Data Center Migration to the Cloud

Approach & Key Considerations

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Abstract

Migrating IT systems and infrastructure to a private or public cloud can be a daunting challenge even for the most seasoned IT professional. At the same time, it provides a great opportunity to revise, rethink, and improve an organization's IT architecture.

The most common strategic drivers behind moving a data center to the cloud include: reducing capital expenditure, decreasing ongoing cost, improving scalability and elasticity, improving time-to-market, and attaining improvements in security and compliance.

A data center migration must start with very careful planning and phased execution. Because the ease of entry to the cloud is so easy, many organizations rush in without a solid plan. However, an inadequate cloud architecture almost always ends up preventing organizations from attaining the benefits that prompted the migration in the first place. In addition, a data center migration is a strategic undertaking that must be executed without affecting business operations, service delivery, performance, and data protection requirements.

This white paper outlines the best approach, key considerations, actionable advice, and common pitfalls related to data center cloud migration.

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Data Center Migration to the Cloud – Key Drivers

The drivers behind moving a data center, or parts of a data center, to the cloud are numerous. They can generally be divided into two categories: requirements and strategy.

Key Requirements Driver

- An organization's current data center can no longer support the need for growth in terms of current space, power and cooling.
- An organization's current data center has too many single points of failure and the risk of outages, affecting business continuity, becomes too high.
- An organization is restructuring due to a merger or acquisition, creating a need to separate and/or consolidate data centers.
- An organization faces the sale of a building, rental fees, or increases in co-location costs.

Key Strategic Drivers

Reduce Capital Expenditure
Reducing capital expenditure is one of the key drivers behind data center cloud migration. By employing cloud-based data centers, organizations only pay for the resources they consume and save time and money by removing the need to buy, install, configure, and maintain an expensive on-premises infrastructure.

Lower Ongoing Costs
The cloud offers substantial economies of scale and efficiency improvements, which allow cloud platform providers to continually lower prices. By taking advantage of multiple pricing models, including hourly pricing, organizations can optimize costs for both variable and stable workloads.

Improve Scalability & Elasticity
The cloud allows organizations to provision only the amount of resources they need and easily scale up or down as required. This enables organizations to ensure expensive resources are not sitting idle and eliminates the need to deal with limited capacity due to on-premises hardware restrictions.

Improve Time-to-Market
In a cloud computing environment, new IT resources are very easy to commission, significantly reducing the time it takes organizations to make those resources available to developers from weeks to just minutes. This lowers the cost and time it takes to experiment and develop, resulting in dramatic increase in organizational agility and time-to-market.

In addition, the ease with which applications can be deployed in multiple regions around the world means organizations can provide a lower latency and better experience for customers at a minimal cost and maximum speed.

Focus on Core Business
With the reduced need for an organization's IT department to be involved with the heavy lifting of racking, stacking, and powering servers, resources are freed up to focus on the organization's own customers. Concentrating on the projects that differentiate an organization's core business, rather than the infrastructure, substantially improves products, services, delivery, and ultimately the ability to compete.

Security and Compliance
Despite the common misconception that a cloud environment is less secure, strategic goals in relation to security and compliance are often key drivers to migrate data centers to the cloud. The major cloud platform providers invest heavily in security and compliance and are more often than not able to provide a better security profile than what the biggest and most conservative organizations can deliver internally.

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Approach and Key Considerations

Planning and Design

With cloud computing, architecture becomes far more flexible than what even the most virtualized data center can offer. As with many aspects of technology, this flexibility and power comes with a responsibility. The ease of entry often tempts newcomers to dive in without a solid plan or design, only to discover later that the lack of a cohesive cloud architecture has robbed them of the benefits they sought in the first place. All major IT initiatives, including a cloud data center migration, must start with a plan.

Successful migrations often start with a data center plan that almost overlooks the fact that this new data center will be cloud-based. Fortunately, a large number of the considerations that go into planning a new physical data center are also applicable to your cloud design.

Key questions to consider during this phase include the following:

- What networking space do I want to occupy?
- How do I want to segment resources in terms of subnets, DHCP blocks, or even separate cloud billing accounts?
- Do I want the cloud data center to have access to the Internet? Do I want this to come through my on-premises data center or directly from the cloud systems?
- How do I want to restrict access to my cloud?
- Do I want multiple data centers for high availability or disaster recovery?
- What security rules do I want in place? Where do I want these in place? Per server? Per subnet? Per "grouping"?
- How and where do I want my applications to scale?
- How do I want my data tier designed? One server per DB? One large DB cluster for all databases?

Figure 1 below shows a simplified cloud architecture for a typical enterprise data center migration to AWS.
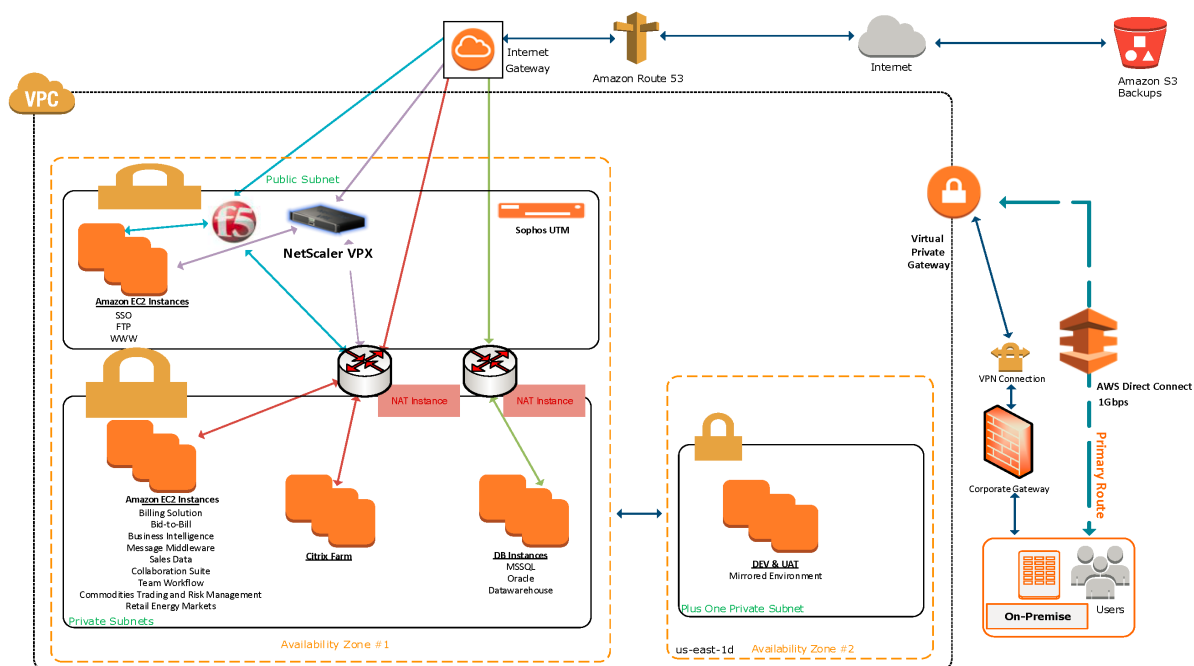

Figure 1 - Infrastructure Design on AWS

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Connect

Cloud computing benefits can be realized immediately after defining a design standard. In traditional data center or co-location projects, you need to procure the empty space for your data center all at once. In the cloud, you just start building what you need and grow from there. The first item of business should therefore be connecting your target environment with the source.

Depending on the nature of your build-out, this can be as simple as a network link from your WAN or a VPN tunnel. For more advanced setups, many of the public cloud providers offer cross-connect-driven private links directly from your site to their data centers. This provides a great option for high-bandwidth projects or dataflows that will need to continue uninterrupted throughout the migration.

Build

Once connected, you should take the cloud design and begin setting up the constructs you defined. Build the accounts, set up the networks, and test the security. Ensure the environment is accessible, usable, and available to all the systems and mechanisms you will leverage to migrate workloads. You don't want to find out midway through moving your ERP database that a subnet isn't accessible from desktops in your offices. This is the time to be sure.

Categorize and Prioritize

At this stage, it's easy to want to start pushing everything and anything to the cloud data center, but that can turn out to be a big mistake if undertaken in haste. A much better approach is to break your applications and workloads into meaningful categories. These can be based on business unit, time zone of affected team, operating system of the backing servers, or anything else that's applicable to your environment. The goal is to organize applications and workloads into manageable units of work. Once the groupings are complete, a decision needs to be made on each grouping's applicability and priority.

Key questions to ask for each grouping include the following:

- Does this group go to the cloud? If not, where does it stay?
- How long can this group be offline? How critical is it to daily operations?
- Is this group typically comprised of trail blazers? Or should this group wait for others to guide the way?

Size

You're almost there, it's now time to start thinking about the cloud servers that will host your applications and workloads. This is the step where you can realize the simplest efficiencies in cloud computing, but also where new cloud projects can encounter the majority of their first mistakes. In a modern data center, even one that is entirely virtualized, it is common to find oversized server instances. As long as you aren't maxing out resources and forcing more expenditures in the way of hardware, why wouldn't you use what you already have?

In the cloud, however, you must resist this temptation. Applications need to be given exactly what they need. You shouldn't under-power, but you also shouldn't overpower. And don't worry, it's easy to scale up immediately if you determine that you need more resources.

Key questions to ask at this point include the following:

- Does this application need the CPU, RAM, and Storage I currently have allocated to it?
- What type of network performance does this application really need?
- Can larger single-role servers be split into large clusters or groups of smaller servers?
- Does this application have a usage pattern where the cloud could assist? Can I turn these off during certain hours, days, months and see no impact to performance?
- What is the IOPS requirement of this application?

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Migrate

Now it's time to move your applications and workloads to their new homes in the cloud. You've got a big decision to make here: Do you rebuild the servers, or do you clone them and shift up? There is a lot buried in each of those choices. If you rebuild, your migration time could dramatically increase. Are the teams that originally constructed these systems still around? Do you know this application well enough to reinstall it? Alternatively, if you clone the existing systems you might give new life to problems that have plagued your data centers for years.

It's useful at this phase to take advantage of the categorization you did earlier. Groups of servers tend to follow the same rules, so you can break this decision into smaller pieces. And with either choice, you have a number of tools at your disposal. Rebuilding is as simple as a few clicks. Large interop functions offered by many leading platforms can simplify cloning as well.

REBUILD	CLONE
Rebuilding provides the opportunity to start with a "clean slate" and is ideal for systems where deployments are already packaged or automated. **VM Import/Export** • Export – Upload – Import - Launch • Supports VMWare (VMDK), Xen (VHD), and Hyper-V (VHD) **vCenter Direct Import/ Export** • VM Import Connector • Supports directly migrating images from VMWare vSphere systems directly from GUI console HotLink© offers a 3rd party tool that extends Hyper-V in the same way	Migrate VM images directly from existing infrastructure without need to rebuild complicated server builds. Select your instance size and starting image • Selection of Base Images for common OS • Selection of community provided images with pre-installed software • AWS Marketplace for vendor-supplied images for turnkey solutions

A NOTE ON LICENSING

Licensing software in the cloud is often overlooked and can, if not properly addressed, dramatically impact the cost, or ROI, of your migration. Here are a few quick points on this topic:

EC2 instances are always billed in an "OS license included" model.

• Current OS available
• Open Source Linux (Ubuntu, Debian, CentOS, etc.)
• RHEL
• SLES
• Windows Server
• *Oracle Linux is also avail under Open Source pricing model

Vendor software (above OS) is licensed in three models

• BYOL/Existing: Large vendors are supporting migration of licenses to AWS under various agreements, IBM ("IBM BYOSL"), Oracle, Microsoft ("License Mobility")

• On-Demand: Many AMIs from vendors come pre-configured with the software and are billed directly through the AWS marketplace on a per hour basis.

• BYOL/New-AdHoc: Some vendors do not have a formal cloud license policy and require cloud resources to be licensed as if they were new hardware

High Availability and Disaster Recovery

High availability (HA) and disaster recovery (DR) could, and rightfully should, occupy a discussion paper of their own. Migration, however, is a great time to take advantage of the DR or HA opportunities inherent to cloud systems. A few easy wins can be made during setup:

• Similar to virtualization systems, automatic backups of all systems can be configured from platform portals. Use this to create instant DR systems.

• Most platforms support scripted construction of infrastructure and automation of scaling scenarios. With platform images and scripts, an active-active,

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pilot light, or cold site can be maintained and brought to satisfy almost any Recovery Time Objective.

- All cloud platforms support High Availability through encouraging the use of multiple instances for application needs. Take advantage of this design pattern. Run multiple instances of everything. Where possible, run these instances in separate data centers.
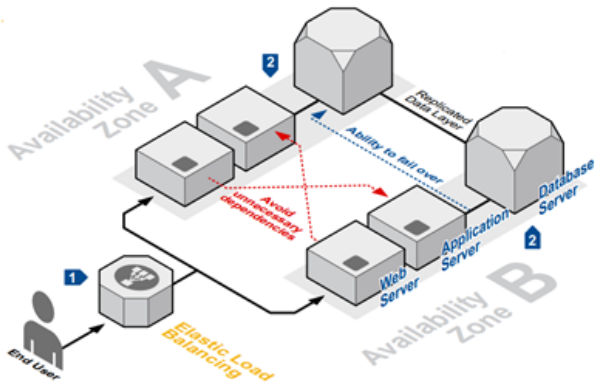

Figure 2 - High Availability and Disaster Recovery

What Are the Main Gotchas?

Just like any IT projects, migration to the cloud has the risk of failure or less-than-optimal success. Proper planning facilitates proper performance and if applications have not been properly analyzed, and more importantly instrumented for performance, then application migrations will fail.

Planning for service interruptions, service updates, and potential application rewrites all become necessary components of the migration planning to ensure success.

In addition to these more traditional risks, it is important to highlight other, less obvious, migration risks and opportunities, and their importance for migration success.

Not Understanding Your Workloads
The modern on-premises data center is a pretty forgiving place. The cloud, while equally flexible, is a service-oriented resource and must be respected as such. Performance, compatibility, performance requirements (including hardware, software, and IOPS), required software, and adaptability to changes must all be understood to be successful in a cloud deployment.

Not Understanding Licensing
The cloud marketplaces make it very easy to "rent" software at an hourly rate. The ease of this purchase is unparalleled. But it is not your only choice. Not all large vendors offer licensing mobility for all applications outside the operating system. Leverage existing relationships with licensing brokers. You don't need to throw out existing licensing channels just because you are moving to the cloud. Not knowing your choices can cost you dearly. Understanding these options can maximize ROI even further.

Ignoring PaaS
A decade ago, cloud vendors emerged onto the market telling everyone to rewrite their applications to work on SOA platforms instead of infrastructure. Five years ago, enterprises IT made it clear that this was an irresponsible approach, and infrastructure as a service (IaaS) was born. But the reality is that those guys ten years ago weren't wrong; their advice was just poorly timed. Platform as a service (PaaS) is going to be a huge part of the future, and it's available today. This doesn't mean you should rewrite everything you have. But look for quick PaaS wins to replace aging systems. Many data centers have entire sub-infrastructures around technology solutions that are now available as a REST API; for example, SMTP, FTP and VDI. Look at your system for quick PaaS wins as you migrate.

Migration on an Island
Building a new data center is a significant IT event, whether it's the organization's second or tenth. It often benefits from coupling with new business, new offices, or similar modernizations. Cloud migrations often do not. Some organizations, however, treat them the same. It is important to recognize that business will not stop as you migrate to the cloud. A critical part of success in a cloud migration is designing the entire process as something that can run along with, and adapt to, other IT changes that occur on the same timeline. Often times application teams adopt cloud deployment practices months before their systems go to the cloud. This way, they are ready before their infrastructure is even prepared, and the cloud migration becomes a non-event. Teaming cloud events with other changes in this manner will maximize your ability to succeed.

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The Bottom Line

The cloud can offer an excellent choice for expanding, supporting, or even replacing your traditional data centers. When joined with the variety of software as a service (SaaS) and platform as a service (PaaS) capabilities, the benefits are measurable.

When executed with a well-conceived plan, moving a data center into the cloud can help you realize immediate benefits, including the following:

- Technology needs are no longer bound by capital expenditures. Upgrade cycles no longer apply, and new hardware/software/infrastructure benefits can be utilized immediately as available.

- Ancillary needs such as DR, HA, etc. do not require facility purchase and maintenance.

- Scale hardware based on volumes. All applications can benefit from scalability, not just the applications you design. Email, VOIP, NAS, etc. can all be configured to grow and shrink along with your business.

The flexibility and options available should make the cloud a favored contender in all future data center migration, setup, or expansion plans.

Case Study

How Nimbo and AWS supported Hess Corporation's Billion Dollar Divestment by Migrating an Entire Enterprise IT Suite to the Cloud

In 2013, Hess Corporation, a leading global energy company, decided to streamline its business to focus on energy exploration and production (E&P), and divest its downstream businesses. Obligated to deliver a functioning, operational infrastructure to the buyer and with no time to redesign applications, Hess put their faith in AWS and initiated what has become known as one of the largest and fastest enterprise cloud migration achievements in AWS history.

This case study covers how Nimbo and AWS worked with Hess to create an escrow type cloud environment for an entire data center, supporting 500+ users, in only six months. Along with a deep dive into the supporting processes and technical aspects, the case study provides unique insights to enterprise cloud adoption challenges and how Hess, and the new owner, were able to successfully overcome them by relying on the ingenuity of AWS solutions and thought leadership.

For more information about this and other Nimbo success stories, please visit:
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Author Biography

Taylor Bird – Principal Architect, Cloud Solutions at Nimbo

Taylor is an experienced architect and technology leader with over 15 years in enterprise technology solutions. Taylor has worked for a number of Fortune 500 companies as well as a broad set of SMBs and start-ups, merging cutting edge technology with an understanding of challenges and solutions that impact and drive enterprise computing. From a hybrid background in global IT operations and enterprise software development, he combines a wide breadth of technical knowledge and corporate experience to deliver innovative and successful cloud technology solutions to businesses of all sizes.

About Nimbo

Nimbo, an Inc. 500 company, provides Enterprise Cloud Solutions and migration services, helping enterprise organizations adopt and manage cloud technologies. Nimbo specializes in migrating line of business applications to the cloud, custom application development, application integration, and managed cloud services.

By continually providing superior cloud solutions to satisfy business objectives, simplify IT management, meet security and compliance requirements, Nimbo is today a trusted partner to CIOs of some of the world's largest organizations.

- Leading U.S. Enterprise Cloud Solutions Provider
- Advanced AWS Consulting Partner
- Extensive AWS Enterprise Implementations
- Recognized in Inc. 500 List of Fastest Growing Companies

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