, exceed the amounts paid in connection with Principled Technologies, Inc.'s testing. Customer's sole and exclusive remedies are as set forth herein.