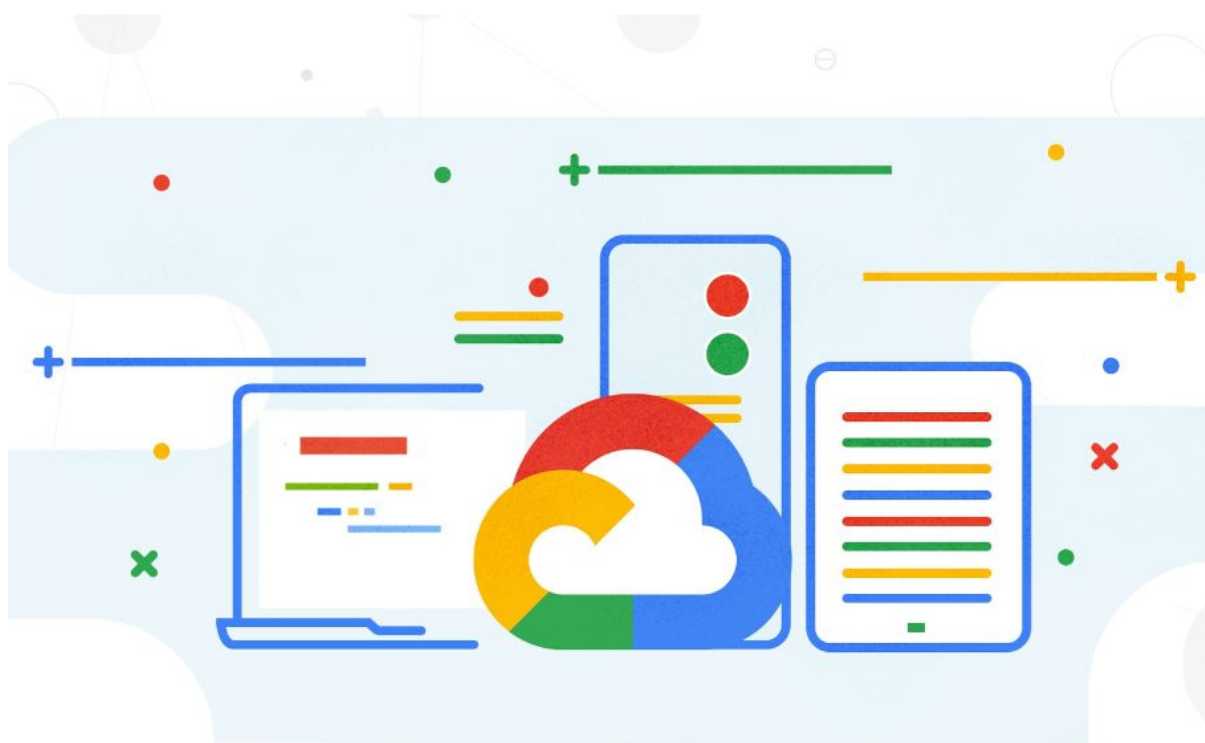


# Up, out, or both?

How to evaluate your cloud  
migration options



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Migrating to the cloud:  
up, out, or both?

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In times of significant disruption, organizations are faced with three choices: Retrench within legacy solutions, pause and do nothing while waiting for more data or different circumstances, or press ahead, potentially even accelerating to realize the desired outcome. In such an environment, it is critical to ensure you're delivering the greatest possible impact to the business.

In Google Cloud's Office of the CTO, or OCTO, we have the privilege of co-innovating with customers to explore what's possible and how we can re-imagine and solve their most strategic challenges. These collaborative innovation engagements are often core to critical transformational projects, which often include the rehosting, evolution, and at times re-architecture of existing business solutions. We distilled the conversations we've had with CIOs, CTOs, and their technical staff into several frameworks that can help cut through the hype and the technical complexity, to help devise the strategy that empowers both the business and IT. We called one such framework "up or out." (And we don't mean some consulting firm's [hard-nosed career philosophy](#).)

## The trouble with on-premises IT

The challenge with on-premises technologies is not actually the speed with which they can be provisioned on behalf of the business. The issue, in reality, is that the time and resources spent licensing, deploying, and maintaining those resources distracts from and delays activities which actually bring value to the business. With traditional approaches, infrastructure and software licenses are the precious resources managed by engineering and operations rather than the data and services they support. The cost and business pressures facing IT organizations today focus attention on value and adopting approaches which allow focus and effort to be spent on the real jewels of the organization—the data and services which power insight and valuable outcomes.

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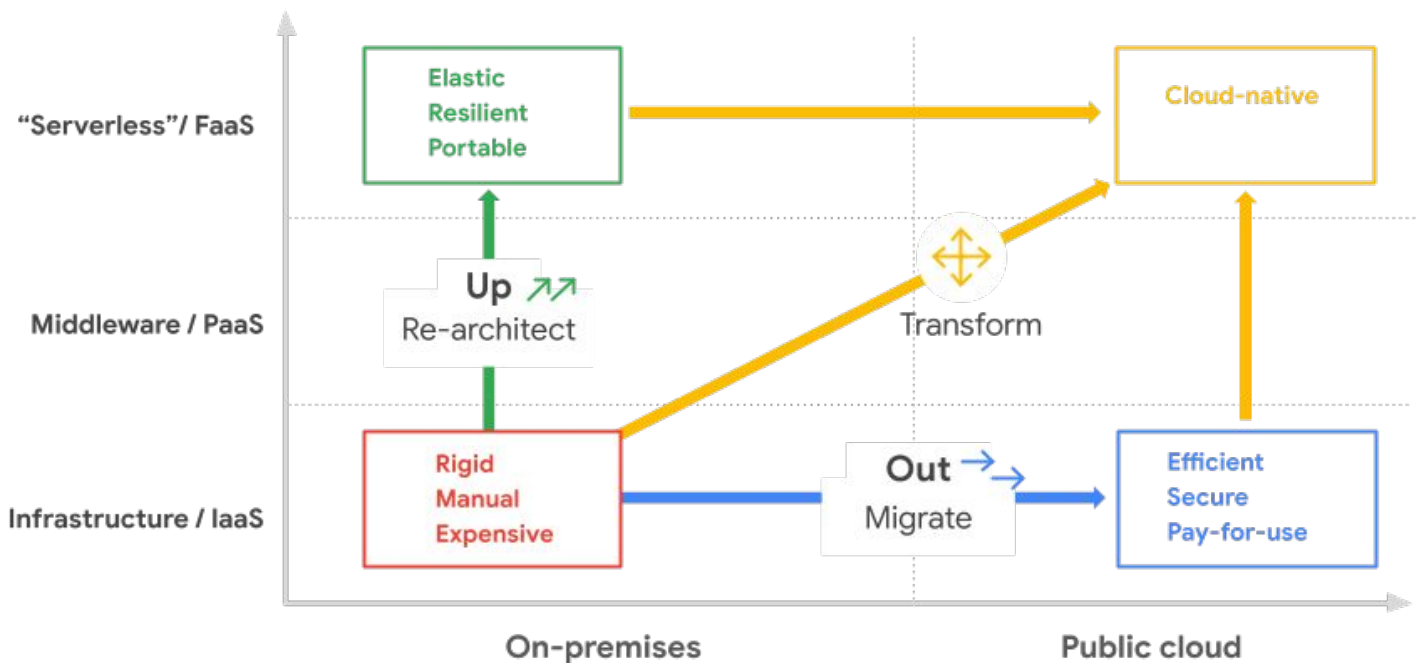
## Migrating to the cloud: up, out, or both?

A cloud-based IT operating model has been shown to offer significant advantages in terms of rapid deployment, elastic scalability, resilient operations, and security. However, large enterprises can't simply wake up one day with all their applications running in the cloud. Thus, every enterprise's move to the cloud is at least initially a hybrid cloud scenario, where some workloads remain on-premises and other workloads run in the cloud.

Additionally, many enterprises rely on geographically distributed compute capacity and data storage that can't be simply centralized into a single cloud data

center. For example, most retail or manufacturing businesses have a significant IT footprint in branches or plants due to latency considerations or to assure continued operations in case of a network failure. Hence, when planning an [enterprise cloud migration](#), you can't simply move all your infrastructure overnight, but must take a more pragmatic approach that differentiates between workloads and data more carefully.

One model that we found can help enterprises chart their cloud adoption journey delineates cloud migration along two axes—up and out.



# Up the stack

One choice you can make is to move your applications up the stack, and this doesn't necessarily imply a migration out onto a cloud provider's environment. As an initial step, you can transition from running monolithic applications on dedicated servers or virtual machines. Later, you can move to a Platform-as-a-Service model that deploys applications and services using containers, managed by open-source Kubernetes, or [Google Kubernetes Engine](#) (GKE) or Google Anthos for on-premises or multi-cloud deployments. So-called serverless deployment, for example with [Cloud Run](#) and [Cloud Functions](#), takes it one step further with individual application functions that hide all the infrastructure underneath.

Moving up the stack has several advantages:

- Application deployment becomes automated, making it easy to add or subtract capacity as needed, as well as accelerating feature velocity.
- Operations also become more resilient because new instances can be rapidly deployed in case of failure, allowing Platform-as-a-Service or serverless platforms to withstand a server failure without visible customer impact.
- Thanks to smaller deployable units, hardware can be more efficiently utilized, thus reducing run costs.
- Lastly, applications become more portable when they are better isolated from infrastructure details, as their containers may be deployed on a variety of infrastructures. This paves the way for a hybrid cloud scenario that provides a consistent service execution environment across the entire estate, including cloud vendors, on-prem data centers, branch locations, and remote devices.

On the flipside, moving up the stack requires you to fundamentally change the way in which you build applications and operate the infrastructure that supports them. This doesn't necessarily mean that you must migrate out into the cloud. Products like Anthos allow you to pursue service-centric cloud-native architectures even for workloads which must remain on-premises.

# Out into the cloud

The second option is to lift, shift, and replatform existing applications largely unchanged out into the cloud, for example by moving virtual machines to Compute Engine or by replacing on-premises data archiving with cold-line Cloud Storage. Shifting workloads in the cloud can be simplified and even automated, for example by using tools like [Migrate for Anthos](#).

Even though the applications don't change, moving them from an existing on-premises data center to the cloud and shifting the operational model to one that's more automated has several advantages:

- Better economies of scale allow for more cost-efficient operations
- Automated patching discipline improves security because it assures that no software with known vulnerabilities is run
- Increased transparency enables more efficient IT asset management, for example by rightsizing servers or detecting and retiring unused IT assets
- Ease of emerging technology adoption like machine learning
- Improved security and access capabilities
- Enhanced resilience

# Out into the cloud (cont.)

Moving out into the cloud transforms how an enterprise operates and acquires IT infrastructure from an asset-based model to usage-based model. This transformation isn't quite so stark, however. Similar to transforming application architectures to move 'up' the stack towards cloud-native systems and services architecture, moving 'out' into the cloud can be seen as a progressive transformation toward cloud-centric operations.

- Lifting existing applications and replatforming them onto cloud infrastructure minimizes initial effort, avoiding the costs of redevelopment, and allowing an enterprise to transform its infrastructure acquisition and scaling processes while minimizing impact to existing operations models.
- Adjusting operations models to increase the use of automation and cloud-native tooling accelerates the overall transformation and maximizes the value from abstracted infrastructure services.
- Finally, decomposing application elements to take advantage of managed cloud services, such as migrating off of self-managed MySQL databases onto provider-managed Database-as-a-Service, requires some additional effort but lays the foundation for focusing engineering effort on truly precious resources: the data and insights generated rather than the databases and analytics platforms themselves.

Not only is combining up and out allowed, it's encouraged. We think of it as a cloud-native hybrid model, where applications are deployed as containers or functions and can be easily shifted and shared from on-premises to the cloud as needed, all while maintaining a consistent deployment, run-time, and management framework.

## Plotting a migration path

There isn't a single path to the cloud—not for individual enterprises and not even for individual applications. Inspired by the hope for simplicity, enterprises often assume that all workload migrations will follow a common trajectory. Rather, we recommend that you use a framework that encourages flexibility. The up or out framework can help an IT organization and its leadership characterize how they can best benefit from [migrating their services or workloads](#). The framework acts as a general pattern that highlights the continuum of approaches to explore. Not all components of a single workload will follow the same path, nor *should* they.

Provided you have access to an application's source code, here are a few questions to ask when considering an up or out strategy:

- Which elements of an application or service would benefit most from an event-driven, serverless approach?
- Which elements of a service require rapid code releases or the ability to validate new features using A/B testing (meaning that a new version of the software is made available to a percentage of users)?
- Which elements change infrequently, but would benefit from automated scaling and deployment?

With the answers to these questions, you can begin to decompose workloads (if amenable) and map them against the up or out framework, thus presenting the organization with a pragmatic migration approach that maximizes value. (And if you don't have the app's source code, you can still pursue [lift and shift](#) or [automation containerization](#) options. And don't forget, your software vendors and partners are in the midst of this transformation too, so don't forget to work with them.)

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**There isn't a single path to the cloud. The up or out framework can help characterize how to best benefit from migrating services or workloads.**

## Applying the model

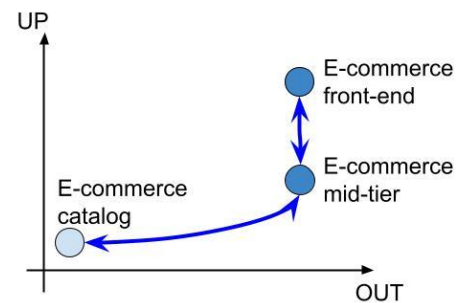
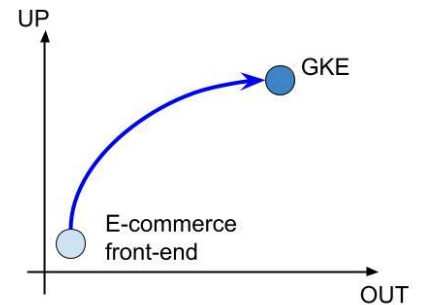
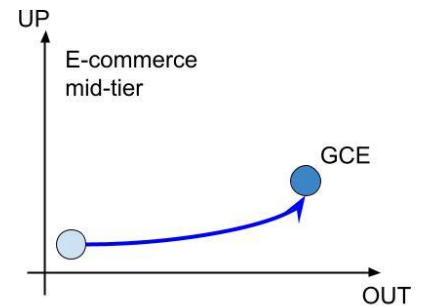
When a major retailer we worked with started migrating to Google Cloud, the up or out model helped them decide which parts of their IT estate should follow which path.

The retailer's user-facing frontend required frequent feature releases to remain ahead in a competitive retail market based on adoption and the value of new features to their users. They chose to move these applications both up the stack and out into the cloud, implementing A/B testing and an automated CI/CD pipeline to deploy the cloud-native applications to Google Kubernetes Engine (GKE).

The retailer's mid-tier application processing also stood to benefit from refactoring and re-architecting over time, but they determined they could generate more immediate value by shifting to an automated scale-out model and gaining operational efficiencies in the cloud. [These applications were moved to Compute Engine](#).

The retailer's back-end catalog systems change quite rarely and were hosted on well-understood and easily maintained systems. To focus their initial energies, they decided to keep these systems in place until they can replace them completely in the future.

Taking this approach allowed the retailer to minimize the time and effort required to accomplish their primary goal—rapid iteration of a customer experience that was becoming stale. They also gained operational and capital efficiencies and set themselves in a good position to migrate their catalog data to the cloud when the time and price are right for them.





## Applying the model (cont.)

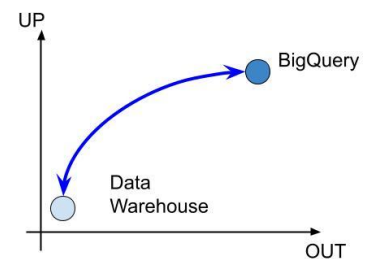
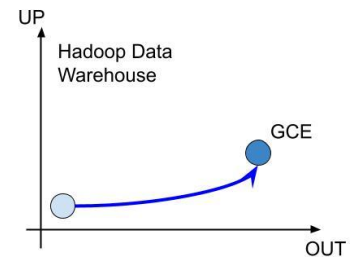
Another common example is an enterprise that is seeing accelerating growth within its data warehouses, and is confronted with consistent and significant increases in licensing costs. In addition, it may be increasing investment in engineering and hardware costs to support the data warehouse. Here too, up and out is a useful framework.

One enterprise we worked with chose simply to move out into the cloud, migrating their existing Hadoop farm onto [Compute Engine](#). Doing so allowed them to shift resources away from the internal facilities, networking, and compute capacity necessary to support their rapidly expanding data warehouse.

By taking this approach, they chose to retain the engineering and operational burden of deploying and maintaining the data warehouse platform itself, thereby avoiding disruption within the data analysis tool chain.

Another retailer chose to move both up and out, migrating from their on-premises, self-managed data warehousing solution to adopt [BigQuery](#), Google's managed cloud data warehouse solution.

Taking this approach allowed the retailer to shift their focus away from managing the infrastructure, systems, and licenses responsible for hosting and analyzing their data. The infrastructure was no longer the precious resource—the data was. As a result, the engineering resources once focused on building and operating the data warehouse were now enriching data and enabling business functions across the retailer to get the most value from the retailer's data. Furthermore, the engineering team responsible for maintaining the data warehouse was now able to expand its scope, exploring and applying machine learning models on their data to deliver value.



## Choose your path(s)

Simple but evocative frameworks like ‘up or out’ can help IT decision makers navigate the inevitable complexity of a cloud migration. Like any good model, simplicity is a feature, not a bug, as it helps keep the focus on the desired outcome and is easily communicated to a variety of audiences. When planning a cloud migration, plotting a path for individual workloads and architectural elements on the up or out framework helps IT decision makers focus on the benefits achieved by re-platforming, re-architecting—or a combination of the two. It also depicts how a migration is accomplished over time in an approachable manner that can be shared with a wide audience in both business and IT.

It’s typical and in fact desirable for different workloads or even individual elements of a system to take unique paths to the cloud. Whatever the best path may be, Google Cloud offers the products and tools you need to move to the cloud, ranging from lift-and-shift to a VM environment (Compute Engine, [Google Cloud VMware Engine](#)), refactoring applications to containers (GKE in the cloud or on-premises with [Anthos](#)), or even deploying cloud-native services to an environment like Cloud Run.

To discuss which path might be best for you, please sign up for a [free discovery and assessment](#) so we can get our migration experts engaged with you.

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**Google Cloud  
offers the products  
and tools you need  
to move to the  
cloud.**

# Evaluating your cloud migration options

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Sign up for a [free discovery and assessment](#).