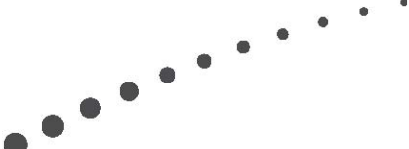




# Citrix Cloud Solution for Dev and Test





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## INTRODUCTION

Within many enterprises, a significant part of the installed IT infrastructure is dedicated to pre-production application development, testing and staging operations. This infrastructure includes the various application development tools, source code repositories and version control tools, build and integration tools and various testing tools and the physical infrastructure running it all. More importantly, and frequently overlooked, it also includes the manual and automated processes stitched together over the years that enable enterprises to get application services out the door. Unfortunately, despite the significant investment made in this infrastructure, the inability to quickly provide development and testing teams the capacity they need frequently causes delays throughout the application development lifecycle as well as negatively impacts software quality.

## FITTING DEV AND TEST TO THE CLOUD

Tapping on-demand cloud computing capacity is seen by many as a faster and more cost effective way of providing dev/test capacity to enterprise dev/test teams, for the following three reasons:

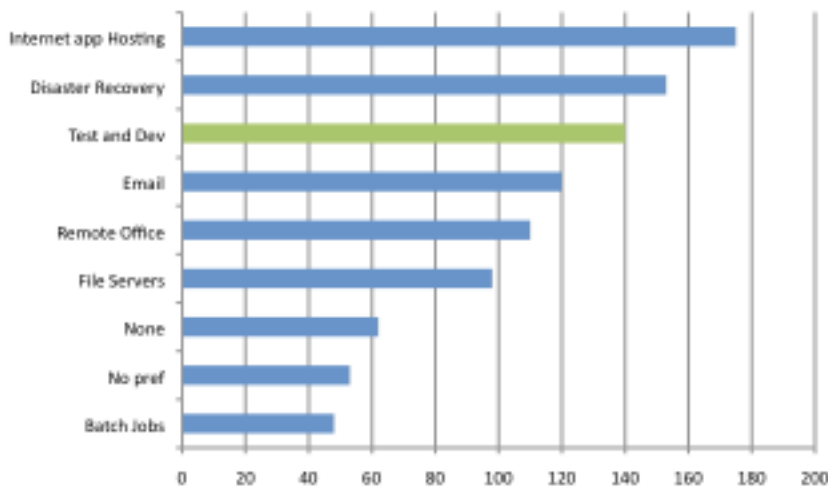
**Higher quality from better coverage.** Organizations that have tapped the cloud for dev/test capacity realize that the combination of variable capacity and cost lets them perform dev and test scenarios that were previously cost prohibitive. In many organizations, non-essential development or test scenarios that require massive hardware simply don't get done. Being able to tap capacity on demand yields more app services and higher app quality.

**Capacity on demand.** To manage capacity fluctuations, many organizations constantly shuffle capacity amongst various projects. Constantly setting up and tearing down lab environments comes at great operational expense. Constantly shuffling capacity between projects not only creates cost. It also costs time. The ability to instantly stand up capacity in the cloud not only cuts operational expenses, but more importantly it makes capacity available to dev/test teams almost immediately.

**Capacity by the sip.** Unlike steady-state production environments, pre-production environments can suffer from wild capacity fluctuations. The "pay-as-you-use" cloud cost model is seen as much more cost effective than over-provisioning dedicated dev/test capacity. If a test requiring massive server capacity needs to only run for an hour, enterprises need only pay for this capacity for an hour. After the hour is up, the capacity is released back to the cloud.

Given this, and the fact that dev/test by definition is “not production” it is not surprising that dev/test in the cloud is identified as a top 3 workload to move to the cloud.

**Q: If you were to increase the use of cloud services which apps would you move to the cloud this year?**



Source: [TachTarget](#) Cloud Computing Readership Survey (2009)

**CONSIDERATIONS FOR DEV AND TEST IN THE CLOUD**

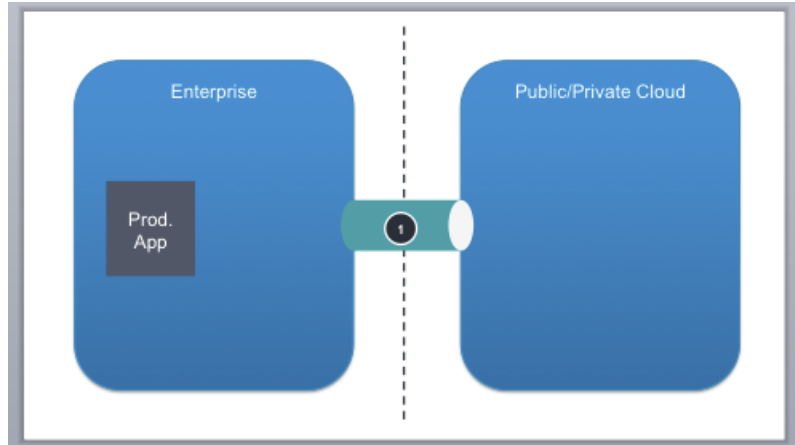
While Cloud Computing emerges as a great alternative to traditional test and dev models, leading to better capacity utilization, lower costs, faster turnaround, and accelerated time to market with greater quality levels – it is not without its own challenges.

- Traditional enterprise infrastructure around an application’s lifecycle has several moving parts, and interactions between all of these components. Some of these components might not even be ready to move to an off-premise cloud instance, because of tight coupling with proprietary/ legacy systems, as well as intellectual property security considerations.
- While the cloud provides a perfect sandbox for organizations to instantiate a wide variety of workloads, with development IDEs, build/ integration systems, test harnesses, and testing tools – there are still very few providers that bring all of this together in a turnkey and managed model, that reduces the burden of managing this infrastructure on the cloud for the organization’s IT teams.

To truly cut upfront capital expenditures and ongoing operational expenditures, these needs must be met. A test/dev solution in the cloud should meet the needs of automation, self-provisioning, delegated administration, and secure communication with on-premise infrastructure.

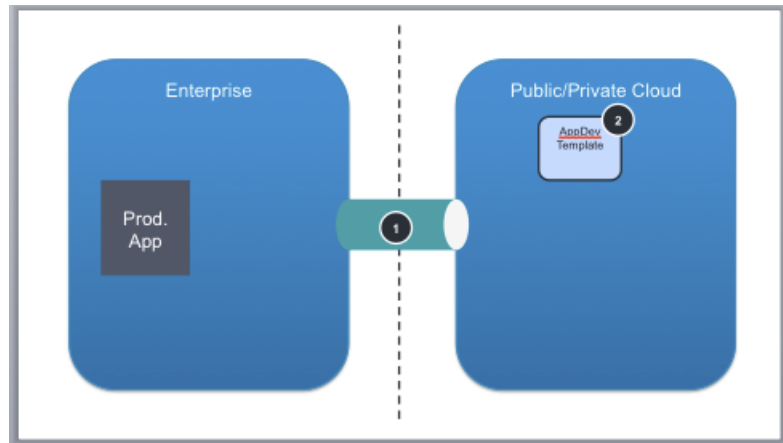
### 1. Establish transparent bridge and access between enterprise and cloud

Many cloud dev/test development use cases will require access and connectivity with infrastructure that remains within the enterprise datacenter. For example, the initial migration of the dev and test workload into the cloud may require a secure connection. Centralized repositories for source code check-in/ check-out may remain within the enterprise data center. Additionally, systems running in the cloud may need to query the enterprise’s directory/identity management infrastructure, which will almost certainly remain within the enterprise data center. To facilitate this, a transparent, secure connection between the enterprise and cloud data centers needs to be available, as well as a mechanism for resources running in the cloud to leverage enterprise identity management infrastructure.



### 2. Create development lab templates

Prior to moving an application workload to the dev/test cloud, a template for the lab environment needs to be created. These templates define the infrastructure within the “self-service” lab environments dev/test teams will use. In addition to specifying the necessary server, memory and storage capacity requirements, this template may also define development and testing tools that should be present in the lab and/or infrastructure elements (e.g., load balancers, firewalls, proxies, etc.) that may also be needed to better mimic the end production environment.

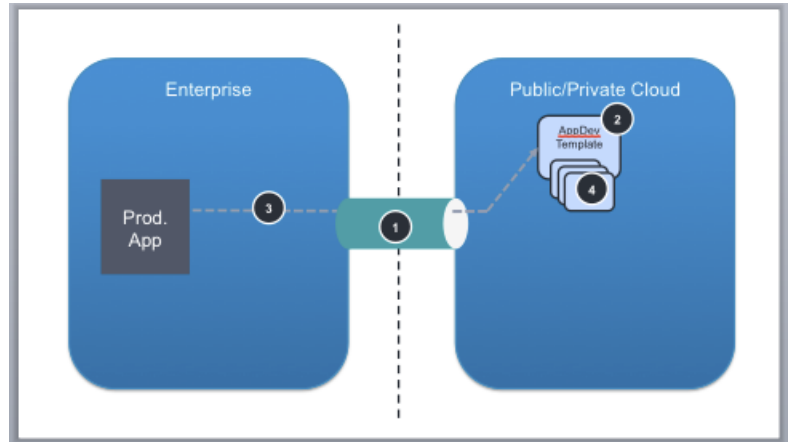


### 3. Migrate application and data into lab template.

Once the base lab template is defined, the actual application workload needs to be added to the template. Various migration solutions that automate either physical-to-virtual (P2V) or virtual-to-virtual (V2V) migration can dramatically cut the time and cost associated with this migration effort.

#### 4. Self-service development lab instance check-in/check-out

Once the lab template is defined, a self-service portal that allows individual dev/test teams to provision their own lab instances should be available. This portal both cuts the time (and human cost) necessary to provision a lab instance and minimizes the likelihood of human error during the setup process. Advanced portals may also provide controls for resource allocation, usage quotas and the appropriate utilization metrics. Additionally, this portal may also need to integrate (via the cloud bridge discussed earlier) with enterprise identity management infrastructure in order to control which teams have access to which lab environments.



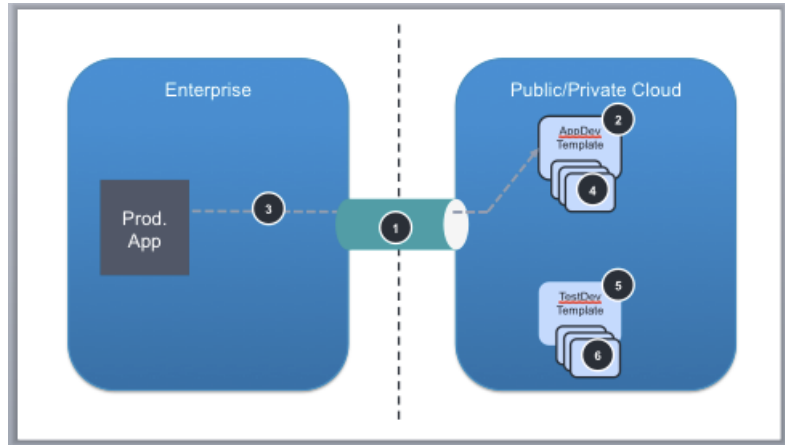
#### 5. Create test lab template

Depending upon the size and complexity of the development effort, dedicated test labs that are independent of development labs may be required. If so, the cloud environment needs to provide for creation of these templates as well. Given that the both the tooling and the capacity for dev and test can vary widely, creating separate labs may prove more cost effective for even simple development environments.

Test lab template potentially includes server capacity, virtualized infrastructure elements, load testing tools, many of which could be automatically provisioned with a successful build of the latest code version, to run through initial regression and sanity tests. Custom templates, as made available by the administrator, could then be self-provisioned, for advanced test processes. The necessary interaction with automated test tools and testing harnesses that remain within the enterprise data center is supported by the cloud bridge and access points.

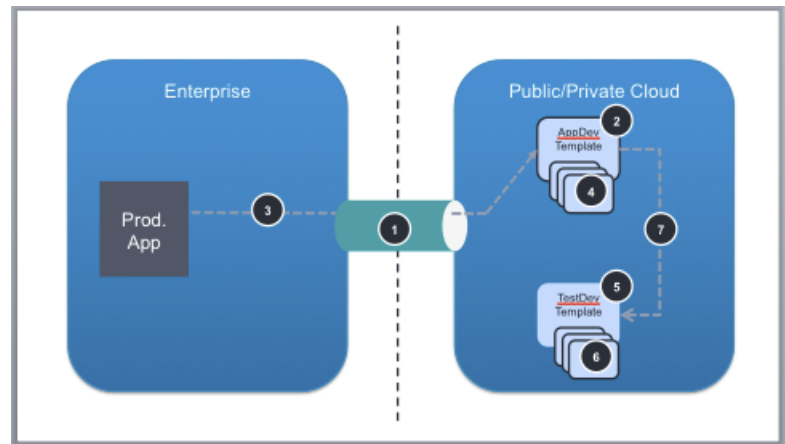
### 6. Enable test teams to create isolated instances of the test lab template via self service

Different test teams, each responsible for different facets of the overall application’s testing, must be able to instantiate and provision the required test labs. Just as with the app development labs, test and QA teams are selecting from available templates on an on-demand basis. Controls for resource allocation and utilization as well as integration with enterprise identity management infrastructure may be required as well.



### 7. Promotion of app from dev lab to test lab

If separate dev and test labs are required, then the iterative movement of an app between dev and test needs to be supported, in much the same way as the initial migration of a production app into the cloud. Depending upon the sophistication of the dev/test cloud this may be built into the larger lab environment management workflows, or tools/utilities enabling V2V migration may be provided.



### 8. Promotion of app from test lab into staging/production

Once the app has undergone its final test iteration, it needs to be merged into the enterprise’s staging/production promotion process. For a simple or non-critical application, this may be as easy as migrating the last iteration back to the production infrastructure. However, for a complex or business-critical application this will likely mean moving the final version of the application into the organization’s change management process for scheduling into an appropriate maintenance window.



A comprehensive cloud solution for development and test provides more than infrastructure capacity on demand. It adds the critical dev/test-specific tools, automation and workflow orchestration enterprises require to effectively leverage this underlying capacity.

Citrix Cloud Partners integrate technology and products from Citrix and select Citrix Ready partners with their public and virtual private cloud offerings to provide turnkey dev/test cloud services. The following table identifies the key requirements Citrix and its partners have identified as well as the capabilities needed to meet these requirements.

Requirement	Citrix Cloud Solution Capability
Self-service creation of isolated lab sandboxes containing required apps and tools, and the management of the iterative migration of apps between dev, test and production environments	Dev-Test-Stage Workflow Management
Integrate lab environment running in the cloud with software development lifecycle management infrastructure within the enterprise data center	Application Lifecycle Management
Access to app dev tools providing real-time assembly and deployment of application components onto cloud and enterprise infrastructure	App Dev and Assembly
Policy-driven control of orchestration, management and security for compute, network and storage resources	Open Cloud Framework
Leverage identity management infrastructure w/in the enterprise with the dev/test labs deployed in the cloud	Cloud Access Services
Seamlessly connect the enterprise datacenter and the cloud datacenter with full security, performance and network transparency	Cloud Bridging Services
Ensure the performance, availability and security of network and server resources running within the cloud data center	Edge Networking Services
Easily allocate pooled network, CPU and memory capacity across different lab environments and virtual network appliances to test the app against as much of the infrastructure used in production	Platform Virtualization



## **Dev-Test-Stage Workflow Management**

Workflow management services, specific to creating and managing dev and test sandboxes, simplify creating development labs and replicating production environments for testing. Increasingly, these environments incorporate not only traditional application components, but also incorporate virtual appliances to closely mimic production environments. Replicating the production environment results in better software quality by catching issues that otherwise wouldn't be captured until deployment time. Tight integration with the overall cloud portal lets individual teams stand-up their own sandboxes on-demand in real-time.

*For more information on how VMLogix provides automation for the creation and management of isolated dev and test environments please [click here](#).*

## **Application Lifecycle Management**

Where appropriate version control, source code control, promotion and rollback, load generation, and testing tools and services will be made available. Depending upon the solution, these may be provided as part of template for an individual lab, or may be shared services available within the cloud.

In many cases, integration with application lifecycle management services that still remain within the enterprise data center will be required, necessitating a hybrid approach. For example, load generation and unit testing tools may be offered as services available in the cloud, but the enterprise may require that on-premise source code control and version management infrastructure be used. In these cases, cloud access and cloud bridging services can be used to simplify integration between the enterprise and cloud data centers.

*For more information on how VMLogix provides version promotion and rollback, and other application lifecycle management services [click here](#).*

## **Application Development and Assembly**

Agile development methodologies call for the rapid prototyping of applications and highly iterative testing cycles. To support this, dev and test cloud solutions increasingly include tools supporting not only rapid application development and assembly, but also facilitate deployment of both application and infrastructure elements across either test or production infrastructure.

For example, once an application has been developed, the ability to “push” the various components of this application to their respective tiers (e.g., web tier, app tier) of the application topology can be supported. Additionally, these same tools can also support the provisioning of other infrastructure components (e.g., load balancing virtual appliance, firewall virtual appliance) that also make up part of the application.

*For more information on how WaveMaker tightly integrates with cloud-based dev/ test environments, please [click here](#).*



## **Open Cloud Framework**

Cloud framework services provide the foundational logic for rapidly provisioning, managing and controlling workloads deployed into multi-tenant, shared infrastructure clouds. The cloud framework ensures policy enforcement and security, and provides for integration with existing services such as billing, metering and self-service portals. Interoperability with other popular Cloud interfaces, and extensibility of the framework itself, provide the flexibility to leverage existing investments when migrating between clouds.

*For more information on how Citrix® CloudController™ provides an extensible, full-featured policy engine for controlling a heterogeneous, multi-tenant environment, [click here](#).*

## **Cloud Access Services**

Citrix CloudAccess™ is a pragmatic solution to the cross-domain authentication problem that leverages existing enterprise infrastructure and works to extend the policy framework that has already been put in place. Features include: Unified Password Management for SaaS, SSO to Cloud/SaaS applications, Password Workflow Automation, support for all major SaaS providers, and integrates into the with full transparency. Benefits include: Improve security across all applications, no end user training required standardizes password policy across both internal and external applications, automatically removes access to applications for users removed from the enterprise authentication framework, and simplifies password reset for end users.

*For more information on Citrix CloudAccess™, [click here](#).*

## **Cloud Bridging Services**

All but the simplest cloud use cases will require a secure, persistent connection between enterprise and cloud data centers. While this “bridge” does incorporate VPN services for security, the bridge is much more than a VPN tunnel. Strategically, the key role of the bridge is to provide an overlay network across physical and virtual topologies, making the cloud a seamless extension of the enterprise network. With the cloud a transparent extension of the enterprise network, migrating application workloads becomes far easier since the applications network-specific configurations won’t need to be overhauled.

*For more information on Citrix CloudBridge™, which leverages key capabilities within Citrix NetScaler, Citrix XenServer and Citrix Branch Repeater, please [click here](#).*

## **Edge Networking Services**

Edge networking services are critical to ensuring the reliability, security and performance of any cloud-based offering. Properly deployed, these services are largely transparent to the cloud consumers, yet are fundamental to ensuring the cloud remains available in the face of natural and man-made disasters, hacker attacks, planned and unplanned network and server outages and unanticipated surges in traffic.



Citrix NetScaler® is an integrated Web application delivery controller that provides advanced traffic management through Layer 4-7 load balancing and content switching. Global server load balancing provides critical business continuity and disaster recovery support during site-level disruptions and outages. NetScaler also includes application security via a web application firewall and SSL VPN. *For more information on Citrix NetScaler, [click here](#).*

Citrix Branch Repeater™, available as a physical or virtual appliance, is a WAN optimization solution that provides a high definition desktop and application experience to branch and mobile users while dramatically reducing WAN bandwidth costs and simplifying branch infrastructure. Branch Repeater accelerates desktop and application delivery, decreases WAN bandwidth consumption, and enables server consolidation. *For more information on Citrix Branch Repeater, [click here](#).*

### **Platform Virtualization**

Server, storage and network virtualization are linchpins of the flexibility, affordability and scalability of any cloud-based offering. By simultaneously optimizing resource utilization through consolidation while still maintaining full isolation, virtualization supports the cost effectiveness of cloud offerings. By abstracting workloads from the underlying physical resources that run them, virtualization enables the elasticity needed for cloud services to be made available on-demand and self-service.

Citrix XenServer™ is the only enterprise-class, cloud-proven server virtualization platform that delivers the critical features of live migration and centralized multi-server management at no cost. XenServer is an open and powerful server virtualization solution powered by the industry-standard Xen® hypervisor, and created by the inventors of Xen. *For more information on XenServer, [click here](#).*

Citrix NetScaler VPX™ provides complete NetScaler functionality in a simple, easy to install virtual appliance. With NetScaler VPX, load balancing and web application acceleration, security and offload are available as virtualized services anywhere within the cloud. *For more information on Citrix NetScaler VPX, [click here](#).*

## **SUMMARY**

A turnkey dev/test cloud solution provides more than just servers and storage priced by the minute. Cloud solutions combining the cost effectiveness of cloud-based capacity with dev/test specific tools and workflows enable enterprises to:

- Cut both the CapEx and OpEx costs associated with maintaining dedicated dev/test capacity within the enterprise data center
- Enable individual test and development teams to setup fully isolated lab environments on demand
- Replicate the entire application stack, along with network virtualization – to increase test coverage and closely mimic production environments, and catch several deployment-time issues



By combining cloud capacity with dev/test specific tools, application lifecycle management, and enabling integration with resources within the enterprise data center, enterprises can:

- Use cloud capacity and pricing without having to manually create differing lab environment templates and enable run test cases, and tear down topology to free up physical resources for other iterations
- Improve overall resource utilization – Do more with less
- Outsource testing iterations to lower cost resources – by providing cloud test topologies that these resources can connect to, and execute the test cases. Only the final results need to be validated by the higher cost human resources

#### ADDITIONAL RESOURCES

For more information on the Carpathia InstantOn - Virtual Lab development and test cloud solution, [click here](#).



## **About Citrix**

Citrix Systems, Inc. (NASDAQ:CTXS) is the leading provider of virtualization, networking and software as a service technologies for more than 230,000 organizations worldwide. Its Citrix Delivery Center, Citrix Cloud Center (C3) and Citrix Online Services product families radically simplify computing for millions of users, delivering applications as an on-demand service to any user, in any location on any device. Citrix customers include the world's largest Internet companies, 99 percent of Fortune Global 500 enterprises, and hundreds of thousands of small businesses and prosumers worldwide. Citrix partners with over 10,000 companies worldwide in more than 100 countries. Founded in 1989, annual revenue in 2008 was \$1.6 billion.

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