

A White Paper

**Which is Better:  
Virtualization or Cloud IaaS?**

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# Which is Better: Virtualization or Cloud IaaS?

## Why should I consider Virtualization or Cloud IaaS at all?

Simply put, they can save you money. Setting aside all the marketing hype about how prevalent one technology or another will be in the next few years, both technologies can provide redundancies that will maximize your uptime and that will allow you to squeeze the most performance out of your hardware. Instead of maintaining dozens of individual servers in a climate controlled server room, the need is reduced to a couple of servers and networked storage. Maybe not even that if you decide to use a remotely hosted Cloud.

## Which is better - Virtualization or Cloud based IaaS?

A better question would be – which is better for my organization? While both Virtualization and Cloud IaaS have common underpinnings, there are significant differences between them that can make one of the technologies a better fit for your needs than the other.

Fundamentally, both Virtualization and Cloud based IaaS provide the same service: a virtualized server created by slicing off resources from a host server. Where they differ is in scale and location. Virtualization is primarily locally hosted, with the upper limit on resources set to locally available hardware. Cloud IaaS servers are primarily available over the internet from remote datacenters, with an upper limit on available resources based on the maximum the virtual OS will support.

While Virtualization and Cloud IaaS differ in scale and location, their underlying technology is the same. Both Virtualization and Cloud Computing start with pooling resources – memory, CPU, disk, and networking. A centralized software program called a hypervisor creates and manages Virtual Machines (VMs), allocating a portion of the pooled resources to each VM. If you're using Virtualization on your own servers, you will need to choose a hypervisor, but, if you're using Cloud IaaS, the hypervisor will be under the Cloud provider's control.

Cloud IaaS adds features to virtualization's resource pooling that allow for the commoditization of computing resources. As per the National Institute of Standards and Technology (NIST) [definition of Cloud Computing](#), these additional features are:

- On demand self-service
- Broad network access
- Rapid elasticity
- Measured Service

These additional features allow Cloud providers to meter the services consumed by a customer, and charge based only on resources used. This can save money if resource usage is relatively low, and

servers are not needed on a constant basis. However, as resource usage and uptime increase, Cloud costs increase as well, eventually reaching a level where Virtualization becomes a more cost effective model.

As an example: You sign up for a reserved m3.medium EC2 instance with Amazon to host a static web site, which is enough to meet your needs 90% of the time. However, your web site slows down during peak usage times, so you configure auto-scaling rules that will spin up a new instance to handle additional load, and then automatically remove the instance when the need is no longer there. Your bill is for the monthly reserved instance usage, and you are charged a higher hourly rate for the additional instance. If your website traffic requires more resources more frequently, you can purchase a larger amount of reserved instance usage, but eventually the total of the monthly recurring costs can end up being higher than the one-time expenditure for virtualization would have been.

### **How do you decide between Virtualization and Cloud IaaS?**

There are multiple considerations that factor into the decision of which platform is the best fit for your organization:

- **Operating Systems Prerequisites**

Migrating your infrastructure to a Virtualized or Cloud IaaS environment is functionally equivalent to installing your existing applications on new servers. The new servers will handle resources far more efficiently, have better uptime, and can access additional resources much more quickly than bare metal servers, but applications are installed and configured in the same way that they were previously. As a result, you need to consider the operating system, or systems, required for your applications.

If you're using a local hypervisor, check the hypervisor vendor's website for a current list of supported OS versions. It is important to note that while some hypervisors are capable of running operating systems that are no longer supported by the vendor (e.g. Windows XP), there is no promise of additional OS support. But, if accounting has a legacy app that absolutely cannot run on anything other than XP, a local hypervisor may keep that app up and running for a little longer.

Cloud IaaS provides currently supported Windows operating systems, one or more Linux versions, and, depending on the vendor, may supply additional OS options. One difference between locally hosted hypervisors and Cloud IaaS is that Cloud vendors build OS licensing fees into the monthly costs, while local hypervisors allow you to deal directly with the OS vendor for licensing. As a result, licensed operating systems (Windows, RedHat, SuSE) will have higher monthly fees to cover licensing than non-licensed operating systems (Centos, Debian, Ubuntu, etc.).

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## ■ Security and Compliance

For as long as the Cloud has existed, there have been concerns about security. Many of these concerns have been addressed by advances in encryption and hypervisor security – but there are still legitimate concerns:

### 1) Data Interception

In a local virtualized system, all data travels across your local LAN, and is stored behind your firewall. For remotely hosted systems, data travels across the internet, and is stored on drives that may be shared with other Cloud consumers. Strong encryption can be used to secure the data both in transit and while it is stored by a Cloud vendor, but any time your data travels across a public network there is the possibility that it can be intercepted. If the data in your Cloud is sufficiently sensitive, interception of encrypted data may not be an acceptable risk.

### 2) Physical Data Storage

Underneath the virtualization, data is still stored on physical media. What happens if the physical media is replaced? Is the data on the old media destroyed? What is done with the old drives? If you have a remote Cloud vendor and you need to ensure that data on old drives is destroyed, make sure you explicitly state this standard in your contract with the vendor.

### 3) User access policies

Users are notoriously bad at setting secure passwords, and users with more access than they need can leave a gaping security hole. Admins managing servers may be more responsible, but an Admin's stolen laptop or mobile device could provide a backdoor into your servers. Make sure that any internet based access to your Cloud IaaS management utilities is locked securely both in terms of who has the ability to access management utilities, and the devices used for management.

### 4) Data ownership

While the vendor may have physical possession of the drives containing your data, make sure you establish that you have full control of any data you store in the Cloud. This control includes the ability to grant or refuse access to data – for example:

- If you face a security audit, or need to do a forensic analysis of your data, can the Cloud vendor comply with your data requirements?
- How long will it take to get your data, and will there be additional fees?
- If the vendor is presented with a court order to hand over your data, will they comply with it – and will they notify you about the request?

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## ■ Performance

Virtualization and Cloud IaaS are both tuned to make the most of available resources without sacrificing performance. However, there are external factors that can lead to application performance problems:

### 1) Network Infrastructure

Application performance depends not only on the resources the application has available, but also on the network latency between the user and the application. An application and user on the same LAN will have less network latency than if they are separated by an internet connection. An internet based application can slow to the point of uselessness if the internet connection is unreliable or does not have enough bandwidth.

Before considering Cloud based IaaS, survey your network capacity and calculate whether it will be able to support the additional load of user connections to remotely hosted applications. If you require additional capacity, make sure you factor that into the cost of Cloud implementation. If it is not possible to upgrade your network access enough to make Cloud IaaS feasible, then locally hosted virtualization is the better option.

On the other hand, if your local internet connection is poor, it makes sense to host externally available applications from a Cloud vendor's datacenter. Cloud vendors can also provide resources in datacenters at multiple remote locations, providing a redundancy in the event one of the datacenters goes down.

### 2) Resource sharing

Locally hosted virtualization is straight forward: you control the hardware for your infrastructure, and you control all resources available for the VMs. Hypervisors let you control which host runs a VM, and if more resources are required, VMs can be moved to a new host with more free resources, sometimes without even shutting down the VM.

The configuration options are more complex with Cloud environments - the NIST model outlines four deployment models to describe how resources are shared across the Cloud:

- Public Cloud: Provisioned for general public use, hosted remotely at vendor facilities.

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- Community Cloud: Provisioned for use by a group of connected organizations, e.g. municipal cloud. May be hosted locally or remotely.
- Private Cloud: Provisioned exclusively for the use of one organization, may be hosted remotely, but typically local.
- Hybrid Cloud: Any combination of the other three cloud deployment models.

These deployment models define at a very high level who is using the Cloud at the same time as your organization. Cloud hypervisors are designed to strictly segregate user activity so that each VM in the Cloud is unable to interact with other VMs, but there are still multiple VM servers on the same physical hardware. If another VM on the same physical hardware as yours has a sudden spike in resource requirements, there can be a brief disruption to your server until the hypervisor software redistributes resources to handle your “noisy neighbor”.

### 3) Outages

- Maintenance Windows  
Although Virtualization and Cloud IaaS incorporate redundancies that limit downtime, both scheduled maintenance windows and unscheduled outages can and do occur. Moving to Virtualization or Cloud IaaS does not mean you can abandon your backup server and disaster recovery plans – it means that the likelihood of needing them is less.

In a local Virtualized environment, your IT staff is able to control scheduling for maintenance windows, while Cloud vendors will announce a window that is a best fit for the majority of their customers, but may not necessarily be a good window for your organization. Keep in mind that maintenance windows can run longer than scheduled, and if they do it is often because a problem occurred during maintenance that may take significant time to resolve. Double check the availability of your resources – either local or remote – when a maintenance window expires.

- Outages and Service Level Agreements (SLAs)  
For outages outside of a scheduled maintenance window, Cloud vendors provide a Service Level Agreement that compensates customers based on the length of the outage. However, the compensation may be in the form of credits for future services, and is usually not enough to cover financial losses due to server downtime. Additionally, many vendors will only

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provide SLA credits if you claim them in the first place – if you don't know there was an outage, they won't tell you about it.

In a local virtualized environment, your IT staff has the responsibility of bringing systems back up after an outage. You will probably have fewer staff available than a Cloud vendor, but your local virtualization environment is correspondingly smaller as well. After the outage has been repaired, you will get a more detailed post mortem of the problem from local IT staff than you would from a Cloud vendor, and can be certain to guard against a recurrence of the problem.

## ■ Budgeting

### 1) Existing Infrastructure

Cloud IaaS provides a quick way to build a server infrastructure from scratch. A good networking infrastructure and devices to access the internet are still necessary, but there is no initial expenditure for servers or facilities to house the servers. It would be possible to configure a complete Cloud IaaS infrastructure – web applications, databases, mail servers, etc. – all from a laptop with a WIFI connection.

If you already have an IT infrastructure, you may be able to recycle some of your servers and storage devices for Virtualization, cutting down on costs for a local Virtualized infrastructure. To check if this is feasible check the Hardware Compatibility List (HCL) for any hypervisors you're considering.

### 2) Budget planning

Given a consistent demand for computing resources, both Virtualization and Cloud IaaS provide the ability to plan a long-term budget. For a Cloud IaaS service, the most cost effective plan is to estimate a basic usage level, and then pay for resource usage beyond that level at a higher ad hoc price. Over time, the resource usage level may increase, and you should monitor resources to determine if it makes more sense to move to a larger scale server. Keep an especially close eye on data storage, as that can creep up quickly, and become a costly add on item.

Keep in mind that Clouds costs are based on resources used, and most Cloud servers are not heavily used 24x7. As server uptime increases, a heavily used 24x7 Cloud instance could cost more than a Virtualized server. Make sure you evaluate the "what if" costs of a server being heavily used, and compare those to the similar flat cost for a Virtualized infrastructure.

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For local virtualization, a need for additional resources can be translated into additional hardware. If you do add hardware, check your licensing agreements – hypervisor licensing can be hardware dependent, and adding additional hardware can increase hypervisor licensing fees.

One cost that is often overlooked for both virtualization and Cloud IaaS is training. Hypervisor and Cloud administration are new skill sets for many administrators, and training your existing staff to manage your environment provides better analysis of performance issues, and better day to day management of resources. There are many free resources available for learning both hypervisor and IaaS management, but providing structured technical training can ensure that all key areas are covered.

### 3) Technical support

Despite the redundancies built in to virtualization and Cloud IaaS, outages can and do occur. Physical hardware is still underneath the virtualized infrastructure, and problems can range from hardware failure to user error to natural disasters. With local virtualization, if something fails, your staff is responsible for repairing the problem and putting measures in place to prevent the problem from happening again.

In Cloud IaaS in the event of a failure you need to make sure that the Cloud vendor is aware of the issue, but then need to wait until the vendor finds and fixes the problem. While Cloud vendors do their best to attempt to live up to the terms of their Service Level Agreement (SLA), keep in mind that the compensation you receive for a Cloud outage may not come close to making up for lost revenue. In order to ensure that the vendor has the proper measures in place to prevent a recurrence of the issue, check with the vendor for an analysis of why an outage occurred and how the issue will be prevented in the future.

## ■ Conclusion

Virtualization and Cloud IaaS are both based on similar principles: pooling computing resources over multiple servers, allowing for the creation of VMs that can increase resources as needed. While Virtualization is limited by the amount of physical resources available on the Virtualization host servers, the Cloud is not limited, and can expand resources to meet demand up to whatever limit you specify. Even better, the Cloud will meter the resources that you use, and bill you only for those resources.

However, the unlimited expansion available through Cloud IaaS comes at the cost of using the vendor's data center, with the security and server sharing issues that entails. In addition, the



Cloud's pay-as-you-go billing is an asset until your resource usage increases to the point where Cloud costs are higher than Virtualization.

The choice of Virtualization or Cloud IaaS for any given organization will depend on that organization's security, performance, and network requirements. Before evaluating either technology, thoroughly survey your requirements, and compare them against the options available from Virtualization hypervisor vendors and Cloud IaaS vendors to find the correct fit for your needs.

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## About Heroix

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