

White paper

Ten Steps for Successful Application Platforming in the Cloud



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Executive overview

Forward-thinking organizations are increasingly looking to emulate the successes of 'Cloud First' companies (such as Netflix and Uber) who use software-driven advances to keep them ahead. While the prospective benefits of cloud are clear for many, the journey can be complicated, including balancing technical and cultural needs. Therefore, the ability to find a simplified path from old world to new world business models remains a challenge for many organizations. Cloud technologies although ubiquitous and often attractive, can themselves lead to increased complexity that further slow necessary progress.

This paper addresses this topic, and is aimed at readers who are planning the implementation or migration of new business models based on flexible, elastic, resilient applications and Multi-Cloud Platforms.

The ability to continuously offer new products and services directly to customers via the Internet is part of a wider paradigm shift. There is also the growing market of cloud providers and the (ever increasing) service choices they facilitate. With the right controls in place, businesses can now safely innovate at a pace that very few could previously attain using more traditional resources. It is no surprise that many companies are seeking to copy the success of the likes of Netflix to deliver ready to consume products and services. However, it takes more than just the migration of ten-year-old monolithic applications to the cloud to compete in today's digital economy.

As you embark on your journey, consider these top ten tips for a successful digital transformation.

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Let your vision be known

The key reasons most commonly quoted by businesses for wanting to move to the cloud are:



Cost savings and control



Increased flexibility (scalability)



Increased resilience/reliability/availability



Security and compliance



Application support

Do these reasons resonate with your business and its objectives? Whatever you feel the key drivers are to move your business applications to the cloud you need to summarize them and communicate them clearly to your employees, IT staff, and department heads. It is critical to have a clear understanding of the direction and expected business outcomes derived directly from operating your business in the cloud.

Recent industry reports revealed the nature of an organizations' leadership, that is its ability to inspire, communicate, and support staff in achieving the company vision, is a key factor in deciding the success of the company in achieving its digital transformation goals. Are your employees aware of your company's vision? Take the action to make sure your employees understand the vision, strategy and goals. Use all available means of communication including employee newsletters, internal web-pages, quarterly employee conference calls, and any current means your company uses to communicate with employees.

Make sure to include key milestones, points of contact to answer any questions, announcements, and most importantly business results, whether these are cost savings, revenue generation, or market positioning. Keep your employees aware and make sure they understand that digital transformation is an opportunity also for them to update their skills, alongside the critical aspects of maintaining your company's competitive advantage and market relevance.



Mind your (own) business

Don't assume you know everything about your applications. Take a mindful approach to knowing how applications support your business.

Don't assume the information you have is all you need. Conduct application reviews to learn about and analyze your application landscape. Far too often IT learns about closet servers running business critical applications in remote locations after the migration has begun. Take the necessary steps early on to understand business requirements, user requirements, critical peak times, and key business functions that are dependent on application services. Don't rely on inventory data collection alone. Leverage partners and automated tools when possible to collect critical infrastructure and application dependencies. Knowing what and where is important, but knowing the dependencies, how, and what each application requires to support all business functions is a must.

Take the next step to classify and categorize your applications. Consider category names such as:



Retired-no longer required to support the business



Retained - kept on premise and not transformed or migrated



Refabric - redesigned and /or refactored for cloud platforms



Replaced - Alternative market relevant SaaS applications (e.g. Salesforce.Com)

This is essential to aligning applications with migration strategies, and future IT infrastructure and support models.



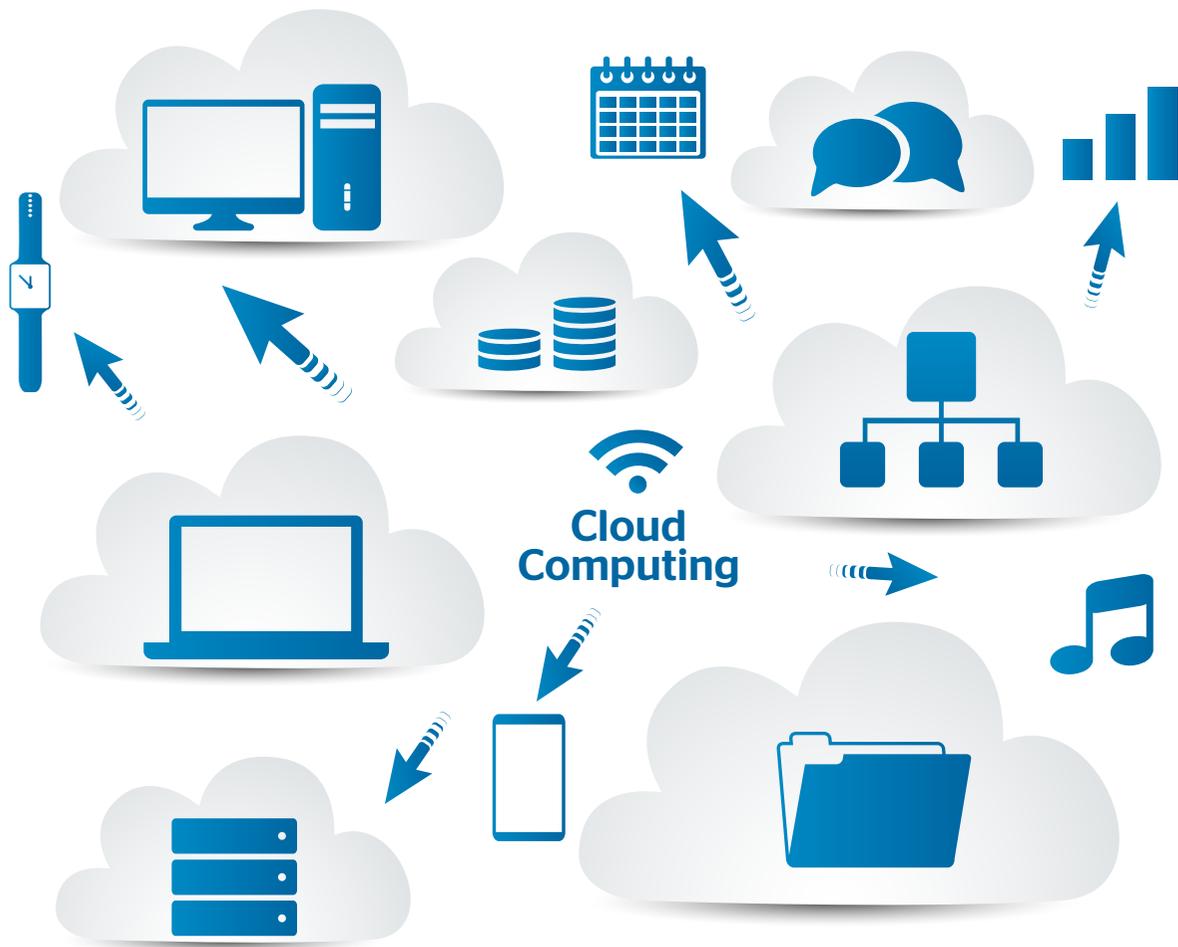
Conway's Law, DevOps and infrastructure come together

Conway's law states that "Any organization that designs a system will produce a design whose structure is a copy of that organizations communication structure".

Although initially rejected by a renowned business review as being unproven, nevertheless the passage of time has proved this to be a valid sociological observation. So if you have a large monolithic team with a top down structure, it will drive the type of applications that team will design, specify or create. Before you decide to re-design, re- platform or purchase new software first review the teams that make such decisions. Are they really 'cloud ready'? Are they aligned to your vision for the business or are they still organized in the same way as the teams that designed the original, on premise legacy applications?

And when you reorganize your teams - don't split your organization into design/ development and support/operations. By doing so you will potentially create friction points and silos that are not effective when moving to cloud platforms and management. For the cloud to really work you need combined teams, you need DevOps.

Consider talking with private, hybrid, and public cloud service providers to gain their perspective on migrating, developing, and managing applications in the cloud. Not all applications are good candidates for cloud, and those that truly benefit from modern platforms require architectures and interfaces with cloud properties like scalability.



At your service(s)

A key element to any consideration of cloud technologies and models is the 'as a service' (XaaS) paradigm.

As with all trends, this is not a new discipline. Many experienced IT users will argue that the as-a-service idea started with lesser known operating systems and legacy mainframes, that are designed with the ability to meter usage of CPU, storage, and other shared resources. However, it wasn't until web scale technologies emerged that XaaS became feasible.

In general, XaaS refers to on-demand utility based commercial models for infrastructure as a service (IaaS), platform as a service (PaaS), and software as a service (SaaS). The diagram below gives a high level view of the differences:

It is important to know how these models and others fit into your strategy and which one will be the right choice for your business. Don't assume the model you choose will satisfy your needs without considering how applications will be secured, provisioned, maintained, and supported for optimal performance and availability.

Talk with service partners and solution partners to understand available market solutions and how they fit your needs. And don't forget to ask about their product roadmaps as your business changes, you need to be assured they will support your business as it grows and evolves.

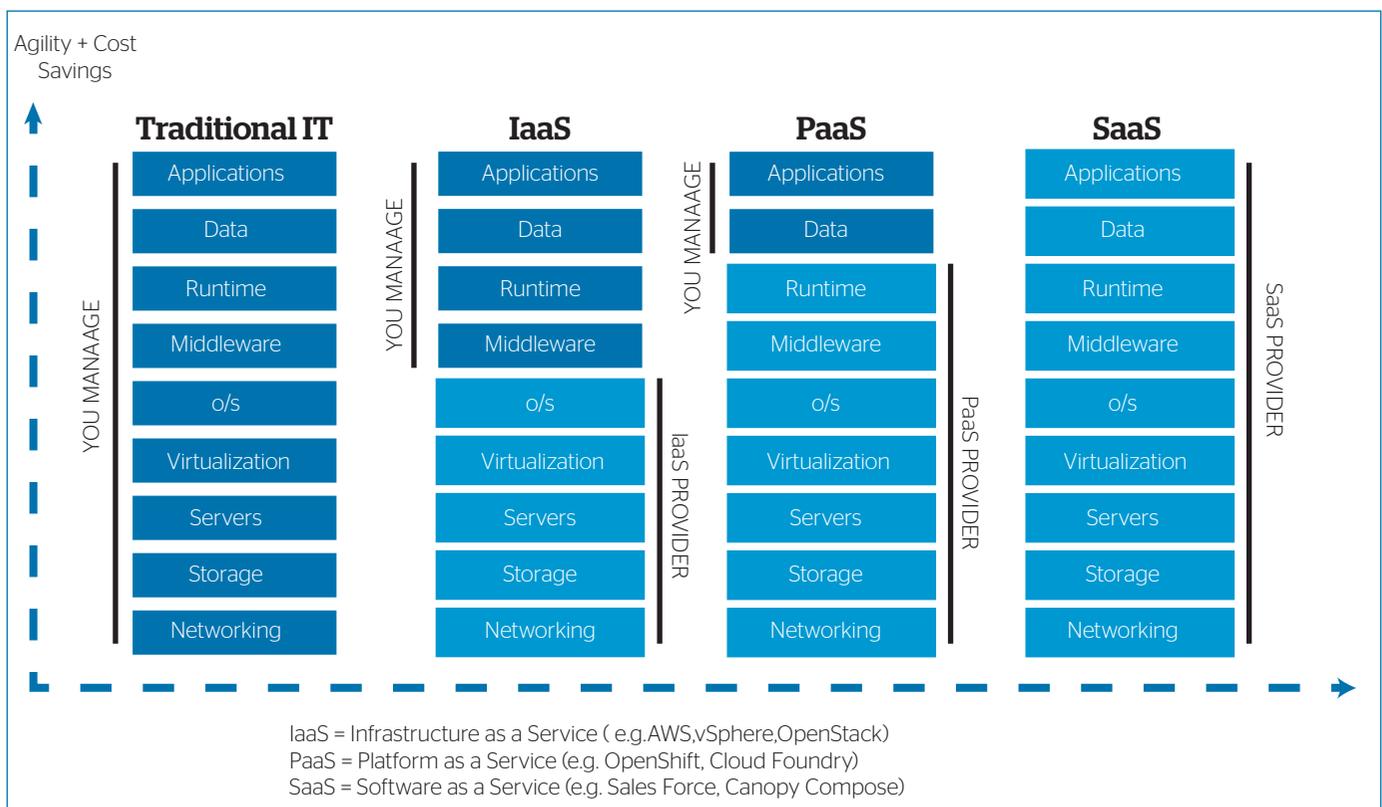


Figure 1: Cloud Foundry view of XaaS

Migration quick wins

Many believe they have achieved a digital transformation to the cloud simply by migrating virtual machines to a public cloud provider.

Although this is the simplest approach, in particular to becoming a public cloud adopter, it does not necessarily transform your business through digital technology. You still need to manage and maintain the virtual machines but now with the added complexity of managing them in the cloud, and it may not have changed the applications and how your business operates, conducts business, or is perceived in the market place.

As you begin to formulate your migration strategy, align your approach to fit the categories of your applications. Many approaches and technology solutions will come into play as you explore the options and align them. You won't need to migrate VMs for an application that is natively built for the cloud. Consider technologies such as containerization for new applications, and the various approaches to migrating and synchronizing data across platforms.

New tools and approaches are popping up quickly as cloud adoption continues to mature. It is now possible to automate, orchestrate and continuously monitor all levels of your services from network all the way up to the business process level. The insights that can be ascertained from such tooling will enable you to steer your business and its information assets in new exciting ways ensuring the agility your business deserves. Consider using an approach similar to the one identified in the figure 2 below.

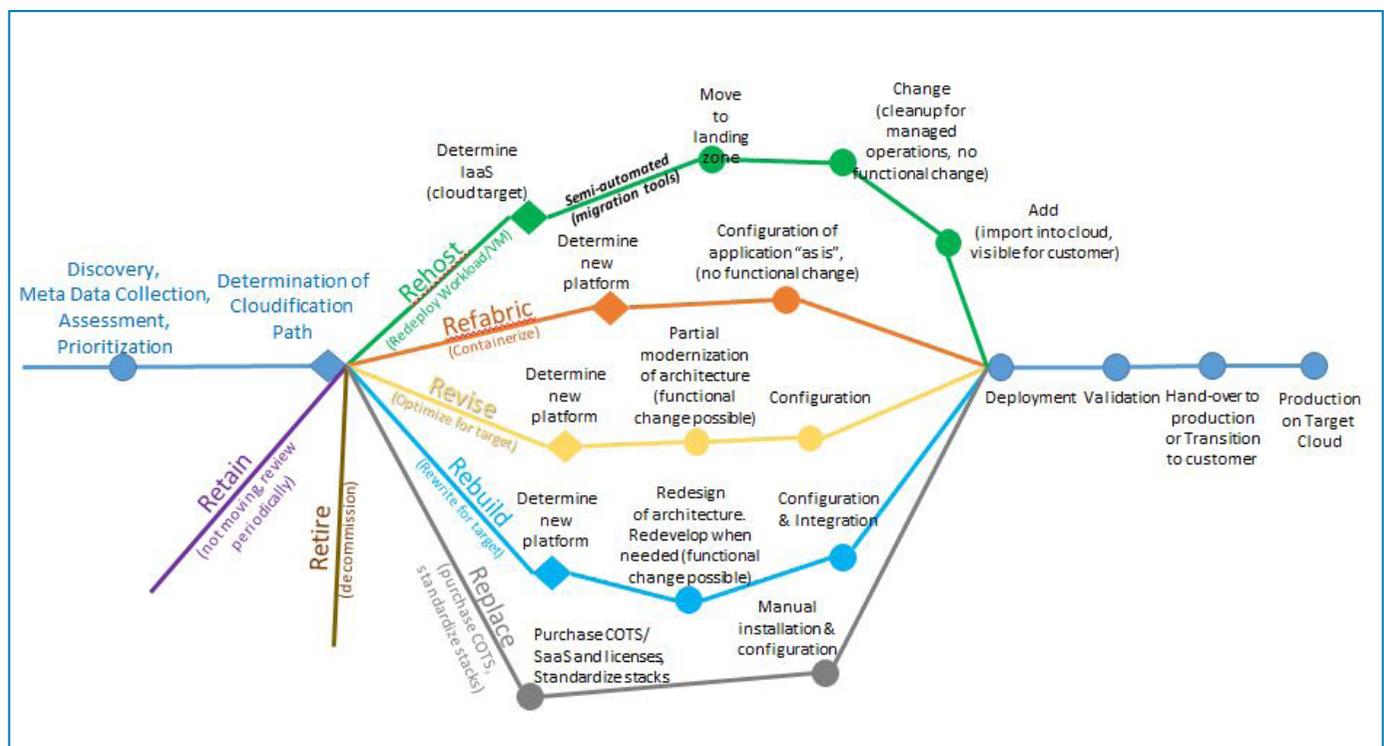


Figure 2: Cloudification Migration Paths

The Big Win - rebuild or revise (The Refactor dilemma)

The thought of rewriting a core line of business application can cause even the strongest CTO or CIO to balk, and horror stories from publications don't help to alleviate these concerns. However, it does not have to lead to disruption or crisis if the transformation is carefully planned and executed.

The first step in any refactoring process is to review the application architecture and design. Many older enterprise solutions were designed using a monolithic approach which means that all the functionality was encapsulated in a single large application. Many of these applications have been modified to work with more modern web based interfaces however they are still effectively monoliths and as such would not reap all the rewards of cloud hosting without some transformation. There are alternative design patterns that have been published for you to research. Make sure to investigate alternative patterns such as Microservices and proxy patterns as starting points for redesign. Before you begin to develop your applications there are some rules of thumb you should follow. Remember to keep it stateless, treat data as an attached resource, scale out via separate processes, treat logs as streams, and look to supplement and redirect via a proxy service rather than scrap outright.

When you are looking to refactor an older application, start by looking at it as a collection of vertical business applications, not functional layers. This process should be eased because you have already reorganized your internal teams along business-driven lines (you did reorganize your teams - right?). By following this approach, you can create smaller, business-focused applications that can replace individual parts of the 'monolith'. Once you have these new applications you can use a Microservices based approach (such as the proxy pattern) to redirect selected traffic to the new application while allowing the rest of the traffic to travel to the older monolithic application as previously. This piecemeal replacement of the application reduces risk, effort and cost while still leveraging the advantages of a cloud platform. This is also often referred to as a self-contained systems approach.

Consider the use of modern low code/ no code (LC/NC) development platforms to create the new business partitioned applications. These platforms are designed to create innovative applications via a point-and-click interface, and are ideal for use by teams that may be business focused as opposed to application development experts.

Finally, before starting down this road, be aware that you are about to create one or more distributed applications. Careful consideration should be given to the design as many problems and issues could result if some key tenets are ignored. Don't go it alone. Seek the assistance of a qualified digital transformation firm with application development consulting and cloud transformation experience.

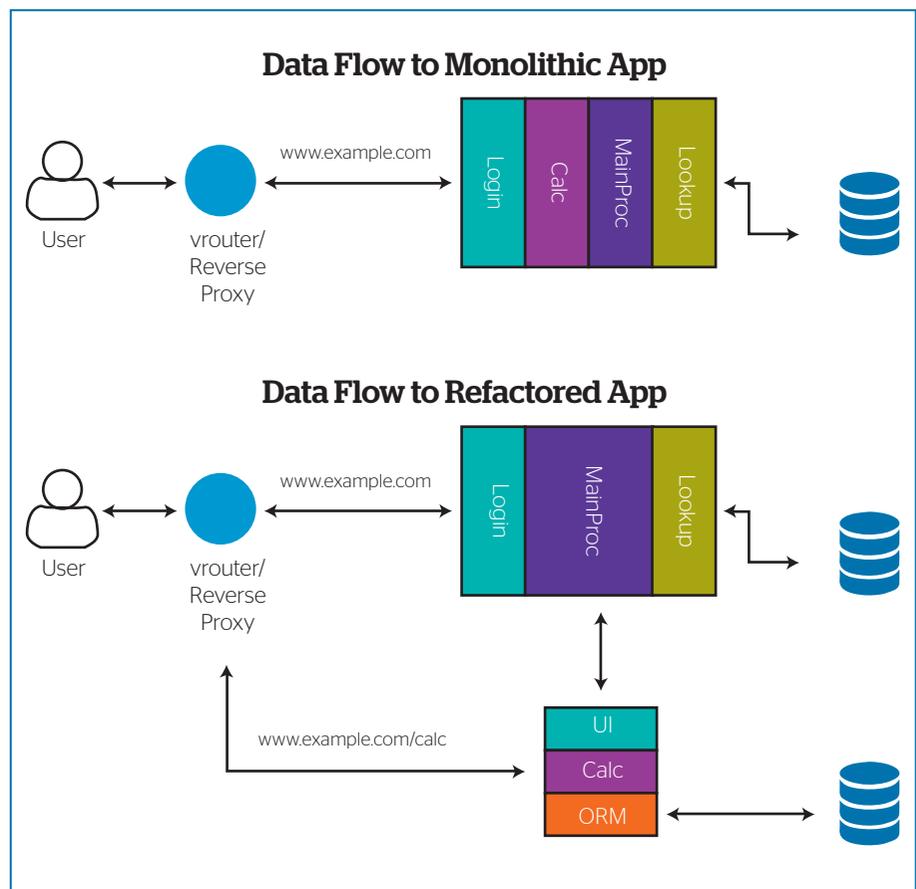


Figure 3: Refactoring by Replacement - Microservices Approach

Don't forget your data

It may be an overused phrase - but data is a business' most valuable asset. So when you decide to migrate some (or all) of your applications to the cloud, you will have to move some of your data as well, and you will have to consider how to securely connect these data sources together. Cloud migration generates some specific challenges, ranging from technical to legal.

Corporate governance and applicable regulations are the first constraint to be analyzed. Some governments and/or industries may enforce specific laws and regulations to protect data privacy and sovereignty (e.g. Global Data Protection Regulation (GDPR)), so carefully check the capabilities and certifications of the cloud provider you select.

The next consideration is how much data needs to be moved, and in how many tranches? If it is of the order of petabytes then you may need to consider moving the physical media. Some cloud providers offer a shipping service via truck for this very purpose. As always we wouldn't recommend a 'big bang' approach and most likely, your migration plan will have to mix various technical solutions, from live synchronization to cold copies and physical transport, all being synchronized with the application migration plan. Again, know your applications and keep the workloads and data as close together as possible over low latency links.

Where applications are scattered among different legacy data centers and cloud services, the issue becomes how to connect applications to remote databases, how to authenticate access and secure data exchange, and the integrity of the workloads and associated databases.

There is an entire landscape of options to be evaluated that includes:

- Distributed databases
- Application brokers
- Data integration platforms
- Data copy and data synchronization solutions

So clearly, on boarding your data into the cloud becomes a project in its own right that should be conducted in parallel and closely aligned to the workload transformation. Don't consider migrating data unless you have answered these key questions:

- Have you classified your data (in a similar way to how your applications were reviewed) to determine which sets can move to the public cloud or to which geographies?
- Will standard network access speeds and methods (such as Internet based VPNs) meet your transfer and security requirements?
- Do you have a map of your data flows to ensure that data intensive workloads remain close to their data sources?



Security without obscurity

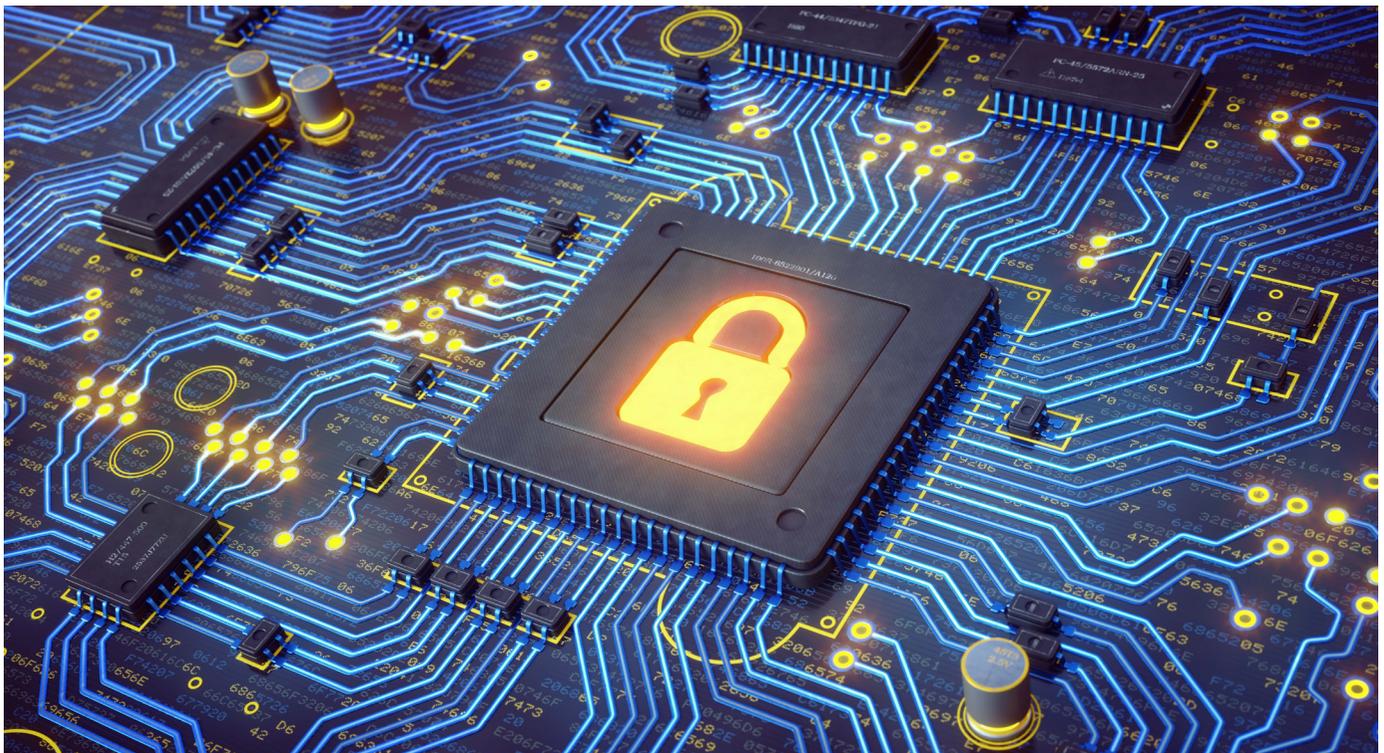
Of all the areas of computing under consideration, security is a key area to review when intending to migrate or refactor applications. There are a number of requirements that can be managed by the cloud platforms built-in features.

For example some IaaS solutions (e.g. Microsoft® Azure Stack®; Openstack) and some PaaS solutions (such as Apprenda®, Cloud Foundry® or Red Hat® OpenShift®) provide mechanisms for Identity and Access Management (IAM) and data encryption. This is yet another reason to carefully consider platform facilities when selecting the right platform(s). Some of the major cloud vendors (e.g. Amazon Web Services®) provide XaaS offerings that help mitigate some security concerns - for example the Aurora® DBaaS (database-as-a-service) provides options to ensure that data is held on encrypted storage automatically. Combine this with encrypted communications between Virtual Private Clouds (VPCs) using Access Control Lists (ACLs) to limit access to white listed addresses, and some of the security concerns can be eliminated by this standard solution. However, this can lead to your application being tied to a specific platform (or a specific platform provider) which could (in the long term) negate one of the benefits of a cloud platform.

Many application developers are increasingly using containers to deploy applications to cloud platforms because they allow dependencies to be managed by the developer. However, many container platforms / run-times need high privilege permissions to run, and a badly constructed container can expose the whole platform not just a single application to exploits.

The best advice is to follow good security guidelines, look to your partners and cloud providers to identify security features and capabilities. Ask yourself these key questions:

- Have you considered the security risks inherent in cloud computing? Do you have mitigations ready?
- Have you created or modified your security policies for the cloud?
- Have you ensured that your designers and development teams follow the good security practices listed above?

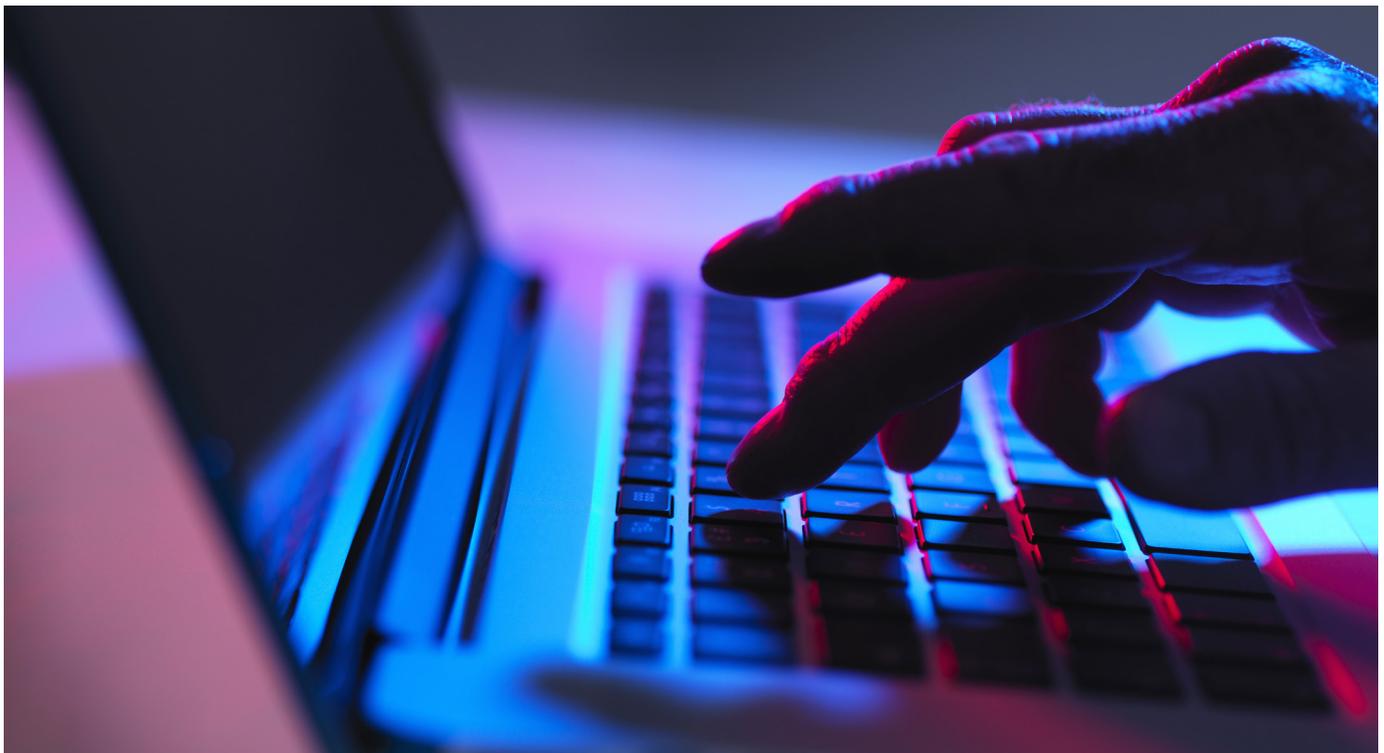


Testing as dogma

Testing is a crucial part of any strategy whether it is migrating data and workloads, rebuilding legacy applications, or creating new applications to exploit innovation or market trends. Automation is your friend here and there is a surplus of testing tools available for every phase of the software development lifecycle.

When considering migrating applications to the cloud testing can provide additional benefits in four ways.

1. When evaluating how to refactor a monolith, Application Performance Management (APM) testing can help reveal the refactoring that will provide the most value
2. When developing replacement services or modules it is essential to use a unit testing framework to create tests based on expected business outputs, an approach known as Test Driven Development (TDD). Cloud development should be organized along, and driven by DevOps methodologies such as Continuous Integration and Deployment (CI/ CD) which is again supported by many automation tools. Even if you outsource the development of your applications, don't assume that you cannot use CI/CD techniques. Using 'Infrastructure as Code' would enable the use of the same techniques (and in some cases even the same tools) to test infrastructure builds whether in the private or public cloud.
3. Follow in the footsteps of the most famous cloud native companies. Go one step further and use automated tools to continually break production systems to test recovery and business continuity processes. The most infamous tool being the "chaos monkey" deployed by Netflix that is used to test their cloud infrastructure.
4. Partner-up with experienced cloud and digital transformation service partners to benefit from their knowledge and investments in resources and technology. Many will have integrated toolsets and proven best practices with ready-to-go testing and lifecycle management solutions.



Drive multi-cloud strategies with the right orchestration

Orchestration is arguably the key concept with cloud platforms. It is the component that manages the virtual machine instances, controls and maintains the number of replicas, and scales up and down as dictated by demand and configuration.

As with all cloud components, there are a multitude of options available:

1. The most common being Kubernetes (K8s or 'Kube') for containers, and is available on most container fabric platforms, both open and closed source (e.g. Red Hat's OpenShift, Microsoft Azure, and Apprenda).
2. The Docker container infrastructure supports K8s but also has its own orchestration system known as Docker Swarm®.
3. Cloud Foundry (CF) uses a combination of Bosh and Diego to provide similar control and functionality - both for native services and containers.

A proven control plane that enables orchestration will serve you well when considering multiple regions and availability zones. But what if you are concerned about having all your eggs in one basket, or applications in one cloud? Industry surveys have shown that most cloud adopters are increasingly favouring a multi-cloud approach. This may be based on a combination of private and public cloud solutions, or based on multiple public cloud providers.

It is also good practice to always ensure that critical data is backed up on another platform which may well be an alternative public cloud. And some clouds can be used to provide an alternative hosting platform should the primary one become unavailable.

The key question is how to move operational application workloads (including the data) between platforms?

Take the necessary steps to educate yourself as to the techniques available. There are several, including some emerging technology solutions that offer new approaches to migrating applications between hosting systems.



In conclusion: create a mindset for enabling cloudification

Keep in mind the path to cloud could result in multiple projects so it is important to keep a pulse on the efforts along the way. Don't make the mistake of assuming your strategy and vision is known and embraced across the enterprise, and not subject to change. Gauge your companies understanding and commitment throughout the journey by asking yourself (and your management and fellow employees):

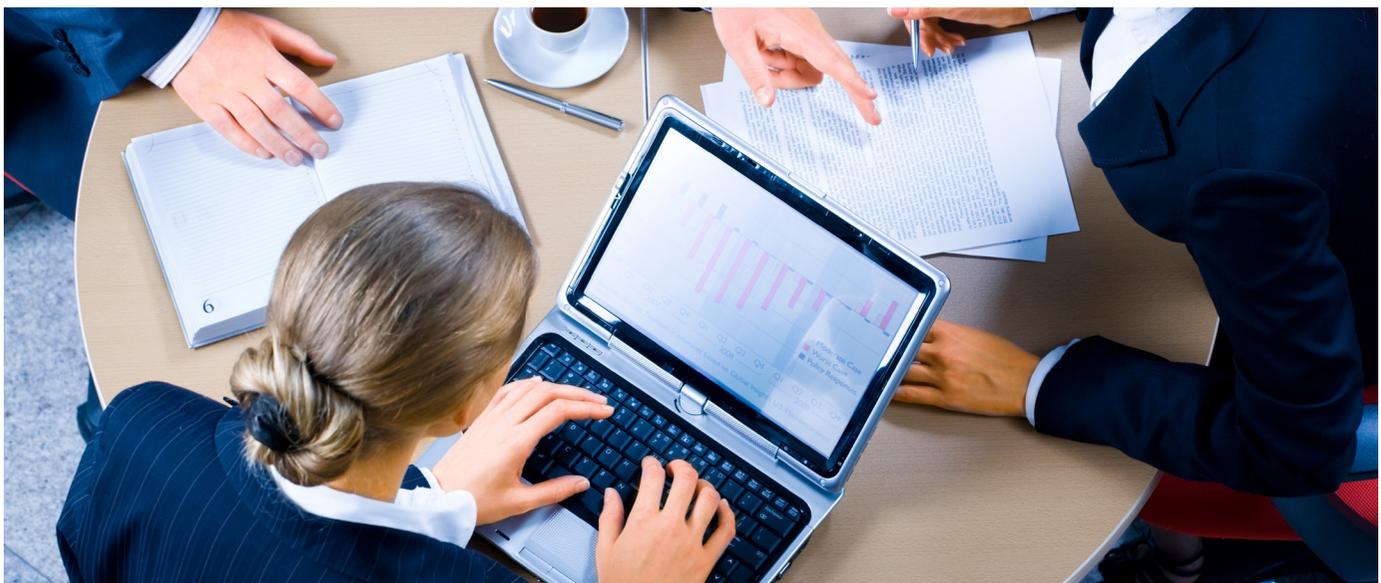
- Do I (you) have the right governance in place to ensure cloud initiatives stay core to the business?
- Are we organized into business focused service-oriented teams, and ready to embrace 'Infrastructure as Code'? Is this organization long-term and sustainable?
- Do I (you) have the competencies? Is my (your) team skilled and trained to conduct business and support at all levels of the organization? Think beyond IT.
- Do I (you) have a methodology to select the best transformation scenarios?
- Is my (your) infrastructure prepared and ready to support the data flow across cloud platforms?
- Do I (you) have any security risks, requirements, or policies that could change the criteria for migrating to the cloud?

Depending on your answers, use them to measure, change, and refresh your strategy and approach. Don't let your organization forget the reasons and risk losing the benefits to your business. It's happened before where companies have steered in other directions, redefined their business strategy, and/or abandoned or lessened their commitment to their cloud initiatives.

Hopefully these top ten tips will help you navigate the complex waters of cloud adoption and migration, and identify with the multitude of new skills necessary to develop and deliver a successful transformation. Create your checklist to ensure you cover all the critical aspects and knowledge areas for cloud migration.

- Architecture design
- Application profiling
- Cloudification techniques
- Tool selection and tool-chain design
- Security optimization
- Application design and testing
- Migration strategies

While you may be fortunate and have some (or even all) of these skills in house or have found individual consultants with the necessary experience, be sure to embrace them early in the process. Industry analysts provide a range of reports that summarize experienced partners with a history in delivering successful projects to guide you on your way. Atos is one of several service providers and ranked a market leader specializing in digital transformation and infrastructure utility services. We have a strong global base of enterprise clients who depend on our knowledge, expertise, partner ecosystem, and Atos branded technology solutions everyday. Our solutions are built just for these purposes and our techniques are proven best practices.



Appendix: Glossary of Terms

Term	Definition
ACL	Access Control List
API	Application Programming Interface
CD	Continuous Development
CF	Cloud Foundry
CI	Continuous Integration
CIO	Chief Information Officer
CPU	Central Processing Unit
CTO	Chief Technical Office
DBaaS	Database-as-a-Service
DevOps	Development & Operations
GDPR	Global Data Protection Regulation
IaaS	Infrastructure as a Service
IAM	Identity & Access Management
K8s or 'Kube'	Kubernetes
LC	Low code
NC	No code
PaaS	Platform-as-a-Service
SaaS	Software-as-a-Service
TDD	Test Driven Development
VM	Virtual Machine
VPC	Virtual Private Cloud
VPN	Virtual Private Network
XaaS	Anything-as-a-Service

About our authors



"An internationally recognized executive, with a passion for technology. Adam has delivered innovation and strategy into many of the world's largest organizations across multiple industries. Experience includes Global CTO, Business/ Technology & Infrastructure Strategy, Digital Transformation, Product Management and Chief Enterprise Architect. Adam has responsibility for Global Application Platforming which includes enabling end-to-end Application Migration strategies, selecting and defining Multi-Cloud Platforms, Creating Application Container Solutions, and empowering DevOps teams."

Adam Lewis,
VP, Global Head of Application Platforming



"An IT industry expert with more than 30 years' experience, specializing in infrastructure, automation and cloud technologies. Doug is a TOGAF certified architect. Cloud Foundry certified specialist, and is an internationally published author and researcher as well as an enthusiastic open source advocate."

Douglas Millward,
Lead Architect and Application Platforming Specialist



"An IT industry expert with a strong background in technology consulting and product/portfolio development. Diane manages a global portfolio that drives and delivers technology innovation and digital transformation."

Diane Peters
Global Portfolio Director, Technology Transformation

About Atos

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Let's start a discussion together



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