



Lessons Learned from Hundreds of Production Cloud Deployments

Top 5 considerations when selecting a cloud platform

Businesses today are looking to reap the benefits of private clouds such as efficiency, flexibility, scalability and cost savings, and have come to realize that transforming IT to agile and efficient cloud services is a strategic priority – no longer a matter of if, but when... and how. Once the decision to move an IT environment to the cloud is made, the next logical questions businesses face are how to get there and where to start.

A recent study found that for most companies, the process of selecting and implementing a cloud platform can take anywhere from 6 to 9+ months! The key challenges businesses said they faced were the lack of staff expertise, managing application specific performance on the cloud and moving legacy applications to a cloud architecture.

As a leader in application and desktop delivery, Citrix® has been at the forefront of shifts in how organizations and their users are leveraging IT infrastructure to meet business goals. In order to be successful when moving your IT environment to the cloud it is important to leverage the lessons learned from companies who have already deployed their clouds. Citrix has proven experience in this area, with hundreds of customers with large-scale production clouds in deployment – some with over 40,000 servers.

Top 5 Do's and Don'ts when transforming to the cloud

In this whitepaper, we will share with you how our customers planned their cloud transformations, implementations and the Citrix cloud solutions they used, so your clouds can be successful too. We have learned some key do's and don'ts to accelerate this transformation. Here are the top 5 do's and don'ts, and why.

(1) **DO** know which apps you want to move to the cloud and what infrastructure they require. Planning which apps you want to put in the cloud will help you understand the requirements of these apps and ensure that your cloud platform can accommodate these choices. For example, many businesses use more than one hypervisor, and therefore need a cloud platform that supports multiple hypervisors. Knowing this upfront will ensure multi-hypervisor support is high on your evaluation criteria.

The University of São Paulo (USP) is the largest Brazilian university and the country's most prestigious educational institution. USP is also the largest institution of higher education in Latin America, with 100,000 students, 6,000 professors and 17,000 employees.

In spite of its status as a leading global university, USP suffered from a dispersed and substandard IT infrastructure. One hundred and fifty mini-datacenters were located in 11 campuses across nine cities, with limited local technical and managerial support; substandard energy and heat dissipation resources; and insufficient policies for data security and backup. Data stored on internal hard drives posed problems for data management and integrity. More than once, years of research was lost due to poor infrastructure, costing USP large amounts of money and undermining projects that could have saved or improved many lives or brought new innovations to market.

“Using electronic media as part of on-site teaching activities, while also providing educational content on digital media, is something we have to immediately integrate now that we are dealing with a generation of students who are digital natives. The decision to pioneer and implement an innovative project of this scale is one of several strategic decisions to ensure that USP retains its position as one of the world’s foremost universities.”

João Grandino Rodas
USP Rector

Building a university-wide cloud with Citrix solutions

The “Nuvem USP” (Cloud USP), as it is called, was conceived and designed to provide on-demand, centrally managed virtual datacenters, with flexibility and security, backup, data replication and high availability. The USP cloud is built on servers virtualized with Citrix XenServer® and orchestrated by Citrix CloudPlatform™, with services managed and presented to all teaching and research units and areas as well as business users through a unified self-service portal built with Citrix CloudPortal™ Business Manager. Citrix powered desktops and streamed applications via Citrix XenDesktop® are available to users anywhere on PCs, mobile devices and thin clients, using Citrix Receiver™ as a universal client. Citrix NetScaler provides cloud networking services including application delivery optimization and load balancing.

Providing self-service cloud services to meet diverse needs institution-wide

Cloud USP greatly streamlines the provisioning of any type of infrastructure in a secure, flexible, and highly scalable environment. Teachers and researchers can start work in minutes by selecting the hardware and software they need through a self-service portal interface, eliminating bureaucratic delays, while managing their budgets in real time. USP’s departments and laboratories can quickly and easily manage servers, storage and networks. Staff and students can use cloud-based apps to arrange meetings, access social networks and view files in a number of formats. Administrators use Cloud USP for email, payment, human resources, grade management and issuing diplomas and certificates. Graduate, postgraduate, research and university extension students can access educational content as well as scanned library and museum collections. For scientists, services focus on research with an emphasis on massive data storage as well as intensive computation or processing.

(2) DO plan a roadmap of cloud adoption.

The value of a cloud grows as you consolidate more workloads on it. So, it is important when choosing a cloud platform that it is extensible to meet not just your immediate needs, but also your longer term needs. It helps to plan a roadmap of where you want to take your cloud adoption. Most businesses want to start with a few new cloud apps and grow to add more of the enterprise and legacy IT apps as cloud services. Knowing this upfront will help you to avoid getting locked in to a narrow cloud platform that won’t be able to accommodate both your cloud-native and traditional enterprise workloads – most cloud platforms are built to run one or the other, but not both.

Autodesk is a world leader in 3D design software for entertainment, natural resources, manufacturing, engineering, construction and civil infrastructure. While the company’s corporate IT department provides services and support for business teams such as finance, sales, training and HR, the development and engineering teams for each of its more than 130 products have traditionally taken responsibility for their own hardware and systems. This includes both lab equipment and the personal laptops used by developers and engineers for their individual work.

“The first team on our Citrix-powered cloud reduced its build process from six or seven days to only four hours.”

Jason Smathers

Manager, Autodesk Enterprise Cloud Engineering

Delivering resources and desktops on-demand through a private cloud solution

Autodesk chose Citrix CloudPlatform, a cost-effective, agile and open cloud orchestration platform enabling IT to rapidly provision the infrastructure needed to develop new products more efficiently.

Autodesk used CloudPlatform to build a private cloud for a new Enterprise Cloud Services (ECS) program. ECS provides on-demand development and test resources for more than 130 product engineering groups around the world. Citrix NetScaler® ensures optimal agility, elasticity and cost efficiency while ensuring security and performance. Integrated into ECS, Citrix XenDesktop with HDX™ 3D Pro delivers the high-performance CAD desktops used by engineers, enabling them to replace high-cost engineering laptops with lower-cost endpoints while providing anywhere, any-device access to their work. Citrix XenServer helps Autodesk increase datacenter utilization and efficiency.

Increasing engineering productivity by 200 percent

CloudPlatform empowers Autodesk engineers to build dynamic machines on the fly, automate and streamline their activities, and get out of the infrastructure business. Each month, more than 100,000 VMs are deployed through ECS. “The first team on our Citrix-powered cloud reduced its build process from six or seven days to only four hours,” says Smathers. The group responsible for AutoCAD, one of the company’s flagship products, increased its weekly productivity by 200 percent. No longer confined to a limited number of machines, engineers can also work on more than one product in parallel to further increase productivity.

“One product team went from having four people spend most of their time managing their lab to half of a single employee’s time. Our global private cloud infrastructure is now comparable in extent to our corporate datacenter, but it’s manageable with far fewer people.”

Rosemary Nahrbar

Senior Manager, Autodesk Infrastructure and Cloud Engineering

(3) DO pick a platform that offers flexibility.

A key benefit of a cloud is the ability to abstract and make changes to the underlying infrastructure without impacting the applications that run on it. For instance, perhaps you want to change the secondary storage to take advantage of less expensive object storage options. Or, you want to move from a flat network during Dev/Test, to a tiered and dedicated network when going to production. Your cloud orchestration layer should offer the flexibility to support these modifications without restricting your choices.

Alcatel-Lucent is at the forefront of global communications. The company provides products and service innovations in Internet Protocol (IP) and cloud networking, as well as ultra-broadband fixed and wireless access. Its customers include service providers, enterprises and institutions throughout the world. The Alcatel-Lucent Cloud Innovation Center (CIC) in Naperville, Ill., helps telecom service providers meet the demands of their customers for new features and increased network capacity.

Eliminating the need for dedicated, service-specific telecom hardware

To avoid the cost and maintenance of dedicated hardware environments for each of its partners, Alcatel-Lucent needed an efficient cloud orchestration solution to power its virtual network platform, Alcatel-Lucent CloudBand. This would make it possible to run multiple services on a common platform, allowing for a more efficient operational model and a reduction of service innovation cycles.

Providing rapidly deployable, open cloud environments with virtualization technology

Alcatel-Lucent chose to integrate Citrix CloudPlatform with its CloudBand solution to build the open, vendor-neutral platform its customers needed. “CloudPlatform gave us the best of both worlds: a strong open source community, and the support of a proven company like Citrix,” says Idan Mor, senior director of strategic alliances at the Cloud Business Unit at Alcatel-Lucent. Citrix CloudPlatform makes it possible to deploy a distributed cloud, connected into a single holistic network with a unified management experience. With Citrix CloudPlatform, an automated, structured rack of servers providing a complete cloud environment can be unpacked and provisioned in less than two hours to support a fully automated production-level deployment.

“Forcing customers to run their cloud operation on a specific platform would undermine much of the value of moving to the cloud. With CloudBand (its virtual network platform) and CloudPlatform, we can offer an end-to-end solution that leverages the full power of the open source community.”

Idan Mor

Senior Director, Strategic Alliances,
Cloud Business Unit, Alcatel-Lucent

Citrix CloudPlatform complements this openness with a high degree of flexibility and control over the placement of individual cloud workloads based on network loads, as well as policies such as the need for a given workload to reside within a specific geography.

(4) DON'T get locked-in.

Many cloud platform vendors are optimizing for their own stacks, and may not make it easy for you to leverage other alternatives. It is important to understand the APIs that a solution supports – if you want to add AWS to your architecture, does your cloud platform have an AWS-compatible API? Does the solution enable you to use your choice of networking, storage, and hypervisor technologies? These are important considerations when choosing a cloud platform.

Building an “Academic Cloud” on Citrix CloudPlatform and XenServer

At the Hokkaido University Information Initiative Center, which conducts research and development (R&D) on information infrastructure, supercomputer-based services are under development for use by researchers throughout Japan, and to bolster the campus network and educational information system.

The Information Initiative Center developed separate physical server environments in university research rooms to support users. However, it required a great deal of effort to create the system environments, and the manual systems used for operations and management activities were inefficient. In addition, the costs of installation, power and labor were on the increase.

The Information Initiative Center staff configured a hardware environment with a processing capacity exceeding 40 teraflops. They chose Citrix XenServer for their server virtualization platform and built a framework that allows more than 2,000 virtual servers to be hosted on the new cloud.

For the middleware to efficiently manage and operate the Academic Cloud, the team chose Citrix CloudPlatform. Independently developing a portal using CloudPlatform APIs, they created a framework that makes it easy for Academic Cloud users to request and use virtual servers. One of the reasons for adopting CloudPlatform was its superior cloud management features, which make

it easy to sign up for a virtual server and to manage the virtual server from the user portal. Munetomo explained, “The thought of developing a portal independently from scratch seemed overwhelming, but CloudPlatform provided the core functionality and rich APIs that made it a relatively easy task.”

Dr. Masaharu Munetomo, a specialist in engineering and an associate professor at the Large-scale Computer Systems Research Division of the Information Initiative Center, described how he learned about CloudPlatform. “At the time, there were a number of cloud services available. We could have quickly put together a system for use in the research rooms, but building a cloud infrastructure that would allow collaboration across the country required consideration of reliability, security and the user interface. In the spring of 2010, we evaluated CloudPlatform and found it would meet our requirements.”

Development began in the spring of 2011, and by November of that year, the Academic Cloud went into service.

Highly agile cloud allows deployment of virtual servers in just 10 minutes

The primary purpose of adopting CloudPlatform for the Academic Cloud was to improve convenience for users. Munetomo said, “User friendliness in operating the cloud is a really important item. Previously, users submitted a written application, the IT team set up a physical server and then send back a form with the configuration details and password. With our Academic Cloud, authorization is automatic after the user signs up on the portal, and services are ready in 10 minutes. That’s a world of difference from what we had before.”

(5) DON'T turn it into a science project.

Yes, you want your cloud management platform to offer flexibility, but this does not mean you need to roll your own platform. Often, open-source cloud efforts like OpenStack are a collection of projects that you need to devote engineering resources to design and develop your own solution. This is one of the key reasons why cloud deployments end up taking a long time and lead to frustration. It is best to start with a narrow set of use cases, deploy quickly, deliver results, while architecting for flexibility in the longer term and expanding the scope of your deployment as you grow.

A private cloud based on CloudPlatform powered by Apache™ CloudStack®

The Walt Disney Company™, commonly known as Disney™, is a family entertainment and media enterprise with five business segments: media networks, parks and resorts, studio entertainment, consumer products and interactive media.

Disney Interactive looked at several solutions to build the infrastructure-as-a-service (IaaS) private cloud. The team focused on compatibility, ease of use and the ability of the engineering staff to adopt the technology and operate the platform efficiently with fairly limited training.

Disney Interactive evaluated OpenStack and Citrix CloudPlatform for the private cloud implementation. Peter Lopez, the systems architect for the private cloud, said, “When we looked at

CloudPlatform compared to OpenStack, one of the key differences that drove us to decide in favor of CloudPlatform was the raw nature of OpenStack itself and the investment, configuration and operational knowhow needed to operate the platform. OpenStack sought to be more than just IaaS and did not allow us to use our existing hardware and software components. Nothing even closely matched what we had in our physical infrastructure. So, it wasn't a good complementary system." He added, "Unlike OpenStack, CloudPlatform gave us the flexibility to leverage our own investments in our datacenter."

Additionally, Disney Interactive realized that it would be very hard to assemble key pieces missing in OpenStack without staffing a development group. They decided that CloudPlatform offered enough versatility to use their existing infrastructure investments and achieve all of their requirements for the private cloud solution.

The team was very impressed with the ease of deployment for CloudPlatform. Lopez noted, "At the time we had a staff of three engineers who had no prior experience with any sort of cloud technology pertaining to IaaS, but they found the CloudPlatform deployment exceptionally easy."

Lopez shared an interesting story. When they started the deployment, it was installed in a network location that was provided to them, but the network location turned out to be incorrect. So after the environment was built, the team had to move the environment while it was actually running. This was accomplished with zero downtime. The Disney Interactive team found that very impressive. Lopez mentioned, "Doing the same transfer with OpenStack probably wouldn't have worked quite that well."

Successful cloud projects use proven and mature solutions that IT can easily deploy and manage; leverage existing investments and expertise; address short and long-term use cases and workload requirements; give users and IT a choice of the underlying hardware, networking and virtualization layers; and start with targeted use cases to deliver quick value.

Citrix CloudPlatform enables businesses to take advantage of a variety of additional key benefits and features including:

- An open, flexible, interoperable and extensible cloud infrastructure framework
- Simple turnkey cloud orchestration and provisioning
- Support for desktop, cloud-native and data center workloads
- Enterprise-class multi-tenancy
- Cloud-native scalability and operations

It is for these reasons that we are continuing to evolve Citrix CloudPlatform to deliver flexibility in your hypervisor, networking, storage and compute options, and the applications you can manage.

Citrix Cloud Platform Product Portfolio

Citrix CloudPlatform provides our 250+ large-scale production cloud customers with the industry's only cloud orchestration and provisioning platform capable of managing cloud-native, desktop and traditional enterprise application workloads with a single cloud infrastructure platform.

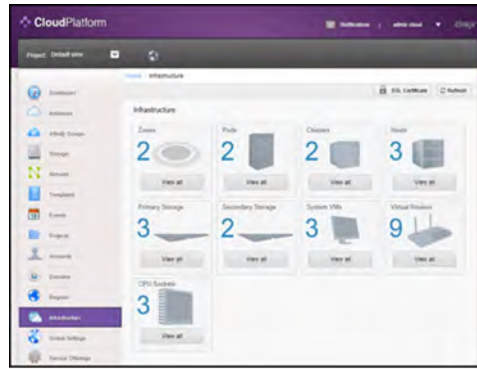
Citrix CloudPortal Business Manager is a unified cloud services delivery and business management platform that unifies and simplifies the delivery, operational, commerce and user management aspects of a cloud.

Citrix XenServer is an industry and value leading open-source virtualization platform for managing cloud, server and desktop virtual infrastructures. Organizations of any size can download XenServer for free to virtualize demanding workloads and automate management processes – increasing IT flexibility and agility and lowering costs.

Citrix Cloud Computing Solutions

Citrix CloudPlatform

Citrix CloudPlatform is a cloud infrastructure and management platform that automates the orchestration and provisioning of IT resources in support of desktop, cloud-native, and enterprise workloads. Automated service provisioning through standardized service offerings and templates reduces IT service delivery times from days to minutes.



Download the free Citrix CloudPlatform 90-day trial software

(www.citrix.com/products/cloudplatform and click "Try it"), or contact your local Citrix representative to start your move to the Cloud.

Core capabilities include:

- **Service Automation:** Citrix CloudPlatform provides service delivery automation by orchestrating user requests across infrastructure resources. End-users select from IT Administrator defined service options and are up-and-running in minutes. Users can view their usage in real-time with data provided by the Citrix CloudPlatform Usage engine.
- **Management Automation:** IT Administrators gain a holistic view of resources via the Citrix CloudPlatform Management Server user interface and APIs. Administrators can provision, view, and manage the cloud infrastructure including domains, user accounts, projects, and configuration settings. Setup easy self-service ordering for end-users or more advanced virtual data centers with dedicated resource pools for unique projects.
- **Multi-Workload:** Run multiple workloads – traditional enterprise, cloud-native, and desktop, to address the requirements of today and tomorrow. Citrix CloudPlatform can orchestrate resources appropriately to support different workload types. Traditional enterprise applications have specific compute, storage and networking requirements different from cloud-native applications or desktop workloads. With Citrix CloudPlatform, all of these types of workloads can function on a single platform in separate availability zones.

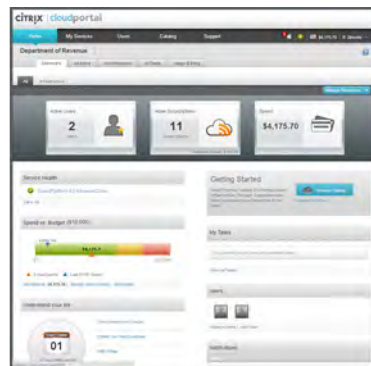
Organizations benefit with:

- **Fast time-to-value.** Simplified out-of-the-box setup and configuration eliminates costly time spent
- **Investment protection.** Extend existing datacenter resource investments and use the virtualization, storage and networking solutions that meet your needs

- **Extensibility.** Provides comprehensive APIs in addition to direct support for AWS EC2 APIs
- **Enterprise-grade production platform.** A best in class, proven cloud platform, with hundreds of production deployments, that can be trusted to run mission-critical workloads

Citrix CloudPortal Business Manager

CloudPortal Business Manager is a unified cloud services delivery and business management platform that unifies and simplifies the delivery, operational, commerce and user management aspects of a cloud. Organizations can aggregate infrastructure, cloud, IT and value add services and deliver them to users through a simple, self-service catalog of cloud services. Users can shop for cloud services and manage their account without calling tech support or waiting for services to be manually provisioned.



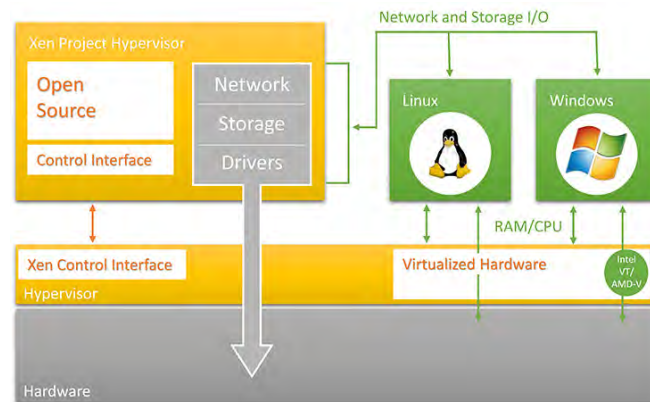
Beyond service delivery, CloudPortal Business Manager centralizes the user management, provisioning and operational aspects of running a cloud into a single comprehensive cloud business platform. CloudPortal Business Manager includes powerful tools to automate provisioning and orchestration workflows along with customer service functions such as onboarding, billing and metering to more efficiently run your cloud.

The extensible architecture makes it easy to deliver a broad array of cloud services, while integrating with existing business, operations and IT systems such as help desks, ticketing, payment gateways, CRM and billing systems. Custom business rules and workflow requirements can easily be injected for service interactions such as account activation and provisioning requests to ensure business processes and technical requirements are met.

- **Cloud Services Delivery and Business Management:** Simplify how clouds operate by automating and unifying service delivery and business operations onto a single cloud services delivery platform.
- **Deliver a broad array of cloud and IT services:** Package and deliver IaaS, cloud or IT service from an intuitive self-service catalog.
- **Self-service IT:** Empower users with simple, self-service access to shop for cloud services and manage their accounts without calling tech support or opening support tickets.
- **Pricing, metering and billing:** Define custom price points, track utilization, automate billing and payment processing all from a single extensible platform.

Citrix XenServer

Citrix XenServer is an industry and value leading open-source virtualization platform for managing cloud, server and desktop virtual infrastructures. Organizations of any size can download XenServer for free to virtualize demanding workloads and automate management processes – increasing IT flexibility and agility and lowering costs.



- **Cloud optimized virtualization:** XenServer is the best server virtualization platform for public and private clouds, powering 4 of the 5 largest hosting provider clouds. Built with scale, security and multi-tenancy in mind, XenServer allows for even greater flexibility and cost efficiency.
- **Leading open-source virtualization:** XenServer enables IT to significantly reduce the number of servers in a datacenter and better utilize existing hardware resources. Through live migration of VMs, high availability and dynamic memory control, XenServer helps IT administrators maximize application performance while increasing efficiency.
- **Best performance for XenDesktop:** XenServer delivers the best-in-class performance for desktop virtualization with an integrated virtualization platform for Citrix XenDesktop. XenServer maximizes VM density, streamlines storage operations and secures the VM network to ensure a quality end-user experience while providing IT control.

Summary

When choosing your cloud solution it is important to determine the best option, not just for today but also for the future. Companies looking to standardize on cloud will find Citrix cloud solutions deliver:

- **End-user self-service:** Instead of risky shadow IT and grass roots adoption, now you have the ability to respond immediately with the resources required, and with governance and visibility into what's being used;
- **IT business agility through automation and streamlining IT Ops:** Menial tasks of provisioning VMs are automated, allowing IT resources to focus on more strategic tasks;
- **Significant cost savings:** By leveraging your existing investments and supporting multiple infrastructure zones to handle both traditional enterprise application and cloud-native application workloads, as well as repurposing or even eliminating redundant hardware;
- **Exceptional management flexibility:** Everything is managed through a single pane of glass;
- **On-demand capacity:** Allowing you to grow or shrink your infrastructure as demands change; and
- **An open system:** With no vendor lock-in. You have the choice of hypervisors or bare metal servers; connectors; storage, networks, etc.

Citrix offers an end-to-end solution comprised of open, proven and mature technologies. These solutions provide a simple path to transform your datacenters into a cloud offering, regardless of the underlying infrastructure components. Our open approach means organizations can build the cloud they need without fear of vendor lock-in should their needs change in the future. Furthermore, these platforms are built on vibrant products from open source communities committed to delivering new feature sets to meet changing business challenges.

For more information

Contact your local Citrix representative to start your move to the Cloud. Download the free Citrix CloudPlatform 90-day trial software (www.citrix.com/products/cloudplatform and click "Try it"),

Corporate Headquarters
Fort Lauderdale, FL, USA

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Bangalore, India

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About Citrix

Citrix (NASDAQ:CTXS) is a leader in mobile workspaces, providing virtualization, mobility management, networking and cloud services to enable new ways to work better. Citrix solutions power business mobility through secure, personal workspaces that provide people with instant access to apps, desktops, data and communications on any device, over any network and cloud. This year Citrix is celebrating 25 years of innovation, making IT simpler and people more productive. With annual revenue in 2013 of \$2.9 billion, Citrix solutions are in use at more than 330,000 organizations and by over 100 million users globally. Learn more at www.citrix.com.

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