Powering the world's largest clouds with an open approach

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.

Citrix was early to market with an innovative virtualization platform that has transformed datacenters around the world. It has become not only the most widely deployed desktop virtualization platform but also powers the world's largest production cloud computing environments. Citrix is leading the shift to cloud computing in the same manner with platform components that are delivering cloud orchestration and cloud management for enterprise and service provider customers worldwide.

At the core of Citrix cloud solutions are a set of open platform technologies: starting with Citrix XenServer, built on the Linux Foundation Xen Project™ hypervisor, for virtualization; and Citrix CloudPlatform, powered by Apache CloudStack, for cloud orchestration. Both of these platform offerings embrace open source development and delivery to provide the flexibility and choice customers require, while leveraging key components of their respective projects. XenServer and CloudPlatform combine to enable the provisioning of elastic, on-demand datacenter resources.

The third Citrix cloud platform technology is Citrix CloudPortal Business Manager, a cloud services delivery platform that enables cloud builders to manage and deliver any cloud or IT service through a single, self-service cloud catalog. It unifies and simplifies the commerce, user management, service provisioning and operational aspects of running a cloud into a single, comprehensive cloud business platform.

Citrix technologies demonstrate cloud leadership

• Xen Project Hypervisor powers the world's largest clouds

• XenServer powers 80 percent of CloudPlatform clouds

• XenServer powers 4 out of 5 of the largest hosting provider clouds

• CloudPlatform is the leading cloud orchestration solution for Telco's and service providers around the globe

• 500+ new Apache CloudStack clouds launch per month

• CloudStack is the fastest-growing open source cloud project

Citrix cloud platforms

XenServer: an industry leading, open source platform for cost-effective cloud, server and desktop virtualization infrastructures that enables a seamless path to the cloud.

CloudPlatform: the only future-proofed, application-centric cloud solution proven to accelerate cloud results and reliably and orchestrate both today's existing workloads and tomorrow's cloud-native workloads.

CloudPortal Business Manager: a cloud services delivery platform for self-service IT, that unifies and simplifies the commerce, user management, service provisioning and operational aspects of a cloud, enabling the journey to IT-as-a-Service.

Virtualization layer provided by XenServer

Citrix XenServer is an industry leading, open source platform for cost-effective cloud, server and desktop virtualization infrastructures. XenServer enables organizations of any size or type to consolidate and transform compute resources into virtual workloads for today's datacenter requirements, while ensuring a seamless pathway for moving workloads to the cloud. XenServer is based on the open source Xen Project, which was originally designed to provide a highly scalable virtualization platform for x86-based computers at a time when alternate solutions were employing emulation techniques. This promise was first met at scale when Amazon adopted the Xen Project Hypervisor as its hypervisor for the Amazon Elastic Compute Cloud (EC2).

XenServer is created by taking the Xen Project Hypervisor and adding a management toolstack, along with a number of features designed to facilitate integration of XenServer into traditional enterprise datacenters. This evolution has allowed XenServer to be adopted by over half of the Fortune 500.

Also, Xen Project and XenServer power well over 80 percent of public clouds and hosting providers today. Amazon uses Xen Project Hypervisor for the Amazon Web Services platform, and key XenServer service provider customers include Rackspace, 1&1 Internet, SoftLayer and Korea Telecom.

Looking past the obvious need for a highly scalable, high-performance and low-cost virtualization platform, there are other aspects of XenServer that have attracted customers.

- **Strong open source heritage** – Access to the source of technology is a key aspect of understanding and managing the risk associated selecting a particular technology stack. Xen has been under development for 10 years as an open source project, and is now part of the Xen Project under a GPLv2 license.

- **Open source Citrix XenServer** – Citrix XenServer is available for free to all users. Citrix sells the commercially supported and verified version of Citrix XenServer that provides simplified management, packaged updates and maintenance, 24x7 worldwide support and commercial license protections. Citrix XenServer is also included with Citrix CloudPlatform.

- **Community-driven** – The XenServer.org community of users, ecosystem partners and industry leading contributors accelerates innovation, feature richness and 3rd party integration.

XenServer in the cloud checklist

- Integrated with CloudPlatform and Apache CloudStack
- XenServer license included with CloudPlatform
- Advanced features such as workload balancing and live storage migration for simpler cloud management
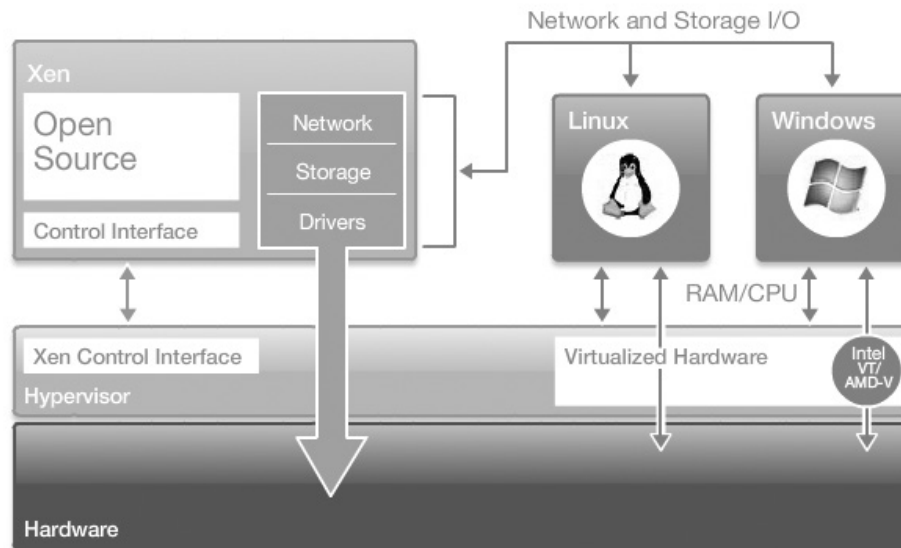
- **Resilient architecture** – No matter what types of SLAs service providers may choose to offer, they need a platform that supports the agility of cloud computing. XenServer is designed with a fully replicated architecture that implements a master/slave model, where any slave can become a master with no loss of functionality or configuration. In practice, this means service providers can freely choose to cluster hosts as required without incurring any additional configuration or management complexity based on cluster size. This level of flexibility is critical for large-scale deployments requiring multiple clusters. In these scenarios, minimizing deployment complexity is vital to operational success.

- **Ability to offer differentiated services at minimal cost** – With AWS, Amazon defined a template for on-demand provisioning of computing services. Competitors seeking to distinguish themselves from AWS can offer premium services, such as highly available virtualization, network traffic monitoring, live VM migration and live storage migration, for which customers will pay extra. All these features are included with the XenServer entitlement in CloudPlatform, enabling service providers to obtain additional revenues with minimal or no additional cost to them.

- **Operational efficiencies inherent in the platform** – Cloud and hosting providers operate very large datacenters servicing multiple, potentially competing customers. Those customers expect assurance that their data is completely isolated from that of other users, and that they will be leveraging a high-performance, agile cloud platform. From a practical standpoint, meeting these expectations often translates into projects ranging from isolating tenant networks to providing tiered storage. It also encompasses mundane tasks such as host and storage maintenance. A platform supporting activities such as live VM migration, regardless of storage choice or cluster boundaries, without incurring any loss of data from network monitoring activities becomes crucial.

When providers look at utility and cloud computing, an important item they consider is the cost of service delivery. Several factors impact this cost, including virtualization licenses, host scalability and ease of management. Whether designed to compete with Amazon AWS or to service the needs of a development group within an IT organization, cost-effective clouds minimize virtualization expenses while maximizing the use of value-added features.

"We wanted a partner who would support an open source mindset for ongoing product enhancements and XenServer delivered the right combination of features, performance and price to support 1&1 Internet in its strategy to build and scale our cloud computing service."

-Michael Frenzel, Vice President, 1&1 Internet

Cloud orchestration layer

CloudPlatform is the industry's only application-centric cloud orchestration platform that enables you to quickly and efficiently build a future proofed cloud. A turn-key solution based on an open and flexible architecture, CloudPlatform is designed to run every workload at scale and with simplicity. CloudPlatform enables you to build any type of cloud—private, public and hybrid—all from a single cloud deployment.

CloudPlatform combines the best private cloud foundation for enterprise workloads like CRM and ERP with true Amazon-style scale, elasticity and operational efficiency for the new generation of cloud-native workloads like social applications, big data and HPC. The cloud-native solution is based on open source Apache CloudStack and lets you leverage existing hypervisor, storage and network investments. Scale beyond 40,000 hosts per region with a simple approach to cloud management and all of the availability, storage and networking capabilities required for running massive cloud workloads.

An orchestration layer designed to manage compute, network and storage is only as strong as the infrastructure components it can directly manage. It is no secret that most public clouds leverage commodity servers, block and object storage and a combination of virtual, physical and SDN network components to meet the scalability, reliability, cost and performance needs of their workloads.

In contrast, private clouds are often built using existing enterprise servers and network and storage infrastructure to meet stringent security, compliance and reliability requirements of traditional or enterprise applications. CloudPlatform is the only IaaS solution designed to support both traditional enterprise and cloud applications by ensuring it can manage all of the infrastructure components that best address the differing cost, scale and reliability requirements of each.

Powered by Apache CloudStack

CloudPlatform is based on an open and flexible architecture that is powered by Apache CloudStack. In April 2012, Citrix chose to contribute the CloudStack platform to the Apache Software Foundation, home of the world's must successful open source projects, to accelerate the development of the platform and the ecosystem. The organization independently fosters and governs what is still the fastest-growing open source cloud orchestration project.

The CloudPlatform Architecture
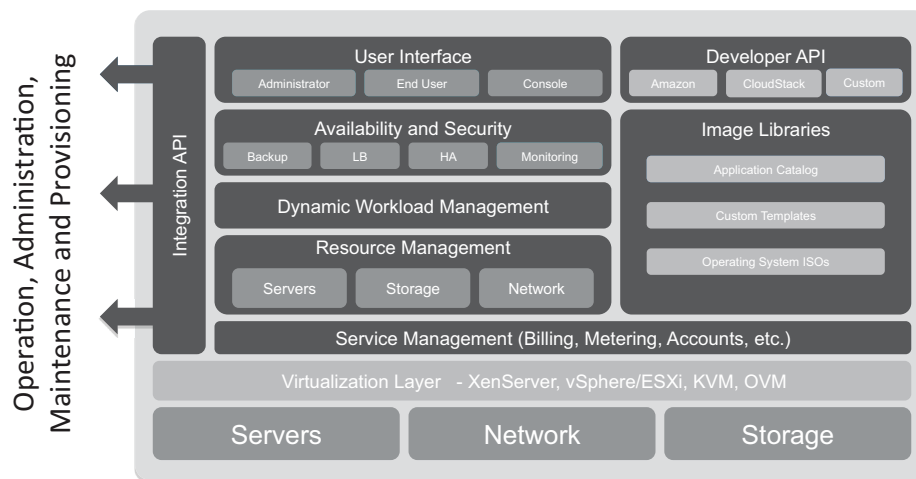
CloudPlatform enables you to leverage your existing infrastructure or choose best-of-breed components for compute, networking and storage.

- **Compute** – CloudPlatform is hypervisor agnostic and can run on top of one or more of the following solutions: Citrix XenServer, KVM, Oracle VM and VMware®vSphere®. In addition, CloudPlatform can also run on bare metal for applications that perform better without being virtualized.

- **Networking** – CloudPlatform works within your network architecture with support for embedded software-based network management, VLAN and direct-attached IP. It allows administrators to define basic and advanced networking for their environment, including the ability to directly interact with a number of virtual and physical networking components such as Cisco UCS®, Citrix NetScaler VPX, SDX and MPX, F5™ and Juniper SRX™. CloudPlatform software is packaged with a comprehensive set of networking components including routing, firewall, VPN and load balancing. In addition, the latest release adds GSLB, portable IP and private VLAN isolation.

- **Storage** – CloudPlatform provides out-of-the-box support for most traditional SAN storage devices for enterprise cloud build outs, as well as block and object storage for Amazon-style commodity infrastructure environments. This broad

support helps cloud builders meet reliability, performance and cost requirements regardless of business goals.

Why choose CloudPlatform?

Open, flexible architecture

CloudPlatform is powered by Apache CloudStack, a community-led open source project backed by tens of thousands of community members and hundreds of strategic technology partners. CloudPlatform implements industry-standard APIs compatible with Apache CloudStack, as well as Amazon Web Services APIs. These APIs enable a cloud powered by CloudPlatform to interface with third-party solutions and back office infrastructure. The open architecture of CloudPlatform facilitates integration with a variety of solutions from external vendors and thus offers a very robust cloud ecosystem.

Any workload, any cloud

CloudPlatform enables enterprises to turn existing datacenters into private clouds and service providers to deliver every application workload—traditional enterprise or cloud-native—from a single platform so you can address the requirements of today and tomorrow. CloudPlatform is the only solution proven to accelerate cloud results and orchestrate both existing and cloud-native workloads.

Proven by the world's largest clouds

CloudPlatform has been orchestrating IaaS clouds since 2009 and is powering hundreds of leading enterprises and Telco's around the world. Meanwhile, the open source Apache CloudStack project, which provides the foundation for CloudPlatform, is powering thousands of operational clouds and is growing by hundreds per month. Extensive operational experience with businesses that are building and operating public and private clouds has expanded the technical expertise of the Citrix professional services organization and provided guidance to Citrix engineering and product management teams for leadership in innovation.

CloudPlatform is not just proven by customers; it is also recognized by industry analysts as a leader in cloud management. In a recent report on cloud management solutions, Info-Tech Research Group recognized CloudPlatform as a champion and value leader and provided the following guidance:

> "Citrix CloudPlatform should be on the shortlist of any enterprise or service provider looking to deploy a Cloud on top of either virtual infrastructure and storage or commodity servers, with flexible options and broad hardware and hypervisor support."

–Info-Tech, Cloud Management Vendor Landscape Report, 2012

Why use CloudPlatform?
- Open, flexible architecture
- Deliver every workload—traditional and cloud
- Amazon style operations and scale
- Fastest time-to-value
- Powered by Apache CloudStack

Analyst Lydia Leong of Gartner has similarly commented, "CloudStack is, at this point in its evolution, a solid product—it's production-stable and relatively turnkey, comparable to VMware's vCloud Director (some providers who have lab-tested both even claim stability and ease of implementation are better than vCD)."[1]

"With CloudPlatform powering SoftLayer private clouds, we're essentially giving someone their own Amazon-style private cloud. At the push of a button our customers can connect their datacenter to ours or build whatever type of cloud they want in a matter of hours, with the scale, choice and control they demand."

–Nathan Day, Chief Scientist for SoftLayer

### Self-service delivery of cloud and IT services with CloudPortal Business Manager

Citrix CloudPortal Business Manager enables cloud builders to realize a true IT-as-a-Service model by managing and delivering any IT service through a single, cloud services catalog. It unifies and simplifies the commerce, user management, service provisioning and operational aspects of running a cloud in a single, comprehensive cloud business platform. Organizations can aggregate any infrastructure, cloud, IT or value add service and enable users to provision them and manage accounts through a simple, self-service portal. The extensible architecture makes it easy to deliver a broad array of internal, external and 3rd party cloud services, while integrating with existing business, operations and IT systems.

CloudPortal Business Manager is tightly integrated with Citrix CloudPlatform to enable you to directly manage an IaaS offering including provisioning multiple hypervisors, controlling virtual machines, allocating storage, configuring networking settings and defining security rules. Designed in close partnership with Citrix customers, CloudPortal Business Manager delivers large-scale IaaS clouds around the world, including IDC Frontier in Japan, Datapipe in the US, Tata Communication's InstaCompute Cloud in India as well as enterprise and university private clouds.

Beyond self-service delivery and provisioning, CloudPortal Business Manager centralizes the user management, business and support operation aspects of running a cloud into a single, comprehensive cloud business platform. CloudPortal Business Manager includes powerful tools to automate business operations 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.

CloudPortal Business Manager Components
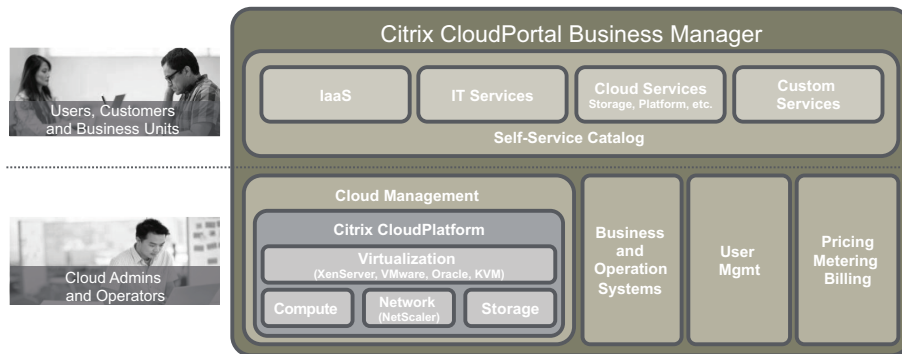
Key features of CloudPortal Business Manager

- **Cloud Services Delivery Platform** – Simplify how clouds operate by automating and unifying service delivery and business operations onto a single cloud services delivery platform. CloudPortal enables you to efficiently manage and deliver a catalog of cloud solutions including IaaS, cloud, 3rd-party and IT services. The comprehensive and extensible delivery platform centralizes user management, CRM, billing, pricing, reporting and support services into a single, comprehensive services delivery platform.

- **Anything-as-a-Service** – Package and deliver any IaaS, PaaS, SaaS, DaaS or 3rd party or IT service from an intuitive self-service catalog. The extensible platform makes it easy to seamlessly deliver any service from CloudPortal using the SDK and partner ecosystem. Tight integration with Citrix CloudPlatform enables you to directly manage an IaaS offering including provisioning multiple hypervisors, controlling virtual machines, allocating storage, configuring networking settings, setup load balancing and defining security rules.

- **Self-Service IT** – Empower user with simple, self-service access to shop for cloud services and manage their accounts without calling tech support or opening support tickets. Users have a single, comprehensive view of their cloud including utilization, availability, system health, performance, billing, helpdesk and alerts.

- **Pricing, Metering and Billing** – Define custom price points, track utilization, automate billing and payment processing all from a single extensible platform. 3rd-party plug-ins allow you to add additional protection measures including phone verification, credit card verification, CAPTCHA verification and GEO-based IP address rules.

- **Open by Design** – Leverage the open architecture of SDKs and APIs for integrating cloud services, business and operations systems into your cloud. Connect to internal and external business and operations support systems such as help desks, ticketing, payment gateways, CRM and billing systems. The partner ecosystem includes additional services such as monitoring, capacity management, PaaS and SaaS to extend the value of your cloud.

Why use CloudPortal Business Manager?
- Simplify cloud services management
- Empower users with self-service
- Deliver Anything-as-a-Service

- **Enterprise Ready** – Integrate private clouds with existing IT and business systems to delegate control, establish workflow approvals and maintain IT policies. Define workflow rules for new user activation and service provisioning to ensure department requirements and budget approvals are met. Active Directory integration enables granular delegated access control and service availability based on users, groups and roles.

Why choose Citrix platforms for your cloud?

When choosing your cloud solution it is important to determine the best option, not just for today but also for the future. Considerations include openness, cost-effectiveness and scalability to ensure the flexibility and stability required in the cloud.

Citrix offers an end-to-end solution comprised of open, proven technologies including the hypervisor layer with XenServer, the cloud orchestration layer with CloudPlatform and the cloud services delivery platform with CloudPortal Business Manager. 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.

Citrix solutions are proven in the cloud space today and both XenServer and CloudPlatform have received top industry awards from analyst firms such as Info-Tech and Gartner, hailing them as champions in their respective markets. Furthermore, both of these platforms are built on vibrant products from open source communities committed to delivering new feature sets to meet changing business challenges.

At Citrix, we believe that a successful cloud project should go beyond simply meeting the agility and cost-savings expectations of our customers to embrace other technologies, not just our own. The large Citrix partner ecosystem makes it easy for customer to build differentiated solutions to achieve their specific business objectives for the cloud.

1. Citrix, CloudStack, OpenStack, and the war for open-source clouds. Lydia Leong. April 3, 2012.
   http://blogs.gartner.com/lydia_leong/2012/04/03/citrix-cloudstack-openstack-and-the-war-for-open-source-clouds/

CİTRIX®

Corporate Headquarters
Fort Lauderdale, FL, USA

Silicon Valley Headquarters
Santa Clara, CA, USA

EMEA Headquarters
Schaffhausen, Switzerland

India Development Center
Bangalore, India

Online Division Headquarters
Santa Barbara, CA, USA

Pacific Headquarters
Hong Kong, China

Latin America Headquarters
Coral Gables, FL, USA

UK Development Center
Chalfont, United Kingdom

About Citrix
Citrix (NASDAQ:CTXS) is the cloud company that enables mobile workstyles—empowering people to work and collaborate from anywhere, easily and securely. With market-leading solutions for mobility, desktop virtualization, cloud networking, cloud platforms, collaboration and data sharing, Citrix helps organizations achieve the speed and agility necessary to succeed in a mobile and dynamic world. Citrix products are in use at more than 260,000 organizations and by over 100 million users globally. Annual revenue in 2012 was $2.59 billion. Learn more at www.citrix.com.