

CliQr CloudCenter **Simplify Private Cloud Management**



Executive Summary

Many organizations have realized the cost savings and efficiencies offered through virtualization. But business users and developers want more, looking to IT to implement some form of cloud computing to give them a more agile and responsive process for access to the infrastructure they depend on to do their jobs.

Cloud computing promises to help IT organizations serve end users with access to infrastructure in just a few clicks. As IT is discovering, though, implementing a private cloud takes a long time and simply providing access to infrastructure on demand is not enough. What business users want is access to secure, managed applications.

CliQr CloudCenter™ is a cloud-agnostic application management platform that helps IT cloud-enable their enterprise. CliQr allows applications to be on-boarded from a physical, virtual, or cloud environment to any public, private, or hybrid cloud, without modifying the application or creating cloud-specific scripts or virtual machine images. Once deployed, CliQr provides complete runtime management and optimization, including cross-cloud policy-based automation, auto-scaling, and integrated governance that includes security, user and rights management, and more.

Introduction

Traditionally, businesses have hosted applications in their datacenters running on physical infrastructure, including servers, storage, and networks. Most of these datacenters were sized to accommodate and provide a buffer to peak workload levels. This approach supported “worst-case” conditions but created tremendous inefficiencies—with most physical datacenter environments operating at 15 to 20 percent utilization.

To improve efficiencies, many businesses began to move from the traditional setup of one server per physical host to multiple virtual machines (VMs) running within the same physical hosts. This strategy allowed applications to use all available resources, significantly improving datacenter utilization.

While this setup has provided businesses with cost efficiencies through better datacenter resource utilization, virtualization alone is now proving to be insufficient. In many cases, it is just a temporary fix as end users start to demand self-service access to compute resources in order to handle even larger workloads. To deal with this evolution, businesses need nimble infrastructure services that are elastically scalable, meet on-demand application needs, and provide complete management capabilities.

Because of important issues such as security, latency, and cost, many public cloud environments are not well aligned with the needs of an enterprise IT department looking to provide flexibility to its business constituents. A private cloud—built on IT infrastructure, provisioned and operated for exclusive use by a single organization of multiple consumers (e.g., business units)—is a better choice. It can be owned, managed internally or by a third-party, and hosted internally or externally. Today organizations have many options for creating a private cloud, such as OpenStack, CloudStack, or VMware.

While any of these solutions will provide infrastructure flexibility to businesses, the fact remains that this market is changing very rapidly and it is not easy to predict the long-term viability of any one of these clouds. This rapid change increases the risks incurred when undergoing a long and expensive private cloud implementation, which amplifies the costs associated with the migration of applications to that cloud.

Further, an organization might choose more than one private cloud. Using an open source alternative to lower costs might be best used for development or test workloads, while paying for a software license from a vendor with 24/7 support for production environments is common. Regardless of how many private clouds are chosen, to administer them and optimize their utility for the business over time requires application-centric governance and runtime management. Capabilities such as monitoring, metering, policy-driven automation, scale-out/scale-in, and VM aging are needed—features that out-of-the-box administration tools often lack.

This paper addresses all these topics and is organized as follows:

- **The Challenges to Achieving Success with the Private Cloud**
- **The CliQr Approach: Simplifying Your Journey to the Cloud**
- **Use Cases for a Private Cloud with CliQr**
 - Use Case 1: Benchmarking
 - Use Case 2: Detailed Usage Metering
 - Use Case 3: IT as a Service
 - Use Case 4: Development and Test Environments
 - Use Case 5: Cloud Bursting
 - Use Case 6: Disaster Recovery and High Availability
 - Use Case 7: Integration with Datacenter-Bound Services
- **Conclusion**

The Challenges To Achieving Success with Private Cloud

The typical enterprise IT organization has hundreds of commercial or customized commercial applications in its portfolio, very few of which have ever been run on a cloud by anyone, ever. This newness is why the process of migrating applications to private cloud environments has not been easy. One of the first tasks faced by CIOs is to understand the business case for migrating, identify which applications should be moved and from which environments, and outline the expected benefits.

Some examples include:

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- **Migration from physical/bare-metal environments**—Moving applications running on physical servers can provide greater infrastructure efficiencies, increased agility, and the ability to automate simple management tasks.
- **Migration from a virtualized infrastructure to a private cloud**—Virtualized infrastructures already provide efficient use of resources, but require additional—and often expensive—product add-ons to unlock the self-service capabilities and automation that private clouds provide.
- **Migration from a public cloud**—Public clouds can be cost prohibitive for some types of applications. Similarly, compliance and security requirements might make it necessary to bring an application back in house to a private cloud.
- **Migration from one private cloud to another**—Companies are constantly evaluating newer private cloud technologies, and might wish to take advantage of an innovative new capability or platform service that is not available on their current private cloud.

Performing the Migration

Once the applications have been identified, the actual migration effort can begin. Preparing applications to run in a private cloud environment presents a number of challenges, including:

- **Education**—Each cloud has its own set of APIs (application programming interfaces), image formats, and best practices that need to be followed in order to provide applications with an optimal and stable runtime environment. Learning these APIs and best practices is a time-consuming process for IT staff, and the rapid pace of innovation in most private cloud distributions means that APIs might change frequently.
- **Scripting and recoding**—To enable an application to run on a cloud usually requires integration with APIs that are unique to each cloud provider, to support provisioning and storage management, or to trigger events such as auto-scaling or VM aging. Certain types of applications might even require changes at the source-code level.
- **VM Image Provisioning** — In many instances, private cloud-specific VM images must be created for each tier in the application (e.g., database, or application tiers). Maintaining and updating these images over time becomes a time-consuming and cumbersome task.

Ongoing Management

Even before the first application has been migrated, the private cloud must be operational. Achieving operational readiness will require organizations to provide security and role-based access and user self-service, as well as handle scenarios such as monitoring, auto-scaling, budgeting, and VM aging to control costs and eliminate VM sprawl. Adding this layer of management can quickly add to the overall cost of development and operations.

In addition to providing these management capabilities, organizations with co-located or geographically distributed public or private clouds will need to plan for enabling secure communication between sites. A private cloud deployed in a co-located facility, for instance, might need to interact with licensing or printing facilities still running in the local datacenter. This interaction requires a secure connection between these environments. To securely provision, configure, and efficiently manage these “federated clouds” is a critical yet difficult task.

Seeking a Different Approach to Make Migration Easier

These challenges weigh heavily on the minds of CIOs as they consider the risks of undergoing an expensive migration, only to find inferior price, performance, or price-performance characteristics for their applications on the cloud.

Because of these challenges, many companies have decided to sit on the sidelines and let the cloud landscape mature a bit before jumping in. Or they outsource the migration work by securing experienced professional services teams to help. Bringing in outside expertise might streamline the migration effort, but still leaves them locked in to a single cloud—leaving them exposed to poor performance if a particular application performs poorly on the cloud of choice.

What companies need is a different approach that makes migrating to the cloud easier.

The CliQr Approach: Simplifying your journey to the cloud

The cloud migration process is more than just forcing application modifications to work exclusively with a single cloud environment. By taking an application-aware view of the cloud that effectively decouples the application and its requirements from the cloud’s infrastructure, CliQr provides the portability that is crucial to the long-term health of an application portfolio without sacrificing day-to-day administration.

This decoupling abstracts out the complexity and implementation details of the underlying cloud provider to deliver a consistent framework for cloud application management and governance. With this approach, no cloud-specific APIs need to be learned or utilized. The need to become an expert on one (or any) cloud is eliminated, while ensuring that applications take advantage of the best services available on every cloud.

CliQr’s CloudCenter platform consists of three main components, which work together to orchestrate and manage applications natively, on any cloud.

Application Profiles are cloud-agnostic descriptions of an application architecture and its dependencies, which include:

- Locations of application libraries or other files required for orchestration.
- Policy descriptions, such as user and cloud access controls, appropriate scale-out behavior, and other runtime management parameters.
- Physical hardware minimum requirements (including storage, networking, and compute).

CliQr CloudCenter is the front-end user interface that provides a single pane of glass for governance and reporting over applications, clouds, and users. Available in both multi-tenant SaaS and dedicated on-premise installations, from this single pane of glass CloudCenter Manager provides:

- Policy-driven runtime automation (including auto-scaling, teardown, and VM sprawl or aging control).
- Lifecycle administration (including on-boarding, testing, benchmarking, publishing to the App Store, patching, and decommissioning).

- User/application and cloud governance, usage metering, and reporting, and enabling departmental chargeback.
- Secure, shared storage management to seamlessly synchronize any files required for application orchestration.

CliQr CloudCenter Orchestrators are cloud-specific application orchestration engines. Each cloud runs its own specialized CloudCenter Orchestrator. It serves to dynamically translate cloud-agnostic Application Profile requirements and policies to cloud-specific APIs and best practices, ensuring that the cloud exposes itself to a way that conforms to an application's runtime requirements and not the other way around.

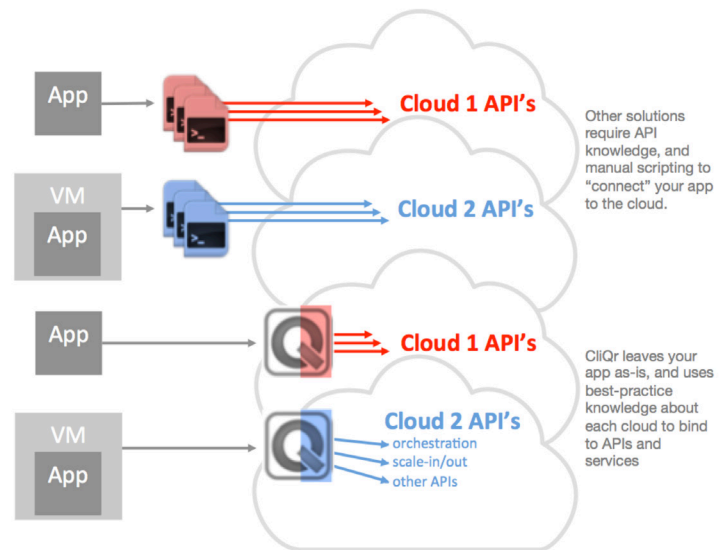
Once deployed, applications run natively and optimally on the desired cloud with no additional overhead incurred by CliQr.

Simplifying Migration and Management with CliQr

With CloudCenter Manager and CloudCenter Orchestrators used in either a multi-tenant or private installation, the only labor involved in readying an application to be deployed, benchmarked, managed, and governed using CliQr is to create an Application Profile. CliQr provides several out-of-the-box Application Profiles covering most popular applications (big compute, enterprise, web, and thick client applications), which accelerates the on-boarding process from hours to minutes, in many cases.

While Application Profiles can be created from scratch, most inherit structure from pre-existing templates for common architectures, including:

- **N-tier**—N-tier applications are made up of multiple tiers (database, back-end cache, message queue, application cluster, load balancer, front-end cache, etc.), where each tier may be provisioned on a different node or node cluster. Examples of N-tier applications are Java-based web applications, and enterprise applications such as Oracle EBS and SAP ECC.
- **Cluster**—Cluster applications require shared storage and a networking protocol (such as RSH, SSH, and MPI) set up across all of the cluster nodes. Examples of cluster applications include MPI-based high-performance computing applications and Oracle RAC.
- **Batch**—Batch applications typically consist of multiple independent jobs, placed in a queue and serviced by a cluster that may be elastically auto-scaled based on policies. Examples of batch applications include gene sequencing, batch-processing documents, regressions, simulations, and video transcoding.
- **Parallel**—Parallelization of applications occurs when workloads that are traditionally run on a single node are broken into multiple, parallel execution paths and run across an elastic cloud cluster. Examples of applications that can run in a parallel mode include gene sequencing and engineering simulations.
- **Cloud-Delivered Thick Client**—Desktop applications that have a GUI interface are considered “thick client” applications. Normally, running them on the cloud would eliminate the ability to interact with the application.



Instead of cloud-enabling your applications, CliQr automatically application-enables each cloud.

This profile allows Windows or Linux applications to be launched on a cloud instance, but allows the application GUI to be accessed from any browser running on any HTML5-compatible device. Using this profile, tablets or laptop computers can interact with the application using well-known protocols such as VNC or RDP. Examples of thick client applications include design/graphics rendering, modeling suites, and engineering or semiconductor layout editors.

- **Custom Tier**—Businesses can import their existing images to create more complex business applications. Examples of custom tier applications include Seibel with Oracle database and Seibel with SQL Server.
- **Multi-Step Workflow**—This profile allows a user to combine any of the above profiles into any multi-step workflow to describe simple to complex applications and application workflows.

From these Application Profiles, CliQr has also created prepackaged profile templates for frequently used and well-known application types, allowing complicated applications to be on-boarded in minutes. These profile templates include:

- Java N-tier web apps
- .NET web apps
- LAMP
- Ruby-on-Rails web apps
- MPI applications
- Hadoop

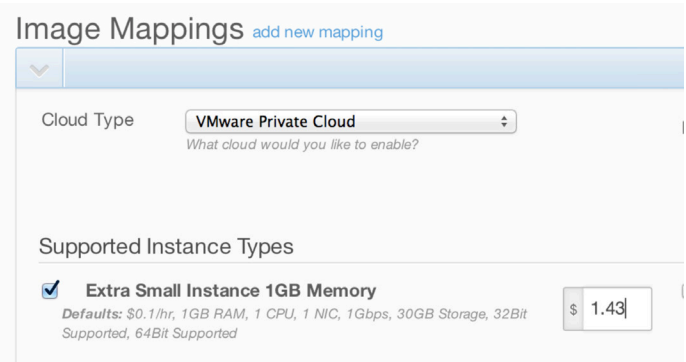
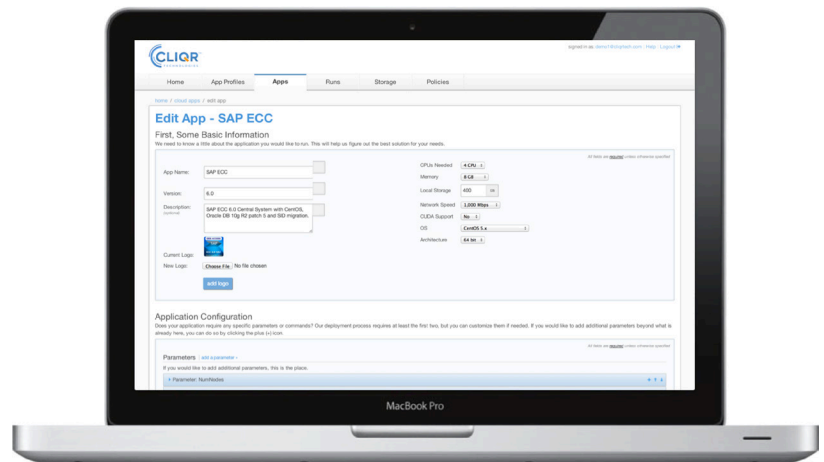
Once they have been filled in with the necessary information, Application Profiles provide CliQr the information needed to orchestrate and manage any application – natively, and according to each cloud's best practice.

Provisioning CliQr CloudCenter on your Private Cloud

CliQr provides a CloudCenter Orchestrator for most popular private clouds, including OpenStack, CloudStack, and VMware. Available as a small virtual appliance, CloudCenter Orchestrator is easily deployed on supported private clouds and then registered with CloudCenter Manager. Once complete, CloudCenter can then manage private cloud VMs.

By defining pricing metrics for different instance sizes and image mappings, CliQr provides a way to meter and track runtime costs broken down by user, application, or location for purposes of showback or chargeback reporting. In addition to broad out-of-box support for the most popular clouds, CliQr can also create CloudCenter Orchestrators for other private clouds.

After an application is deployed, CliQr continues to manage and optimize the application at runtime using cloud-specific APIs to enable auto-scaling and elastic load balancing. These capabilities are accomplished using a lightweight CliQr monitoring agent running on deployed



By entering in the fully loaded cost of private cloud images, IT can provide the business with granular showback/chargeback reporting by user, application, cloud, and region.

cloud resources. CliQr can also integrate with other third-party monitoring solutions to trigger actions based on other metrics as well.

Deployment and Orchestration

Before an application can be orchestrated on a cloud, essential application binaries (such as a Java .WAR file, database backups, or configuration files) or job inputs (such as a Hadoop input file) need to be made available locally. CliQr CloudCenter provides an easy way to sync files securely to and between any number of clouds using a proprietary, easy-to-use, and highly secured shared cloud storage.

CliQr CloudCenter supports most popular private clouds, including those based on CloudStack, OpenStack, and VMware.

CliQr also provides a powerful SDK to allow new private clouds to be added to the platform.

Use Cases for a Private Cloud with CliQr

CliQr makes it fast and efficient to migrate, manage, and secure a wide variety of applications onto private cloud environments. There are many instances where CliQr can assist in private cloud-related use cases, as described in the following examples.

Use Case One: Benchmarking

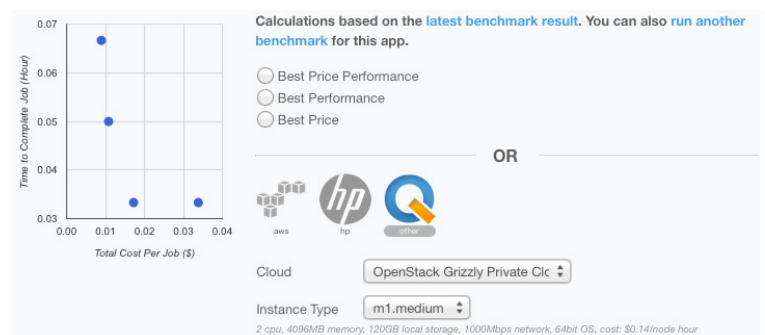
Every cloud infrastructure is different, with distinct instance names, sizes, memory configurations, and node-hour pricing. Discovering which instance types yield the best price-performance ratio is an important consideration when making cloud selections.

CliQr's ability to run unmodified applications natively on any cloud gives organizations the ability to benchmark applications in an automated, portable, and repeatable way. This ability provides a clear view of key price, performance, and other application-centric metrics to identify the best cloud provider, region, and instance configuration to run each application.

Once benchmarking is complete, CliQr will surface that information at deployment time to help you and your users choose the best provider based on business need.



CliQr allows companies to automate benchmarking of applications across instance types, regions, or entire clouds in a programmatic fashion.

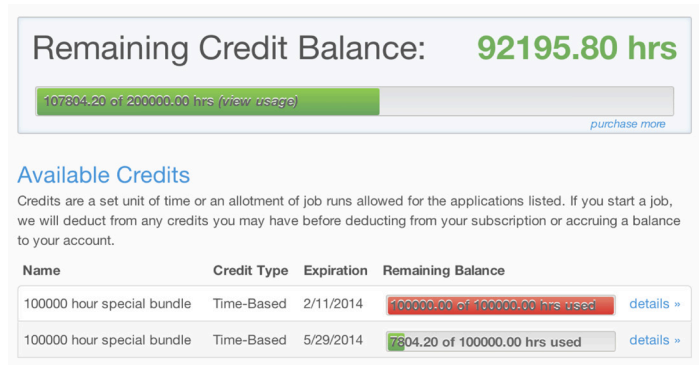


CliQr provides transparency around every application's best execution venue to make sure business requirements are met.

Use Case Two: Detailed Usage Metering for Showback/Chargeback

Most cloud environments monitor server-level resource usage. Traditionally it has been difficult to monitor and meter the cloud more granularly on a per-application or per-user basis so that an IT department can implement cloud governance and administrative processes such as showback/chargeback for virtualized datacenters.

CliQr provides this needed detailed metering that, when combined with fully burdened per-VM costs, gives IT visibility into the cost of operations to enable departmental showback/chargeback. Even better, administrators can also set up policies to restrict an application and/or a user's consumption of cloud resources based on budgetary or other restrictions.



CliQr provides comprehensive licensing, pricing, and metering capabilities application and user. CliQr can also integrate with existing billing systems, or take payment via credit card or purchase order.

Use Case Three: IT as a Service

“Shadow IT” happens when IT can’t keep up with, or even fulfill, the IT demands of the business. CliQr’s CloudCenter bridges the gap between consumers and on-demand infrastructure with a user-friendly App Store that enables a centrally governed IT as a Service (ITaaS) environment. The CliQr CloudCenter App Store provides users with secure, personalized point-and click access to permitted apps and clouds. Users can review, deploy, manage, and retire applications in just a few clicks.

CliQr provides a user-friendly, personalized App Store to give users self-service access to allowed applications and clouds.

CliQr CloudCenter supports an IT as a Service operating model with:

- Streamlined, self-service IT capabilities to accelerate application delivery.
- Per-app payment cost definitions and user activity reports for cloud and application chargeback/showback.
- The ability to promote new or enhanced applications to external customers, internal users, or lines of business.
- Personalized App Store listings by user, group, and cloud.

Use Case Four: Development and Test Environments

Managing application development/test (dev/test) workloads has not always been a top priority for IT operations teams, who are primarily concerned about stability and performance of the production environments. In many cases IT budgets force an underfunding of dev/test, making it difficult to approximate production and complete testing that discovers defects earlier in the development cycle when they are more cost-effective to fix.

CliQr simplifies and streamlines dev/test deployments, reducing their cost and easing the ability to mimic production. By enabling a completely governed ITaaS environment, CliQr’s private App Store provides developers with a self-service mechanism to leverage pre-approved configurations for dev/test on the private cloud. This mechanism drastically reduces the amount of time it takes to create and tear down a complete dev/test environment.

And, because the same Application Profile is used to deploy the application to both production and dev/test, the results of the testing cycle provide increased confidence to the IT operations teams supporting that exact same configuration in production.

Use Case Five: Cloud Bursting

As businesses focus on data-driven models to optimize decisions and investments, they are increasingly looking at the cloud to run scalable big data/big compute, web, and high-performance computing applications. Unpredictable application workload swings make it difficult for IT to manage compute capacity—buy too much and you have idle servers most of the time, buy too little and starve the business.

The portable nature of CliQr's Application Profiles, combined with the secure shared storage capabilities and benchmarking capabilities of CloudCenter, allows IT to cloud burst applications from one cloud environment to another based on the desired characteristics of the target cloud, such as cost or performance.

Use Case Six: Disaster Recovery and High-Availability

While datacenter consolidation has reduced the number of required servers, businesses still have to maintain multiple instances of their applications and data in different locations to comply with service-level agreements and to ensure business continuity in the event of a disaster. Technically the cloud offers an excellent platform to maintain high availability of applications, but in practical terms, disaster recovery/high availability is a daunting task to achieve on the cloud.

With CliQr, organizations can provide cross-cloud disaster recovery for their private cloud by replicating data and switching over to another private cloud site. More important, CliQr's cloud-agnostic Application Profiles and seamless data syncing between clouds enables "one-click-and-switch" cold disaster recovery capabilities to any of CliQr's supported public clouds as well—which would prove very useful in a disaster scenario in which all private cloud sites were somehow taken down at the same time.

Use Case Seven: Integration with Datacenter-Bound Services

Real-world enterprise-class application deployments often require connections to other applications, data sources, and services that reside on-premise or on a different cloud. Securely integrating these hybrid cloud environments is critical to cloud operations, but traditional VPN solutions are too broad, typically opening access to an entire corporate network.

CliQr CloudCenter Connect™ is a secure service proxy that allows businesses to automatically and selectively access applications and private cloud services (including database, Flex/LM, SSO, and printing) securely from any cloud deployment, all without requiring changes to firewall settings. This capability allows applications and services residing in an on-premise private cloud or on a bare-metal environment to be easily accessed from co-located/external private or public clouds.

Conclusion

By automating routine tasks, Private clouds can be a boon to IT productivity and unlock real value for the business. The CliQr CloudCenter platform simplifies the way IT can move, manage and secure applications from physical or virtual environments onto Private clouds. Using CliQr, these Private cloud deployments are highly manageable and support additional and coordinated Private, Public and hybrid cloud deployments and related business use cases.

Unlike other migration tools and approaches, CliQr makes it unnecessary to modify the application, write cloud-specific scripts, or create VM images. CliQr also makes it easy to get to the cloud by providing Application Profiles out-of-the-box with support for a broad range of application types. CliQr provides a powerful runtime-management platform that delivers visibility and control into users, groups, applications, and clouds.



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