Migration Plan with Google Cloud

About this document

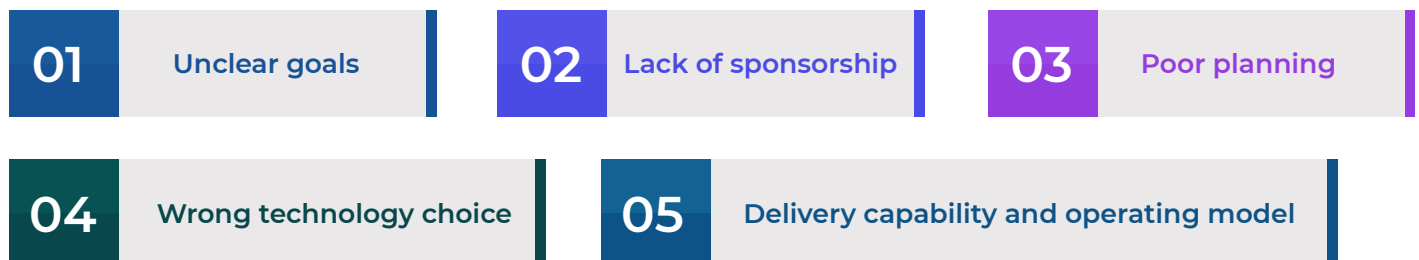| Document Details	
Purpose	This document describes the migration approach onto the cloud. Google Cloud has a four-stage approach to Migration (Discover & Assess / Plan / Migrate / Optimize).
Intended Audience	A CIO or other senior technology stakeholders in an organization that is about to embark on a migration program; or who is looking to scale up an existing migration.
Key assumptions	The reader should have a high-level understanding of the concepts discussed in the Google Cloud Adoption Framework, and have a desire to migrate a large number of workloads to Google Cloud (in the order of hundreds or more of applications, or thousands or more of servers).

1. Executive Summary

Many organizations are looking to the public cloud to solve on-premises infrastructure challenges. These range from capacity constraints, aging hardware, or reliability issues; or alternatively, organizations may be looking to capitalize on the value that cloud infrastructure can bring - saving money through automatic scaling, or deriving business value from large scale, cloud-native approaches to data processing and analytics.

However, moving to the cloud can be a complex and time-consuming journey. An inefficient migration program can significantly reduce the benefits realized from the migration, and a pure lift-and-shift approach can leave you with similar challenges and costs in the cloud as you were trying to escape from on-premises.

In this document, we outline Knoldus' adoption of Google's approach for migrating the apps onto the cloud. A blended team of people with the right skills and understanding of the organization, with clearly defined goals that are closely measured through the life of the program.

2. The Challenges of migrating to Cloud

Every organization is planning to migrate their workloads to Cloud as it offers enormous benefits for businesses. However, migrating the workloads is not an easier task and requires proper planning from the inception. Few major challenges that one may have to go through:

01 Unclear goals	02 Lack of sponsorship	03 Poor planning

04 Wrong technology choice	05 Delivery capability and operating model

Unclear goals
Organizations may not understand exactly why they're migrating to the cloud, and how this aligns to their business strategy. Often there may be a short-term need - a capacity crunch, reliability issues, or data center contract expiry. While these are valid reasons to move to the cloud, there may be a lack of clear business value in the transition, and a clear view on return on investment.

Lack of sponsorship
A cloud migration requires significant investment of time and effort, no matter how your workloads make it to the cloud. Even in a lift-and-shift migration, there is disruption to business-as-usual activities. As a result, these programs need strong sponsorship from both IT and business leadership, with commitment to the business goals communicated

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across the organization. A lift-and-shift migration is typically the first step of a larger transformation, and this should be made clear.

Poor planning

Many organizations embark on a cloud journey without understanding the complexity of their existing application estate, or the impact of moving workloads to the cloud. In a large estate, the dependencies and sensitivities of applications have often grown up over a long period of time and this can be hard to discover.

Wrong technology choice

There is a tradeoff when migrating to the cloud of the type of technology to use. For example, while a lift-and-shift migration of web/application servers is the lowest effort/risk, it is often beneficial to move to a managed cloud product for one part of the technology stack. Similarly, it is typically useful to take advantage of cloud-native tooling for building VMs, and for backups, patching and monitoring, though these need planning and teams need training. This is also true for the migration tooling itself - tracking migrations in a spreadsheet works up to a point - but this becomes too cumbersome at a massive scale.
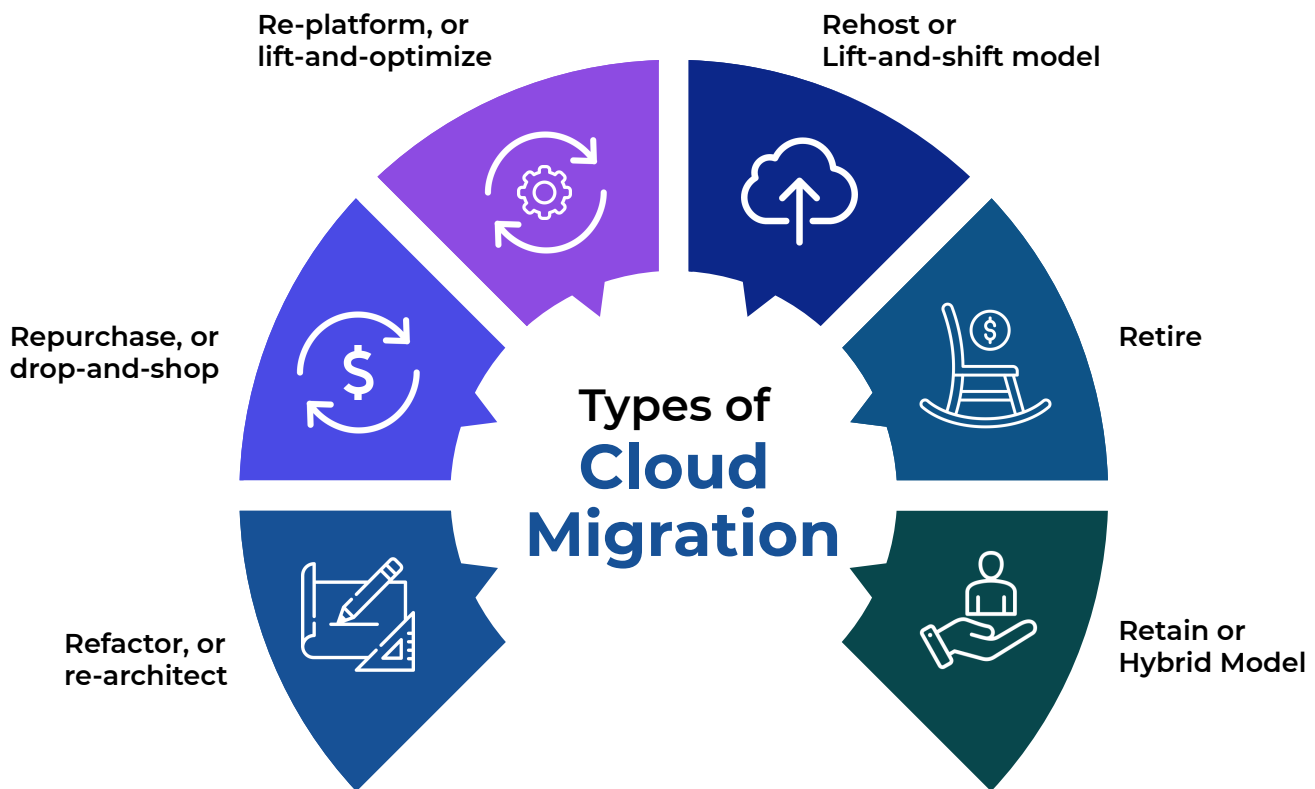
Delivery capability and operating model

The above challenges combined result in a large amount of organizational effort and change management in order to accomplish a large-scale migration. This period of change often means a temporary spike in team resources - both to accommodate the change itself and also to allow teams the time and space to learn new technologies. Meanwhile, changes to your infrastructure operating model and approach to security as a result of a cloud adoption are also significant risk factors. We mitigate these through use of a Migration Factory approach.

3. Our approach to migration

The journey to the cloud is different for every organization, as there is no one-size-fits-all migration plan. Each IT asset to be migrated is unique in terms of cost, performance, and complexity. So, you cannot move all components to the cloud with one common method. Making a roadmap for the migration will answer the questions of what, how, and in what order to move these components. This is where the cloud migration strategies come into play.

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3.1 Migration Strategy

Broadly known as the 6 R's of migration, these strategies essentially answer the question of how to migrate your assets to the cloud.

Re-platform, or lift-and-optimize

Rehost or Lift-and-shift model

Repurchase, or drop-and-shop

Types of Cloud Migration

Retire

Refactor, or re-architect

Retain or Hybrid Model

Rehost - Lift-and-shift: "Moving out of a data center"

In a lift-and-shift migration, you move workloads from a source environment to a target environment with minor or no modifications or refactoring. The modifications you apply to the workloads to migrate are only the minimum changes you need to make in order for the workloads to operate in the target environment. A lift-and-shift migration is ideal when a workload can operate as-is in the target environment, or when there is little or no business need for change. This migration is the type that requires the least amount of time because the amount of refactoring is kept to a minimum - and is an ideal target for a Migration Factory. A lift-and-shift approach may not be appropriate in some situations, such as when the software is approaching End of Life (EOL) or the underlying compute requirements are not supported in the cloud, such as with Solaris or mainframe-based workloads.

Replatform - Move and improve: "Application Modernization"

In a move and improve migration, you modernize the workload while migrating it. In this type of migration, you modify the workloads to take advantage of cloud-native capabilities, and not just to make them work in the new environment. You can improve each workload for performance, features, cost, or user experience. The move and improve migration is ideal when the current architecture or infrastructure of an app isn't supported in the target environment as it is, and a certain amount of refactoring is necessary to overcome these limits. These workloads may still be appropriate for a Migration Factory, assuming the modernization is limited to platform version updates, and only minor application modification is required.

Repurchase

It is often referred to as a drop end shop. This refers to the organization's decision to move to another product, which sometimes means ending existing licensing and repurposing services on a new platform or service. Examples of this include a CRM system or an industry specific application not designed to run on cloud infrastructures. This is often not necessary with applications written with modern application code since it's possible to transport the code from one provider to another. The repurchase strategy is often applied when using a proprietary data based platform or proprietary product.

Retain

During a cloud migration process, you may want to retain portions of your IT portfolio. There are some applications you aren't ready to migrate to the cloud and feel more comfortable keeping them on premise. In this use case, it makes sense to retain aspects of your IT services in its current environment and implement a hybrid or part migration strategy. This also makes sense if current regulatory or constitutional rules require you to store or run aspects of your services or business application on-premise or within specific regions.
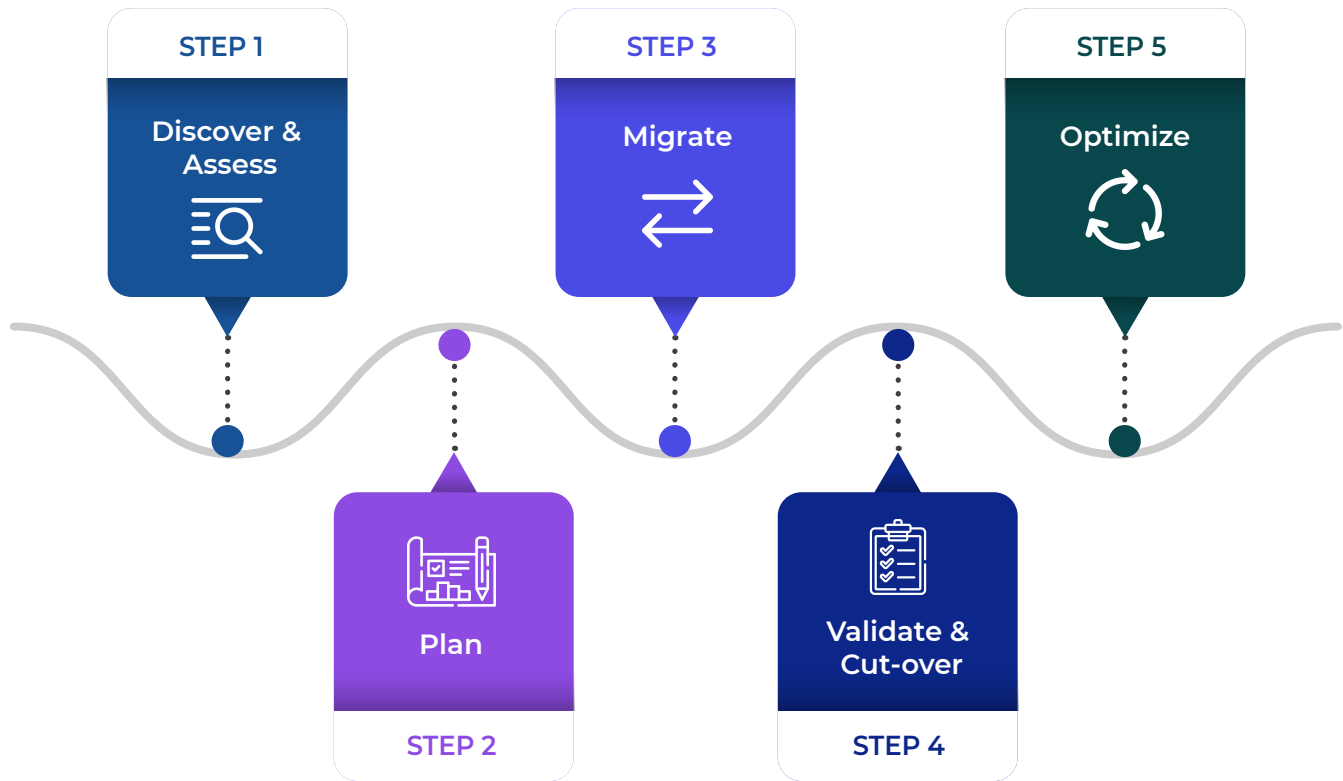
Retire

Retiring services involves identifying assets and services that can be turned off so the business can focus on services that are widely used and have immediate business value.

By understanding your current cloud maturity, and your business goals, a particular strategy can be adopted.

3.2 Phases of Migration

Cloud Migration Process can be classified as 5-Phase approach:

STEP 1	STEP 3	STEP 5
Discover & Assess	**Migrate**	**Optimize**

STEP 2	STEP 4
Plan	**Validate & Cut-over**

Phase 1

Discover and Assess

Engage with stakeholders and executives to define and document motivations for cloud transformation and map them to specific business outcomes. Assess the entire digital estate and take inventory of workloads. Aggregate inventory according to suitable criteria like complexity, business criticality, size etc. Then determine the best approach for migrating each workload using 6 R's strategy. Then calculate expected total cost of ownership (TCO) after migration and finally prioritize the workloads for migrations. Discovery and Assessment are done using tools to automate the process to the maximum possible extent.

Phase 2

Plan

This phase consists firstly of the target operating model and governance model which are defined. Then accordingly the architecture of cloud foundation is defined. Some of the important decisions made include:

◆ Resource organization hierarchy

◆ Identity and Access Management

◆ Network topology and connectivity

◆ Security and Compliance

Finally, according to the defined architecture, a landing zone is defined and deployed.

Phase 3

Migrate

Migrate workloads to the cloud according to the selected approach (re-platform, re-host or re-architect) and defined waves. Migration process is validated, and learnings are used to mature the process for further migrations. Experience shows that using a factory model for executing cloud migrations makes large-scale digital transformations manageable by applying the principles of industrialization. This model accelerates cloud migration projects and reduces complexity.

Phase 4

Validate and Cut-over

Perform the end-to-end validation testing including function testing, integration testing etc to validate the migrated application and then cut-over to switch from on-premises to cloud. A methodology for knowledge transfer from migration team to product team is defined to ensure that post migration, the product team understands the code modifications and can perform further transformations.

Optimize

Optimization is an ongoing and continuous task. Cloud environment is continuously optimized as it evolves. There can be many aspects of optimization like:

◆ Cost optimization

◆ Autoscaling

◆ Moving to managed workloads to reduce operational overhead

◆ Increased automation

◆ Defence in depth

◆ Easier operations and management

4. Migration Tools and Services

Cloud migration tools not only provide flexibility, scalability, and cost-efficiency for the cloud migration process but also make it faster and easier for enterprises to migrate their workloads onto the cloud. There are a number of readily available services and open-source tools that can not only help you reduce the migration effort but also accelerate your migration timelines, such as:

Cloud Foundation Toolkit

The Cloud Foundation Toolkit (CFT) aims to provide a common baseline of GCP best practices implemented in Terraform and Deployment Manager. It is designed specifically to meet the compliance and security needs of enterprises. By creating a foundational environment using these templates, you can be confident that best practices are implemented out of the box—including key security and governance controls.

Migrate to Virtual Machines

GCP's real-time enterprise compute migration tool

Google BigQuery data transfer service

Real-time data transfer from Teradata and Amazon S3 to BigQuery

CFT Scorecard

CFT Scorecard supplements Google Cloud Terraform and Deployment Manager

templates by providing a simple CLI for quickly checking 17 environments for common security misconfigurations. This tool integrates with Forseti Config Validator and Cloud Asset Inventory and can be used to check over 40 security controls from the Policy Library.

Migrate to Containers

Use Migrate to Containers to convert VM-based workloads into containers that run on Google Kubernetes Engine (GKE), Anthos clusters, or Cloud Run platform. You can migrate workloads from VMs that run on VMware, AWS, Azure, or Compute Engine, giving you the flexibility to containerize your existing workloads with ease.

Database Migration Service

Database Migration Service makes it easier for you to migrate your data to Google Cloud. Database Migration Service helps you lift and shift your MySQL, PostgreSQL, and SQL Server workloads into Cloud SQL and AlloyDB for PostgreSQL, and lift and modernize your Oracle workloads into Cloud SQL for PostgreSQL.

5. Deployment Types

There are different deployment process types and one can choose as per the requirement. Approach can vary as below

◆ Deploy manually

◆ Deploy with Configuration Management (CM) tools like Ansible, Chef, Puppet and SaltStack.

◆ Deploy by using container orchestration tools like Kubernetes and Google Kubernetes Engine (GKE).

◆ Deploy automatically using tools like Jenkins, Cloud Build, Container Registry and Spinnaker.

◆ Deploy by applying the infrastructure as code pattern using Terraform and services like Deployment Manager.

6. Monitoring and Observability

Monitoring and observability are one of a set of capabilities that drive higher software delivery and organizational performance.

Monitoring is tooling or a technical solution that allows teams to watch and understand the state of their systems. Monitoring is based on gathering predefined sets of metrics or logs.

Observability is tooling or a technical solution that allows teams to actively debug their system. Observability is based on exploring properties and patterns not defined in advance.

Monitoring and observability solutions are designed to do the following:

◆ Provide leading indicators of an outage or service degradation.

◆ Detects outages, service degradations, bugs, and unauthorized activity.

◆ Help debug outages, service degradations, bugs, and unauthorized activity.

◆ Identify long-term trends for capacity planning and business purposes.

◆ Expose unexpected side effects of changes or added functionality.

Tools and services used are plenty in the market like Ops Agent, Prometheus, and Grafana to name a few.

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