



Cloud migration:
enterprise apps on the move

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Cloud migration: enterprise apps on the move

The broad issue of cloud migration

From a business perspective, the verdict is unambiguous: cloud 100%, status quo zero.

Cloud wins conceptually for the same reasons that we run our households on the grid rather than on a generator in the back yard. Scale, efficiency, and cost all argue for cloud. The practicality of using only what you need, when you need it is compelling. But as it turns out, paying only for what you use, when you use it takes a back seat to business agility as a prime motivator for sending enterprise applications cloudward.

From a technical perspective, the verdict is "yes/but"

Yes, cloud makes sense ... but what type of cloud? IaaS, PaaS, SaaS, in what combination of private and public, federated and hybrid? Yes, Amazon is fine for dev/test today, but what cloud provider or providers will best suit our needs over the next three years? Yes, we are already moving most of our dev/test activity to the cloud, but most of our workloads are production applications in the datacenter ... how do we move them out and back if/as needed?

As enterprise IT gains experience with cloud use, and encounters increased executive pressure to exploit cloud economies, it comes face to face with the challenges of moving application workloads in a server-centric world. Tools and technologies designed to deploy and consolidate server instances are remarkably ill-suited for moving production applications anywhere – much less to and from multiple clouds and datacenter.

So far, the cloud market, public and private alike, has been building out on top of the first wave of adoption – server virtualization, known primarily for reducing the number and cost of physical machines. However, as IT turns in earnest to moving enterprise applications to an array of cloud variants, the mismatch between infrastructure tools and application requirements becomes apparent. This mismatch is both an impediment to cloud adoption, and an impetus to adoption of application-centric tools.

Purpose and intended audience

Cost cutting has classic allure, but the big promise of cloud is in business agility for the enterprise – in the movability of workloads (applications, not servers) according to business needs. This paper considers the pluses and minuses of mainstream server-centric options for moving existing enterprise applications in contrast to AppZero's application-centric approach.

The intended audience for this paper is anyone interested in, or responsible for moving enterprise applications to or from datacenters and clouds. The paper will be of particular interest to Managed Service Providers whose business model requires efficient movement of enterprise applications to their cloud. Also, cloud providers and IT practitioners will find the contents useful in answering business leaders who wonder why cloud progress isn't faster and less expensive.

Strategies for migrating applications to the cloud

In a May 2011 press release, analyst firm Gartner identified five ways to migrate applications to the cloud. Noting associated costs, benefits, and drawbacks to each, Richard Watson, research director said, “When the CIO issues the simple directive: ‘Move some applications to the cloud’, architects face bewildering choices about how to do this...” A paraphrase of the five migration strategies follows:

1. **Rehost** to IaaS locks the application in and doesn’t allow scalability.
2. **Refactor** an application to run on a PaaS infrastructure -- labor intensive and risks lock-in.
3. **Revise** modifies or extends the existing code base to support legacy modernization, then uses rehost or refactor options to deploy to cloud. This option is a major project.
4. **Rebuild** an application specifically to run on PaaS commits to lock-in regardless of performance or changing circumstances.
5. **Replace** an application entirely choosing a SaaS offering instead.

Interestingly, Gartner left out the biggest “R” of all –

Remain just the same. Risk nothing; change nothing. As every cloud provider knows, this choice has a large following across industries, leaving a large market opportunity of existing enterprise applications, land-locked in data centers.

Options for migrating applications to the cloud

When it comes to migrating applications to the cloud, the options for responsibility are pretty universal:

The enterprise owns the migration: IT reinstalls applications onto new environments manually or with P2V tools. Alternatively, IT contracts a third party to perform the migration for them.

...or ...

The cloud provider owns the migration: A customer migration/service team reinstalls applications manually or with P2V tools. Alternatively, a 3rd party is contracted to do the work.

Whether migration is performed by enterprise IT, cloud provider, or third party professional services firm, the following types of tools are those commonly in use today:

- **Datacenter automation:** Automation platforms that are widely used for application deployment in the datacenter are ill-suited for cloud migrations: 1.) From a technical viewpoint, these solutions are not cloud-ready because they rely on management agents which simply don’t work in most cloud environments; 2.) From a practical perspective, these tools – which are labor-intensive to use and administer in their own right – have per-server licensing terms that are incompatible with the business model of a migration project.
- **Manual installation and scripting:** This labor-intensive approach, although expensive, can be a viable way to move one or two applications. However, this hand-crafted

approach is unworkable for migration of an enterprise application portfolio, or even a subset of that portfolio, let alone a sustained migration practice serving multiple enterprise clients.

- **Physical to Virtual (P2V) Toolkits:** Available standalone or buried within larger product suites, P2V tools are rarely an easy alternative. Limitations include: 1.) Complexity – the details of how a given VM format is imported to a given cloud are frequently left to the enterprise to unravel, 2.) Size and certainty – In addition to the desired application, the P2V approach brings the good and the bad from a legacy server, introducing conflicts and vastly increased storage requirements, 3.) Disenfranchisement– VMs often run into cloud or server support roadblocks and are regularly disqualified from QoS based SLAs. 4.) Lock-in – Lock-in remains an issue as the application, once virtualized, can't return to the datacenter unchanged.
- **Server imaging tools:** When the target environment is a cloud, server imaging has all the limitations of P2V tools including excessive image sizes, customization complexity, and technology lock-in.

Note: *Although the topic is enterprise application migration, the work being undertaken and the tools in use are quite server/machine-centric.*

Server virtualization dominates the conversation

At the dawn of contemporary virtualization, VMware commercialized server virtualization. Separating the operating system (OS) from hardware produced an avalanche of savings, industry innovation, and inaugurated a new market. It also arguably planted the seeds for what would become cloud computing.

After serving a mandatory probationary period as a dev/test playground, virtual machines (VM) quickly became mainstream IT. Moderating the interaction between VM and the underlying hardware, was the hypervisor – VMware's vSphere, soon followed by Microsoft's Hyper-V and the open source Xen Server.

Like a sheep with its shepherd, each VM will only respond to the hypervisor for which it was built. So, when a VM is used to deploy (package and distribute) an application, it will be fit for only one hypervisor at the target location.

Bundling an application, OS, and configuration into a single disk image is a server-centric way to move an application.

Limitations of packaging an application with a VM/OS

Packaging an application with a VM/OS is the software equivalent of explaining how to build a watch, when the question is about time. It is cumbersome and limiting to enterprise IT operations folks who are used to specializing on either the OS or the application. It is also the current, known and understood method. Limitations include:

- **Incompatibility of hypervisors and VMs** – Even though VMware still dominates the market it created, it has nothing close to a monopoly. Other hypervisors such as Hyper-V, KVM, Xen and PowerVM are bundled into operating systems and continue to gain in usage. Most large organizations use more than one hypervisor, and that number is growing. So, VM and hypervisor incompatibility will continue to be problematic.
- **Size of application packaged with VM/OS** – Consider the following example: A VM that includes Windows 2008 Server, which exceeds 20 gigabyte (GB) and a typical .NET application with SQL Server included of roughly 1.5 (GB) creates a 21.5 GB package to deliver a 1.5GB application. At almost 15x the size of the application, the VM incurs a similar multiplier on network transfer time and fees, as well as cloud storage costs. When moving an application across a WAN to a public cloud, this multiplier is the difference between hours and days of transfer time, increasing labor costs for migration staff, and delays in project duration.
- **VM complexity introduces ‘lock-out’** – VMs lockout applications from operating across all but a narrowly defined combination of hardware, hypervisor, and cloud service types/vendors. OS configurations must be changed for any new or differing environments.
- **Application and OS must be managed with respect to each other** – ISVs, cloud providers or IT professionals who might only have an interest in the application, must also manage the OS when a VM is used to move an application. The problem here is that most enterprises are organized around ‘services’ that map to applications – not to servers or OS, which are handled by server operations folks. The server-centric approach means that IT professionals across such functions as performance management, and application delivery need to become server-savvy as well.
- **Exponential complexity in production** – An application and OS, deployed as a single disk image, begins to change as soon as it starts running in production. Configuration changes, OS patches, application updates quickly alter the package from its initial image. Each application/VM package must therefore be managed individually.
- **Licensing issues and costs** – Packaging an application with an OS for distribution can be legally and financially complex, especially for Microsoft products.
- **Cloud provider SLAs** – Cloud providers will not guarantee quality of service (QoS) and service level agreements (SLAs) on an OS other than the one they certify and offer.
- **Cloud type/vendor lock-in** – The cost and effort involved in engineering an application for one destination, effectively provides lock-in.

AppZero packages enterprise applications for instant mobility

AppZero takes an application-centric approach to moving enterprise applications to and from any cloud. Unlike the machine-centric VM/VA approach, using AppZero makes enterprise applications instantly and repeatably moveable without engineering or lock-in. (Note: See companion technical whitepaper for a more detailed product description.)

In a nutshell: AppZero *packages* up an application (Windows and Linux server; Windows desktop) ... for *instant deployment* with the simplicity of a copy ... which is made possible because the application has been *preinstalled, preconfigured* and *encapsulated* in a file that holds elements or items that the application may need to run well, but ... *does not contain a VM or an operating system* (OS). The result is that fully configured applications can be instantly deployed at the click of a mouse.

Because AppZero packages an application with all it needs, but without an OS, the application can be freely moved anywhere that there is a machine— physical or virtual, in a datacenter or in any number of clouds – as long as there is a compatible OS running. Point and click for instant copy and move deployment.

When the application runs, it is moderated by a light intercept layer that isolates the application from the OS. This layer redirects any modifications that are made to an application's artifacts (files, registry) keeping them contained in the AppZero encapsulation file.

This encapsulation means that as the OS runs and changes, application changes are not entwined with the OS. So, the application is free to move again ... and again. The application can move from cloud to cloud, with no lock-in, and back to the data center according to business drivers.

The point of AppZero's VM/OS-free encapsulation is application agility – the freedom to quickly and precisely provision and deploy even complex, multi-tiered applications. AppZero calls its encapsulation file a "Virtual Application Appliance" (VAA) – a play on, and differentiating reference to, the well-known VM-based Virtual Appliance (VA).

AppZero – package once/ run everywhere

AppZero provides tools that can create VAAs from applications 1.) that are initially installed and configured onto a baseline system, or 2.) from existing application instances that are already deployed in a datacenter environment. This application-centric approach requires little or no prior knowledge of the application structure.

1. **Snapshot creation of new installations** -- In the case of a brand new application installation, AppZero uses a snapshot approach. A snapshot of the machine is taken before the application is installed and again after installation. The AppZero creation tool captures the differences, including any configuration changes. This approach means that technical staff can continue to use their configuration tools of choice for such activities as creating specialized configurations, pre-populating databases, or setting up custom security. AppZero's creation tool captures the work and contains it in the VAA along with the application, which is now ready to be repeatedly moved with a copy.

2. **Automated encapsulation of existing applications** – AppZero also automates the capture and encapsulation of an existing application and its dependencies. In this case, the application is run in a fresh/empty VAA on a target machine. As the application executes on the target machine, AppZero retains a connection to the source machine. When the application that is running on the target machine cannot find something it needs (such as a file, or configurable element), the connection makes it possible to find the “missing piece” and deliver it for inclusion in the VAA. Perfectly suited for existing applications, this approach effectively lets the executing application define its dependencies and requirements.

Applications packaged in an AppZero VAA are unaffected by environmental characteristics that do impact VMs or server images, such as choice of CPU core count, storage architecture and memory configuration, OS configurations, file versions, server size, hypervisor or cloud platform.

Applications packaged in an AppZero VAA are very easy to move:

- Run the application anywhere and everywhere – package once
- Run it instantly – there is no installation of the application, simply copy and run
- Run it error free – effectively establish a “gold” configuration

Dissolve for business as usual ... only better

AppZero also provides a function in which the VAA can dissolve upon delivery of the application. Clients using the dissolve function take advantage of the speed and simplicity of provisioning of an application in a VAA. However, once the VAA is dissolved, the application becomes enmeshed with the OS as if it had been traditionally installed, and loses the ability to make further seamless moves. It becomes a standard application as if the VAA had never existed. (Note: It can of course be re-encapsulated as described above.)

Compare/contrast: Machine image vs. AppZero application image migration

Compare: Both approaches share the following characteristics:

- Broad platform support, including Windows, Linux, and UNIX
- Ease of movement to dissimilar hardware
- Physical and virtual migration
- Ability to capture application state for ease of cloning or movement
- Support for booting off DAS and SAN

Contrast: Application image migration offers the following advantages:

- The application is moveable across any operational stack and cloud provider's platform, without re-configuration.
- This movability is well-suited to hybrid clouds, letting enterprises scale up/down as needed.
- Moving a VAA will be 10 – 100s of times faster than moving that same application as a machine image. This difference slashes migration labor costs, cycle times, and cloud storage fees.
- Applications can be easily deployed to cloud providers' certified, hardened OS
- The application will be hardware and hypervisor agnostic.
- Management and maintenance of application and OS are separated – Maps IT professionals along existing lines of application-based services.
- Ability to run application on service provider certified/hardened OS – The application can now layer onto a cloud provider's or MSP's own management structure complete with monitoring and automation agents. As a result, MSPs can deliver high value services at higher margins, while operating with increased efficiency.
- The benefits of cloud provisioning now extend to application provisioning.

Moving enterprise applications with the ease of an app store

AppZero's point of view is that enterprise applications can be as moveable as those in an appstore. Using AppZero's application-centric approach lets enterprise IT and cloud providers move existing applications:

- To any operational stack
- Across stacks instantly and efficiently
- To and from physical and virtual machines at will
- In response to business needs now and in a future yet unknown
- Without re-engineering or lock in
- Using tools to automate the process
- Working with existing management solutions

Business agility trumps server agility

At the end of the day, the reason IT has servers – physical or virtual, in the datacenter or clouds – is to run applications and to deliver business services around those applications. The ‘business-of-IT’ is to serve the ‘business of the enterprise’. People, processes, and budgets are all organized along business application lines of demarcation. As the enterprise stretches into new paradigms and possibilities of agility, it will do so migrating application portfolios, not servers.

Likewise, those who provide services to the enterprise will be able to move up the value chain – both real and perceived – when they can accommodate and accelerate application movability. Moving production applications free of complicating machine encumbrances makes it financially rewarding to offer a range of high value services. These services differentiate the provider, positioning its professionals as trusted advisors who bring strategic relevance to their client CIOs.

Concluding thoughts and next steps

The industry has experimented with applications that can easily run in the cloud, using them as a defacto proof of concept. Dev/test is a natural as are stateless web applications and new applications written for the cloud. But these cloud pioneers are only the tip of the iceberg that is enterprise IT.

Applications that run the business continue to command the lion’s share of IT budget and support staff. They represent the cloud’s largest target of opportunity. Realization of that potential will require that application-centric tools supplant machine-centric ones when the task is moving existing applications.

Visit www.appzero.com for more information, or get in touch with us today to find out how AppZero fits your specific challenge set.

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