Cloud Migration Strategy

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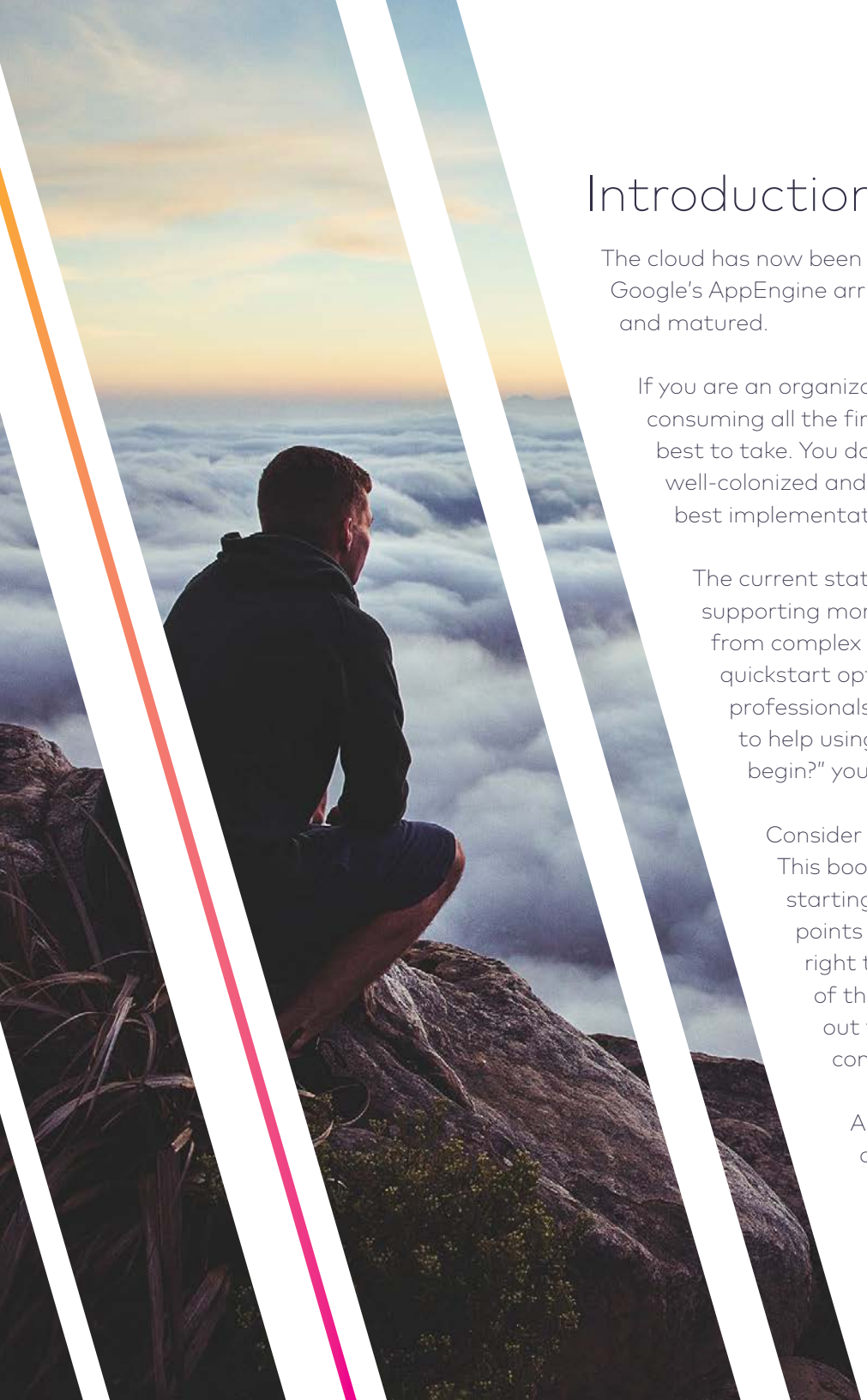


Introduction

The cloud has now been with us for a while. AWS EC2 became first available in 2006 and Google's AppEngine arrived in 2008. Since then, what the cloud is and does have only evolved and matured.

If you are an organization considering a cloud migration, you are free of the burden of consuming all the first-time risk and now take up the burden of analyzing which path is best to take. You don't have to be first to land on the moon; turns out the moon is now a well-colonized and popular destination. You do have to analyse the right trajectory and best implementation for landing your particular rocket there.

The current state of cloud maturity not only covers common business cases, but makes supporting more specific business cases possible. This does not mean that you are free from complex implementations. The landscape is a sea awash with cloud models and quickstart options to choose from. There is also a broad spectrum of experienced professionals that have lived the complexity of cloud migrations and are willing to help using their particular take on the subject. Now instead of "Where to even begin?" you need to ask **"Which beginning do I even take?"**

Consider this ebook your hitchhiker's guide to embarking on your moon landing. This book is going to help you figure out what beginning you need to take when starting your cloud migration journey along with identifying various decision points along the way. Some of the decision points may seem like simple left or right turns but mask long term implications. We will try to point out as many of the specific impacts these decisions can have. At times, we will merely lay out the implications and you will need to filter them through your specific context.

And of course you are going to overthink things. Any good engineer or IT decision-maker will do that. But also consider it an epic journey, a one-giant-leap quest to land your organization's spacecraft in the best spot possible. **Let's begin.**

Background

Before walking through the elements of a cloud strategy, a bit of background is in order on the subjects of why digital businesses are moving to the cloud, and what moving to the cloud looks like for applications.

The Digital Business and the Cloud

What is a Digital Business? At its core, a digital business is one that uses technology to gain marketplace advantage. One definition describes it as, "an organization mixing digital and physical to create new business opportunities" (Lopez).

Examples of digital businesses are everywhere. Stop & Shop is a supermarket chain in the northeast that uses an array of digital offerings to enhance the shopping experience. In-store customers can scan items as they venture through the store which directly accelerates the check-out process. You can use the Stop & Shop app to create your grocery list and add digital coupons. Stop & Shop leverages the PeaPod brand to provide food delivery to homes in some markets. They are using technology to gain the attention of a younger generation of buyers and build life-long customer buy-in. This is an example of creating a marketplace advantage while mixing physical and digital together.

Digital advantage surfaces even in the humblest of enterprises: a lemonade stand for the digital age.
I know, because I was a patron at a bistro-lemonade-stand that some enterprising young kids set up in a neighborhood adjacent to a local horse-racing track.
On top of offering lemonade to please kids, they had coffee and croissants for the adults, and free WiFi. They took fast, contactless payments via Square.

Is that a digital business or a fancy lemonade stand? It's both. The WiFi makes the venue sticky. The longer customers linger, the retail conversion rate goes up which means more sales. Additionally, using Square makes transactions easy for patrons. These kids took a classic business and used technology to drive higher sales per customer but made the experience fun and easy.

And that experience was better than any competing lemonade stands nearby, gaining marketplace advantage.

The reason you need the cloud for your business is to accelerate differentiation.

If you are a regional grocer like Stop & Shop, you need to provide a shopping experience above and beyond the experience national and other regional competitors are providing. Here there is a classic grocery-getting experience of shopping in the store, and an enhanced digital experience that may involve an app or digital service.

As a classic grocer, your core IT capabilities are focused on supporting the classic experience. This means your enterprise resource planning capabilities are centered on managing physical buildings, delivery of food products, managing vendor relations, and supporting other business activities. Yet cloud providers are not just a platform for core IT services. They extend one's reach to enable a robust customer experience. They provide customer engagement capabilities, developer tools, mobile services, internet of things, marketing analytics, business forecasting, and even robotics technology. This direct business enablement means that a classic grocer or any business can have an accelerated delivery of digital capabilities.

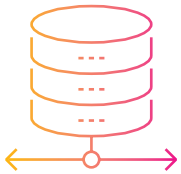
This is why a cloud migration strategy is important for aspiring digital businesses. The development of the strategy allows the aspiring digital business to take their best business capabilities and expand them in various dimensions — features, markets, even brand new businesses — beyond what could previously be attained.

Cloud Migration Options

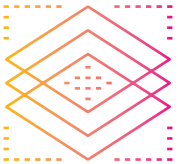
Since cloud technologies have been with us for more than a decade, a handful of migration options have coalesced into **six primary paths** for an application moving to the cloud. These are known as the **6 Rs** (five of them were originally described in a 2010 Gartner article). Your overall cloud strategy will dictate which 6 R path, or likely combination of paths, an organization will use for moving their applications to the cloud.

Retain

Retire



Rehost



Replatform

Refactor (Re-architect)

Repurchase

Retain

This option means you do nothing. The application in question may gain little from any sort of migration. There could be several reasons for Retaining applications, including a product line reaching end-of-life, or the technology of the solution space has not evolved. You may also just need to revisit the solution in question at a later date. As the rest of the organization migrates to the cloud, changes in the surrounding ecosystem will impact the value proposition of choosing to retain an application, and you can reassess from there.

Retire

You may just retire a solution. This means you no longer need the solution. It may be discovered during a migration that redundant IT solutions are simply still out there consuming resources in the enterprise. It could be that in the process of performing a repurchase to replace another system, the new system also performs the function of another existing IT solution, which you then decide to retire.

Rehost

This is the classic "life-and-shift" approach. You rehost your current application in the cloud without using any of the cloud provider's extended capabilities. Often enterprises choose this tactic because it is simple and obvious. This strategy is no different than moving your workloads into a co-location facility. It may be a simple matter of moving VMs and there are several tools that can perform this action. Often, there is still some installation and configuration changes in order for applications to function in the cloud.

Replatform

This approach is a variation on Rehost. Instead of an almost pure lateral move that Rehosting implies, when you Replatform you make low-cost, low-complexity changes to the application to leverage features from the cloud. For example, when Replatforming you might keep the core application as-is, but use a cloud provider's managed database service or managed file server instead of moving the on-premise capability into the cloud.

Refactor (Re-architect)

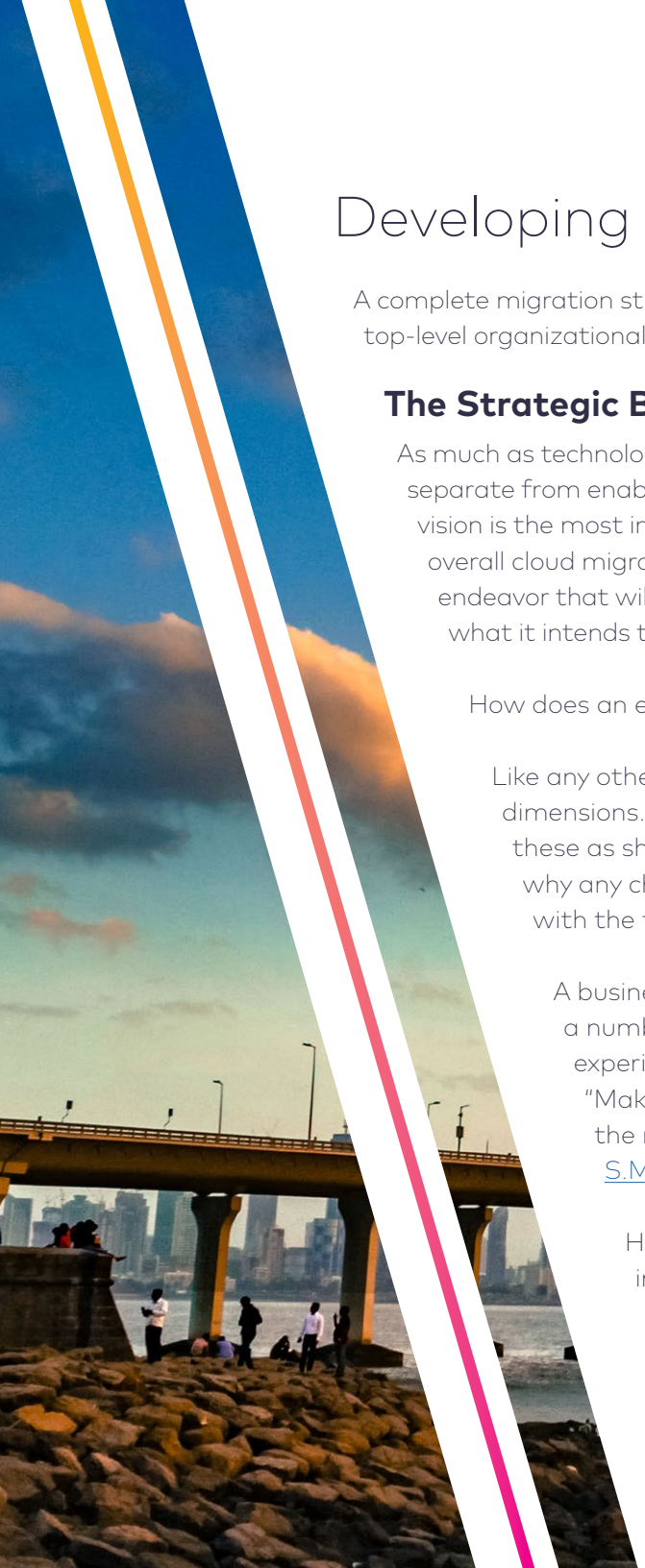
This migration option means you take the existing application and re-architect it for the cloud. You apply cloud-native techniques and technologies to create the application anew. This provides the most cloud leverage and has the best chance of providing the highest return on investment. It is often pursued when an organization decides to "strangle the monolith" and refactor the application into several smaller, agile components that take advantage of fast deployment, scaling, and other cloud benefits.

Repurchase

Performing a repurchase often refers to completely abandoning an existing system for a new functional equivalent. When the functional capabilities of an existing solution provide no strategic differentiation when compared to a new cloud variant, repurchase can be a good choice. A common path is to discard an existing on-premise application for a SaaS solution. Repurchases could also be changing to a different managed offering from a competing vendor, or choosing a new SaaS provider.

An Emerging R: Relocation

As organizations have adopted packable runtimes another migration option has emerged. Relocation is similar to Rehost if the majority of the enterprise's applications are packaged as containers - pursuit of cloud native pre-cloud. If the organization has already embraced a container orchestration technology (especially Kubernetes), the workloads can be easily relocated to a cloud provider's managed container orchestration offering. Coincidently, this implies that an organization has the foundations to pursue a multi-cloud strategy at the beginning of their cloud migration. In addition to just containers, many Cloud IaaS now have robust VMware Cloud support that allows those workloads to seamlessly move to the cloud (see the example of vMotion that can do live migrations of VMs under certain conditions).



Developing Your Cloud Migration Strategy

A complete migration strategy is not just a technical endeavor but an organizational endeavor. Here, we will describe the top-level organizational, business and technical components that should be considered when developing your cloud strategy.

The Strategic Business Vision & Goals

As much as technologists want to have fun with new, exciting technologies, migration should not occur in a vacuum separate from enabling business needs. Exploring the strategic needs of the business and articulating it into a business vision is the most important prerequisite for developing a cloud migration strategy. The vision and goals inform the overall cloud migration strategy and the many detailed decisions made along the way. A cloud migration is a non-trivial endeavor that will transform how the enterprise delivers technical solutions and the enterprise should have an idea of what it intends to accomplish. This also allows an enterprise to know when the migration is "done."

How does an enterprise create a strategic vision around the cloud?

Like any other non-trivial initiative, an organization needs to develop strategic business goals in two dimensions. First, the goals for the future of the business without regard to any technology. One may consider these as shareholder goals or aspirational goals. These are important as north star statements that guide why any change is enacted. Secondly, a set of goals specific to the cloud migration. These should overlap with the first set of goals with added details that may reference technical execution.

A business centric goal for a telecom might be, "Differentiate ourselves in the marketplace by creating a number of self-service options for mobile plans and billing so that each customer has a tailored experience." A corresponding technical goal to speed the release of self-service options might then be, "Make applications cloud-native and automate releasing new features using Continuous Delivery in the next two years." This second set of cloud-specific goals narrows the focus and should therefore be S.M.A.R.T goals — Specific, Memorable, Achievable, Relevant and Time-bound.

Here there is nothing surprising or different than any other goal creation process. What is more important is that the enterprise has a successful goal creation process. With goals in hand, you formulate a vision statement that will be part of the first enterprise messages concerning cloud migration.

Choosing the Leadership

Who should lead this migration effort? The answer to this question is organization-specific, but there are some points to consider when picking between the groups of people that will sherpa your migration.

The opening salvo in chapter sixteen of *Accelerate* states that "Leadership really does have an impact on results..." (Forsgren et al.). Often organizations get lost in the technical activities involved in performing a migration. But a cloud migration necessitates a transformation of the organization itself. Thus, a transformation that is strongly led is always preferred over one that focuses on the finer points of technical implementation.

Before we look at what we would consider best practice for leadership, let's look at some of the common answers to the question of who should lead cloud migrations.

Business Led:

A western corporate model typically suggests a top-down approach: that the business portion of the organization should lead the cloud effort. This is sensible because the "business" is responsible for making shareholders and various other stakeholders satisfied. Because they understand client value and business vision in the marketplace, they have the best grasp on which features and applications have priority for cloud implementation.

But then moving to the cloud is by nature a highly technical move underlying all business value. It requires careful consideration for the architecture and technical details to move forward. If a migration is business led, how will you also account for the tech side of things?

Even though you need involvement from digital gurus, Nathan Furr devotes an entire article as to why putting them in charge may not be best, titled,

"Don't Put a Digital Expert in Charge of Your Digital Transformation".

He suggests that a different leadership model outside of pure "tech" is more appropriate.

Application Team Led:

Here "application teams" are groups that perform the technical work of creating applications but are not generally involved in managing the underlying storage, compute, and networking. They are the technical organization that the business team interacts with. So from a business *and* technical perspective, at first glance it may make perfect sense to have them lead the cloud effort.

However, the application team is rarely involved in conversations regarding the strategic benchmarks that have been set across the enterprise. How many "market window target" meetings are filled with backend developers? The vice president of engineering (or equivalent) may be in those strategic meetings, but they are also removed from the nuts and bolts of trunk-based development or triaging performance bugs. They likely won't make the best cloud-equivalent tool recommendations for lower-level architecture.

Essentially, there is a sense of blindness from picking either a business or application team-led approach.

Infrastructure Team Led:

What about the cloud implementation being led from the infrastructure team? Depending on the structure of the organization, the infrastructure team may provide the rationale for the cloud migration. IT is attempting to support application creation and sees the request for capabilities. They also see the requests for configuration changes, and are responsible when things go wrong. With the cloud's focus on platform and infrastructure, it seems like IT could lead this effort.

Unfortunately, infrastructure-led migrations are typically like-for-like IaaS migrations. The cloud is treated as a co-location facility that provides none of the actual advantages of using the cloud that application teams might implement. As well, infrastructure teams are typically the farthest removed from understanding the market, client concerns and business value.

Leading With a Guiding Coalition

None of the previous leadership models was a perfect fit. Yes, the business is directly responsible for revenue generation and guides where the organization goes, but if the infrastructure team is passively-aggressively resisting cloud implementation, failure is guaranteed. Application teams may love the prospect of full cloud native development, but the business side doesn't understand the cost-to-value proposition, and so it resists the investment. What is an organization to do?

The problem of executing change in the enterprise is not a new one. One of the leading methods to tackle change across the enterprise is to build a dedicated team to enact the change according to the 8 steps described in the Kotter Method. The Kotter Method specifically describes creating a guiding coalition to lead change.

The guiding coalition is your change agent dream team for cloud migration. The guiding coalition should be composed of individuals from different job titles (tech and business) and different skill sets from across the enterprise. Their function is to shepard this organizational change through the enterprise (because moving to the cloud is also an organization change). The coalition should be free from having an internal management hierarchy with no one semantically leading the coalition. It should be self-organizing, and as a unit, lead the cloud migration.

The guiding coalition intentionally breaks the operating hierarchy of the organization. As Kotter points out in the article "*Accelerate*!", ***...strategy implementation methodologies, hung on the hierarchical spine, are not up to the challenge of managing speedy transformation... Mounting complexity and rapid change create strategic challenges that even a souped-up hierarchy can't handle*** **(Kotter).**

Hierarchies laiden with the conditioned politics of the organization at large don't do well at enacting the speedy change that successful cloud migrations require. In fact, the guiding coalition's cross-organizational and democratic nature make it the best group to create the strategic business vision. Because they represent a cross-cut of the entire organization, they have the clearest vision from both the business and technical side. They also have the credibility to drive messaging throughout the enterprise.

As you progress on your migration journey, your organization will gain experience and reach certain milestones in the cloud. At this point you may want to create another body called a **Cloud Center of Excellence (CCoE)**. This group is similar to the guiding coalition, but different in a few ways. The CCoE is created by the guiding coalition as its successor organization. The guiding coalition was focused on shepherding the organization through the cloud migration. However, once "done" was achieved (a milestone created by the guiding coalition) their mission is over and the torch is taken up by the cloud center of excellence. The CCoE acts as leadership in future cloud architecture, as well as a community that helps define and promote best practices throughout the organization.

Migration Assessments

Since the cloud migration vision does not enumerate the technology stacks or cultural changes for the migration, you will need to perform individual application and enterprise skill assessments to determine how your future cloud will come together.

Application Assessments

What you are attempting to migrate to the cloud is business value. Some business value is bound up in internal business operations applications, and some is in customer facing applications.

To determine what apps hold priority to migrate, you'll need to perform an assessment of your entire application portfolio. The assessment will help inform elements of your cloud migration strategy. Essentially, this will involve the creation of an assessment rubric or checklist for each application. This checklist will score the applications in various areas such as complexity, business importance and risk. The scorecard may also assign which "R" migration option is determined appropriate.

Each enterprise will have unique factors they use to score application suitability for migration. For example, if an organization assigns value to an application according to the number of client-facing features in the pipeline, they may use an upcoming feature count to prioritize migration.

Usually creating such an agreed-upon checklist is not an easy task as everyone in the organization has their own agenda and considerations for priority. Overall goals and vision should be a northstar guide here, though it should also be well-informed by underlying technical considerations. Once criteria is created and scored, ideally you can then create a ranked list of the applications that should be migrated first.

Decomposing and Multiple Rs

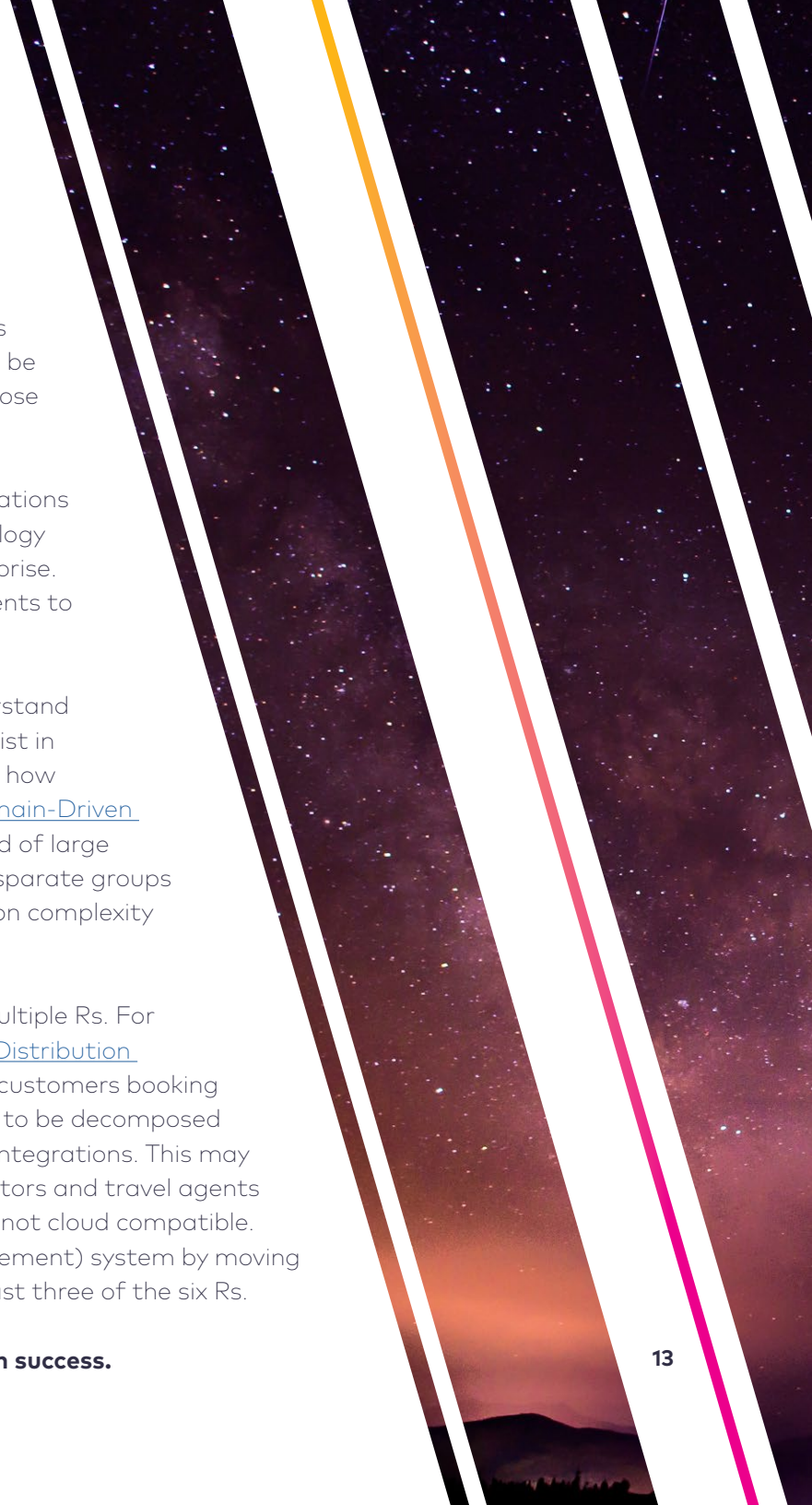
As a part of assessment, you'll want to decompose your applications to understand the technology used, IT impacts, and the different domains it is a part of. Decomposing an application can be a difficult task if most of your applications pre-date microservices architecture. However it's important to do this decomposition to understand the nature of your portfolio: how applications might be moved to the cloud with the 6 Rs, and the complexity and risk that is involved in those movements.

The most obvious decomposition is understanding the technology that your applications are composed of. For example, if 70% of your applications are of the same technology (e.g. Java WARs) then you have a path to identify commonalities across the enterprise. Technology helps determine how migrations could be chunked, and which movements to the cloud are easiest to pull off without completely refactoring.

Additionally, this may be the first instance where someone attempts to fully understand the different contexts monolith applications are used across the enterprise. To assist in decomposition one should consider using the notion of Bounded Context to model how enterprise domains are broken out. Bounded Context is a concept taken from Domain-Driven Design which allows organizations to design complex software solutions composed of large domain models and teams. Some of your monoliths may provide capabilities to disparate groups within your enterprise. This level of decomposition will inform the level of application complexity and business risk.

As you decompose each application you may discover that you may need to use multiple Rs. For example, an airline may want to fully embrace the advertised capabilities of New Distribution Capability (NDC), an XML standard that helps push better digital experiences for customers booking travel. Let's say the airline has an existing vertical monolith application that needs to be decomposed and migrated. Some integrations like satellite uplinks have non-cloud compatible integrations. This may mean they decide to Refactor portions of the monolith to enable content aggregators and travel agents using the NDC standard, while they Retain fleet communication systems that are not cloud compatible. Additionally, they may want to Repurchase a CRM (Customer Relationship Management) system by moving to a SaaS solution. Breaking apart the airline's monolith will then depend on at least three of the six Rs.

Decomposition allows you to determine which of the Rs are required for migration success.



Measuring Complexity

You'll need a means to score the complexity of the individual applications for migration. This scoring is required even if you intend to migrate the entire application portfolio. Admittedly, complexity is a subjective term and will vary by enterprise. The scoring should be tied to your organization's capability and skill-set for making the cloud move. This is another benefit of decomposing applications: individuals will have opinions on what complexity means and decomposing will force you to reconcile those definitions.

Eventually, you'll determine that your application portfolio is composed of applications along a scale of simple to complex. Simple applications make for quick wins. You should always try to prioritize a few quick wins early on in your migration. But also keep in mind that simple applications do not test your migration due diligence. They do not test your organization's ability to migrate. On the other hand, choosing the most complex application will challenge your organization unnecessarily without having a great deal of experience. Therefore, outside quick wins, one of your early migrations should include an application that is complex enough to test the migration process, but also has a good-sized chance of migration success.

Importance and Risk

An intangible value to measure for an application is importance. Specifically, how important is this application to the enterprise? It doesn't matter if the first few applications you migrate are of little consequence to the enterprise. The larger goal is that your cloud migration will drive transformation within the enterprise. Therefore, among the first migrated applications there should be at least one application that has inherent enterprise-wide visibility and importance.

This does not mean choosing the most complex application. The application could be low complexity but the enterprise visibility is quite high. A successful migration of an important application furthers the cause of migration by bolstering the overall vision for what is important, why we are making the move, and how other applications can do the same.

Another business specific intangible to quantify is risk. What happens to the business if this migration fails? This can be a crippling conversation. Your digital business needs the cloud, but does not want to become undone by the cloud. Maybe your first migration attempt is also an application that drives the most revenue and is therefore risky. However, you may also see marketplace pressure that the cloud migration unlocks new capabilities, so you take the chance. The point here is that [3] you need to factor for highly contextualized risk defined by the enterprise in your scoring methodology for each application.

Skills Assessments

What cloud skills does my enterprise possess? Your organization may desire to use the cloud but be at a loss as to how. You may have to use partners or new hires to fill the skills gap. First you need to identify what that gap is. And while it may appear obvious that you don't have anyone with cloud skills, in this day and age you could very well have untapped or unidentified cloud skills hidden in your organization. Additionally, you may have people with cloud-compatible skills in areas like networking.

Your guiding coalition should partner with human resources (or whoever is responsible for learning and development) to perform a skills assessment identifying employees that can help execute the migration. If employees show some level of cloud experience or compatible skills, it may be that the remaining gap could be filled with training alongside the migration. The need to assess and train internally is seen by some researchers as needing "to build the next new professional corporate function: reskilling" (Dua). As you build your cloud roadmap, you will need to determine the impact of skills gaps and training on the ability to execute.

Selecting a Cloud Provider

Having performed application and skills assessments, your next technical decision is selecting a cloud provider (or providers). Each cloud provider is different, with different global footprints and capabilities. The application assessment informs what capabilities your applications will need from cloud providers in the migration, but it does not inform future needs. The difficulty for organizations new to the cloud is that the large cloud providers are also indistinct in the commodity cloud IaaS areas of network, storage, and compute.

Your provider selection process should focus on the true uniqueness of each provider and how they mesh with your current applications and future tech endeavors. Consider the following questions as you choose a provider.

- Does the provider have capabilities that natively integrate with existing systems?
- Does the provider have a service that drastically reduces what I need to migrate?
- Is the provider a leader in the technical area I want to exploit in the future?

As your application assessments demonstrate a certain level of due-diligence, your cloud provider selection should be the same. You may even need to account for political or business concerns in selection. Two cloud providers may be equally capable of delivering technical capabilities, but one of the providers may have a business ecosystem that competes with your core business.

Finally, do not preclude that you may become a multi-cloud enterprise that uses the strengths of different providers for various use cases. Your organization may desire to use offerings from AWS to build customer-facing apps, leverage GCP for machine learning, consolidate Active Directory Forests with Azure, and run business support apps on Azure.

Choosing the Right Partners

Choosing the right partners and new talent for a cloud migration is arguably more important than choosing the right technology.

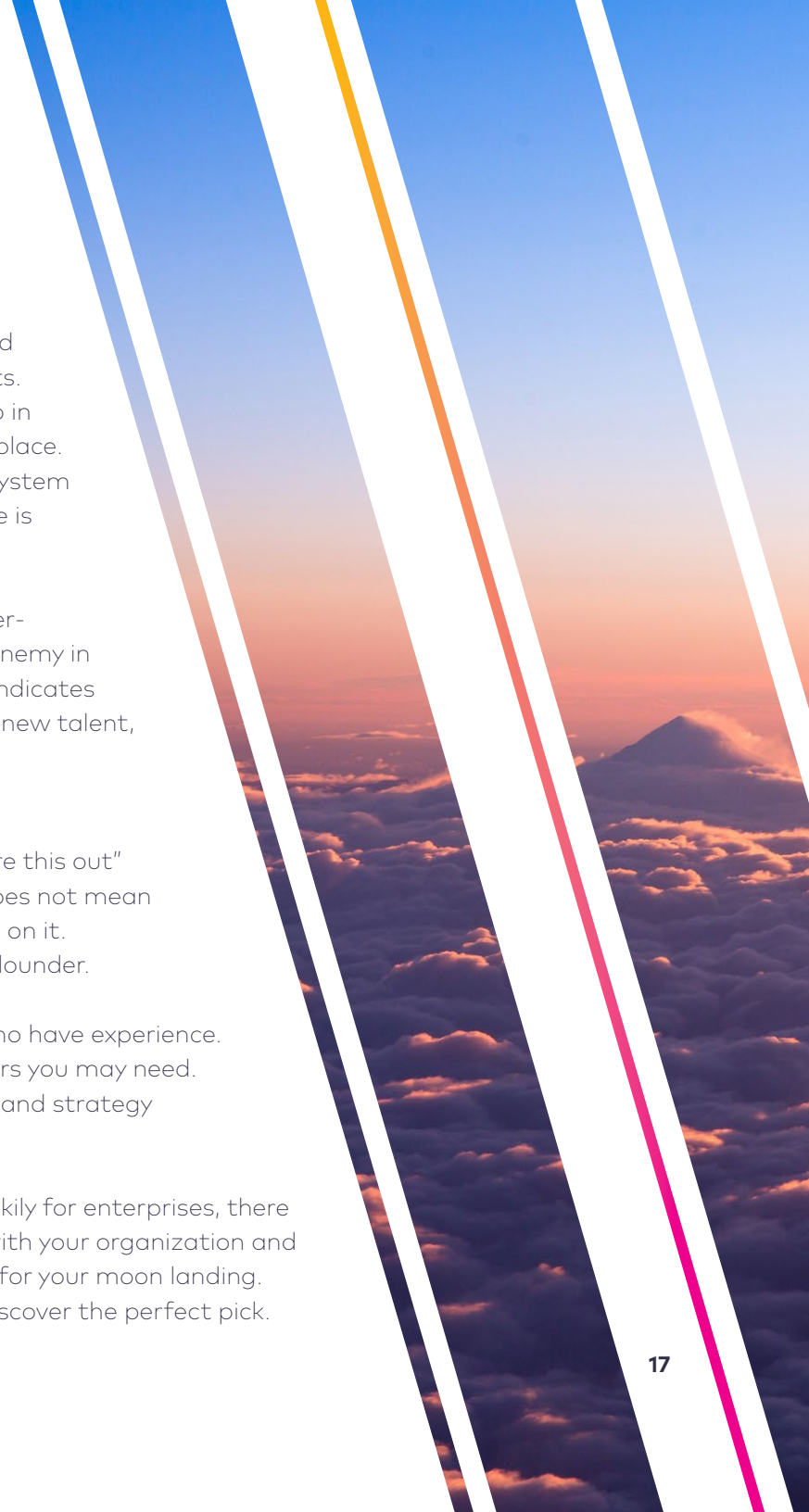
Earlier we discussed skills assessments and associated capabilities gaps that should be identified. One path to fill this gap is bringing on board new talent or consultants. Some organizations attempt to hire the *best technical* people money can buy. Keep in mind that you are competing for talented individuals with everyone in your marketplace. As a McKinsey study points out, "For superstar firms, the rise of the superstar ecosystem is a harbinger of an intensifying war for talent and resources" (Ramaswamy). There is also an arguable difference between talent and experience.

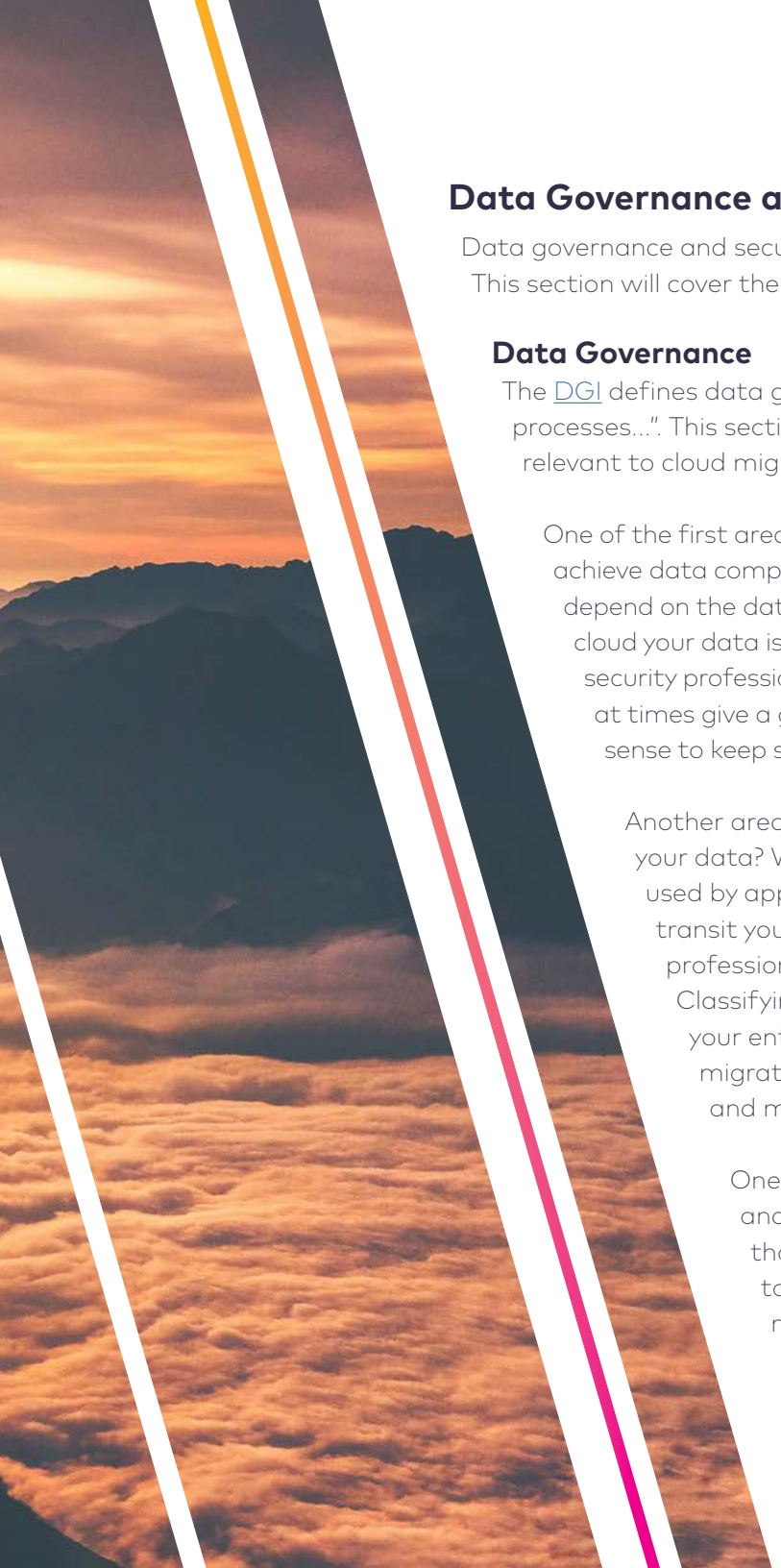
Three highly experienced individuals of average capability can out-execute five super-talented individuals. Always remember what our logical friend Spock said of their enemy in *Star Trek II: The Wrath of Khan*: "He is intelligent, but not experienced. His pattern indicates two-dimensional thinking." Beware of intelligence with no experience when finding new talent, as it invites two-dimensional solutions in the cloud.

A Forbes article affirms Spock's conclusion when discussing reasons for why cloud implementations fail: "Mistake #3: Our people are technically savvy – they can figure this out" (Fleece). Assuming you have the smartest people in the world (or can hire them) does not mean they have the experience to create an entire cloud implementation plan, or execute on it. The critical error of going in with a lack of experience can cause your migration to flounder.

The solution is partnering with the appropriate vendors and consulting partners who have experience. Performing organizational skills assessments will inform you of the types of partners you may need. If you have a cadre of technical skills internally, you may just need technical leaders and strategy consultants that have experience with your particular size and type of migration.

Luckily for enterprises, there are many partners available in the marketplace. Unluckily for enterprises, there are many partners available in the marketplace. Picking a good one that meshes with your organization and has the right experience to fill this crucial role is a bit like selecting a pilot and crew for your moon landing. You can't do it lightly. It may take some time to interview all the consultants and discover the perfect pick.





Data Governance and Security

Data governance and security are broad topics that are also top-tier items in your cloud migration strategy. This section will cover their analysis in brief, but is not meant to be a comprehensive discussion.

Data Governance

The DGI defines data governance as "a system of decision rights and accountabilities for information-related processes...". This section will highlight some areas of inquiry for data accountability and governance that are relevant to cloud migration.

One of the first areas for evaluation is around your current regulatory compliance. Your organization can likely achieve data compliance capabilities in the public cloud similar to what you have now. Some organizations depend on the data being within their logical *and* physical walls to meet compliance needs. With the public cloud your data is within your logical walls. The lack of physical possession may cause some information security professionals to object. Your ability to monitor and protect data within your own four walls may at times give a greater needed control than what the cloud can offer. If this is the case, it may make sense to keep sensitive data and apps on-prem but move other less sensitive applications to the cloud.

Another area to explore is data classification. Do you have granular data classifications concerning your data? When you start using the public cloud you will move or generate data in the cloud to be used by applications elsewhere. This means data should be within your logical boundaries but may transit your physical boundaries. Mapping out and defining data classifications will help SecOps professionals identify when data transits are proper and should be allowed versus not allowed. Classifying data will also help you obtain more transparency on how data is used throughout your enterprise, and may give you the opportunity to review data quality. In the cloud migration context, this classification exercise can occur alongside application assessments and may inform what applications components can migrate to the cloud.

One big motivator for your business data being in the public cloud is using cloud-delivered analytics. The major cloud providers are offering business intelligence tools and services that used to require million-dollar on-premise solutions. The cloud now makes analytics tools much more easily attainable, so it makes perfect sense to use them. But it also means you need to take careful data security protections with those analytics and to classify the data according to sensitivity.

Security

Some research suggests that companies are, "delaying cloud deployment due to a cybersecurity skills gap" (Columbus). Regardless of any skills gap, you need your existing infosec organization to be cloud capable before the first application migrates to the cloud. It is easier to do it the right way first than retrofit after the fact.

Security concerns in the cloud are similar to security concerns you already have. What follows are just a few specific recommendations that should be accounted for in a cloud migration.

Expanded Identity and Access Management

Your enterprise's Identity and Access Management (IAM) solution will need to expand to cover cloud providers. This is obvious. However, an organization should take this opportunity to expand SSO and the usage of temporary access tokens for greater security and control. Choosing this approach means that passwords never exist outside of the corporate IAM solution. Even in cases where dedicated identities are needed for administrative functions for a cloud provider, those instances should allow for multi-factor authentication.

Guidelines for multi-factor authentication using transient token assertions can be found in the NIST publication series 800-63-3. Additionally, this collection of publications offers guidelines that enable the creation of identity aware and context aware access controls often discussed in the context of Google's Beyondcorp. Delivering these types of expansions can occur independent of a cloud migration because they inherently benefit the security posture of the entire enterprise.

Automated Anomaly Detection

An organization should choose to augment their security organization and processes by leveraging solutions that provide anomaly detection. Anomaly detection solutions attempt to identify rare, outlier events against the established norm. These machine learning based solutions also create a subtle but powerful mitigation against new and emerging threats your security organization may not be current on. Anomaly detection also frees security professionals from chasing every false flag event that occurs, and allows them to focus on preventing simple human errors via automation and detecting advanced persistent threats. As cloud, hybrid cloud, and multi-cloud scenarios become more common, threats are more complicated to defend against, and automated anomaly detection fills known and unknown gaps.

Security by Default

One security benefit of "the cloud" is that it is configurable and versionable. This is because you can use the control plane and API to configure resources in your IaaS. The configuration can be captured in static files and those files can be versioned. This provides an organization the opportunity to define security elements in that configuration and track configuration drift that could lead to unsecure conditions. This is of course another benefit of Infrastructure as Code (IaC). You can configure security by default.

Network Security

Many enterprises have properly configured TLS at the edges but not always internally. Using the cloud will often result in extending the logical boundaries of the enterprise beyond the physical boundaries, and so pursuing a robust TLS throughout the enterprise is preferred. Along with a robustly configured TLS one also needs a robust DNS (essentially DNSSEC). These elements plus the previously mentioned context and identity aware controls enables an organization to achieve a zero-trust computing environment.

Messaging Within the Enterprise

One of the first tasks of the guiding coalition is to determine how they will message the cloud migration throughout the enterprise.

The move to the cloud is going to be applauded by some and opposed by others. Therefore you need to be able to communicate the vision across the enterprise. Kotter identifies this next step as, "Communicate the vision and the strategy to create buy-in and attract a growing volunteer army" (Kotter). As soon as the enterprise commits to the migration the enterprise needs to hear about this new endeavor for buy-in. The initial communication should initiate a sense of urgency throughout the enterprise. It is also the guiding coalitions' first marketing message. In an article written by Leslie Zane, she associates corporate brand recognition in the marketplace with ideas in the workplace and states:

The sooner brands begin building positive associations in the subconscious minds of customers, the better. In the workplace, the "first-mover advantage" is just as valuable. The more time you spend accumulating positive associations about your idea, the larger its brand matrix will be by the time the decision is made (Zane).

It's the guiding coalition's job to create and build these positive associations. As people in the organization see the cloud migration as a positive effort they will proactively support the migration. They will volunteer. If they don't see it as a positive change, they will likely resist the effort and the associated changes that will happen in their job.

It's important that the guiding coalition creates a communication strategy. A communication strategy is an organizational enablement activity whose scope deserves its own ebook. However, one tangible item that aligns with the cloud migration is a communications kit.

Creating the Communications Kit

A communications kit is more than a series of quarterly progress emails corporate wide. It is the vehicle by which the guiding coalition extends its organization influence. What could be in the communication kit will vary by organization, but may include:

Board meeting presentation materials

- A cloud migration is a digital transformation event that impacts shareholder value, and it is key to also share this vision with the entire organization

A migration micro-site

- Tells the business story of the migration based on the goals and vision
- Shows the roadmap and progress
- Contains blog articles written by employees involved with the migration

Email messaging

- Messaging around regularly scheduled migration events
- Special messaging around successes, including both small and big wins
- Messaging meant to connect individuals to the future potential at the end of the migration

As the migration progresses you will have additional messages. Some will be about how the organization is changing (preferable for the better!). Others will be around enabling a volunteer community of practitioners — for example, you might advertise a best practices wiki for the community to update. Some of those volunteers may opt to bootstrap the aforementioned cloud center of excellence.

It cannot be overstated that effective communication within the enterprise is important during the massive change that cloud transformation brings. The guiding coalition's most important task is effectively and transparently communicating the urgent need of the ongoing cloud migration.

Workshops, RoadMaps & Action Plans

So far we've discussed high-level topics like successful leadership, tackling security, and examining the applications. There are many other details involved in a migration that are specific to your organization's journey. How do you discover those details? Once you discover the details how do you make them actionable?

Workshops

Anyone that has spent time in a large enterprise has heard the term workshop. Essentially, you get the right people together in the same room — and more than once. Nothing sparks ideas and collaboration than people in the same room trying to determine how to move an enterprise forward.

The sections of this ebook align to high-level workshop tracks. As this document outlines, one of the first agenda items for your cloud migration workshops is identifying the strategic business vision and goals for the migration. Other workshop sessions could be around assessing applications, determining existing cloud capabilities, domain modeling, and determining what the security and data governance implications are with using the public cloud. Workshops may go outside the scope of this ebook into things like application architecture and automation of CI/CD pipelines.

Obviously, workshops do not occur in a vacuum. There will be research and discovery before, during, and after the core set of workshop sessions. The strategy workshops should produce a series of next steps, research areas and milestones. These enable you to create you an overall cloud migration strategy and produce roadmaps and action plans that detail the steps along the way.

Action Plans & RoadMaps

Next steps should be explicitly described in an action plan. Your Cloud Action Plan will include an array of activities required to make the cloud migration successful. This includes both people-enablement activities around training and communication, as well as raw technical activities like network configurations. Some items on the action plan may be research and development activities that lead to more actions. This is consistent with any organizational transformation where all the answers are not known.

The roadmap is composed of items in the action plan mapped out by estimated start and end dates. The roadmap describes the starting state and also defines what "done" looks like. Between the two points in time, it describes the targets and indicators for each major step in the journey.

You can have several roadmaps. One for the entire migration and one for every sophisticated application you are migrating. You can have a roadmap for the training and up-skilling plan. The better the actions on a roadmap are defined, the better you can illustrate temporal relationships and dependencies across several roadmaps.

Executing the Strategy

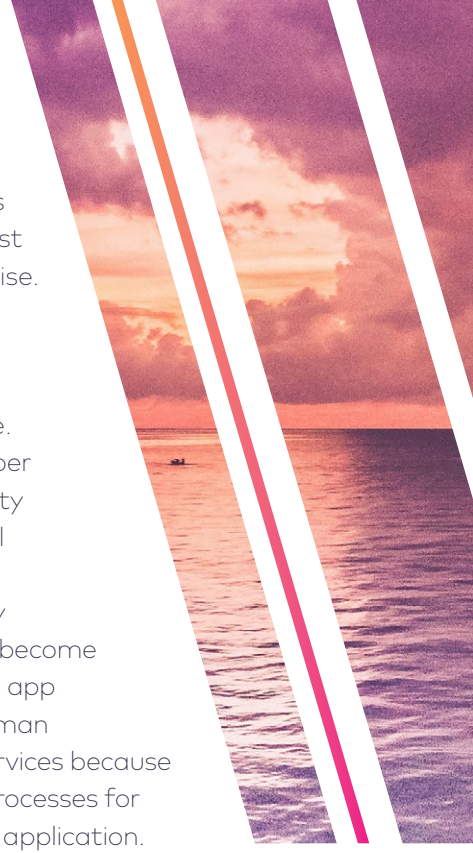
You've now developed a strategy for your cloud adoption/migration. You've wrangled all the organizational players together, identified what business value needs to move to the cloud first, and determined the goal state of a completed migration. From your strategy development efforts, you've drawn a potential roadmap and action plan. Executing should simply be trying to follow that roadmap. However, there are a few key points to consider as you go along.

Hidden Refactoring Opportunities

In the background material regarding migration options and in the sections on application assessments, we described *Refactoring* as a migration option for existing applications. Also consider the possibility of refactoring an existing business process.

Opportunities to refactor a business process will occur almost naturally and spontaneously. This is also why messaging throughout the journey is important. As different corners of the enterprise become aware of cloud-enablement and new capabilities through continual messaging, individuals will choose to leverage the new capabilities has they arrive. Leveraging these will inevitably create opportunities to stream-line business processes.

To illustrate, let's walk through a real-world example. As part of a cloud migration strategy, a retail organization realized they needed to get a better understanding about who had access to what within the enterprise. Ostensibly, the project involved a non-trivial upgrade of backend authentication capabilities. A group of enterprise identity engineers went to work. In the midst of solving for all the complexity of implementing a single sign-on backend in the cloud accessed by myriad applications, the real gap was identified: it was one of process. Employees had too many interfaces to interact with just to credential themselves within the enterprise.



During the same period, one of the cloud provider's built-in PaaS solutions for single sign-on became available to the enterprise. So, with forgiveness in mind, a single developer sallied forth and created an employee identity services app that even included some payroll features. This application was mostly a user experience that interacted with all the newly replatformed and refactored APIs that had become available as part of the cloud migration. The app directly resulted in fewer support calls to human resources, pay roll, and corporate identity services because the undocumented web of interfaces and processes for authentication were collapsed into that one application.

Most of the enterprise identity team originally working on the complex solution was working tangentially to the cloud. They were trying to refactor an existing process within their own siloed domain. Eventually the messaging around the new PaaS single sign-on capability and app implementation reached them, and sparked a eureka moment within that team. The team could deliver their customer-facing value using the new PaaS solution without ever having to engage the broader IT organization.

What's apparent is that this spontaneous business value generation could not have been predicted and accounted for in a cloud migration strategy or action plan. It was a short-cut to business value discovered along the way. The act of migrating to the cloud, then, has an ROI multiplier unto itself. These hidden refactoring opportunities lead to better business outcomes.

Metrics for Course Correction

The old maxim of "No plan survives contact with reality" is certainly true of cloud migrations. Or as Helmuth von Moltke the Elder originally stated, "No plan of operations extends with certainty beyond the first encounter with the enemy's main strength" (Hughes). This does not mean any planning based on a strategy is futile. It's more a statement of our inability to measure or predict all the possible changes in our universe that could impact planning.

This is why it's vital to track metrics during cloud migration; they will give you a heartbeat monitor for when things are not going according to plan and first aid is required.

There are several metrics an organization can use to determine course correction in the cloud. What you measure largely depends on the cloud value you are trying to achieve specific to your organization. However, we'll take a look at a couple DevOps metrics we consider important from Forsgren and others' popular book *Accelerate*.

If part of your migration requires a cloud-native application refactor, you *should* be implementing a repeatable software delivery process with Continuous Delivery. Continuous delivery will allow you deliver features faster and take advantage of all the agility the cloud has to offer. With agility as the goal, you can then measure and track your *Deployment Frequency*. Deployment frequency describes the rate your organization deploys code changes into production.

Alongside this metric is *Change Fail Percentage*, which refers to the percentage of production changes that fail. Research from *Accelerate* suggests that employing DevOps principles of cooperation and automation "improves both delivery performance and quality, and also helps improve culture and reduce burnout and deployment pain" (Forsgren et al.). DevOps results not only in faster deployments, but in higher quality of code with fewer failures.

Now, these metrics do not grade the validity of an overall cloud migration strategy. They do reflect the tactical execution of the strategy within the bounded context of a particular application being migrated. If one of the goals of the migration includes faster customer-requested feature delivery, then a low or stagnant deployment frequency may indicate there are too many manual processes bogging down your cloud migration. If you have many delivery attempts but a high change failure percentage, there may be a DevOps element that is missing from the people/process/technology changes accompanying your cloud migration.

Conclusion

Congratulations! You've made it to the end of a dense ebook filled with valuable insight that should truly help with your cloud migration... and you are now completely overwhelmed.

There are so many factors to take into account. And so much planning. And there was no discussion of tooling or architecture or microservice best practices. And your machines are still chugging away in their server rooms. It's like you've read the overview instructions for your moon landing (good stuff), but the moon is still many miles away.

Don't let the prospect of cloud overwhelm you without sitting down and chatting with folks that have made the journey before. Kenzan has helped architect a number of successful cloud migrations for small and large clients. We'd like to help. We're not only highly experienced, but highly empathetic. We specialize in listening to exactly where clients are at and charting out where they could go within the cloud. We like to make rocket science not seem so rocket-sciencey.

Contact Us

If you'd like to chat with Kenzan about help with your cloud migration, contact **Andi Bollefer** at **abollefer@kenzan.com**.

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