IBM Services Cloud Modernization and Migration for IBM Cloud Private (ICP)

Part 1: Quick Start and Assessment
Abstract
IBM Service's cloud enablement offerings include all major cloud providers as part of its multi-cloud approach to transforming the enterprise. This paper will focus on helping customers modernize and migrate applications to IBM Cloud Private (ICP).

IBM will look to quick start the engagement in three ways. First, IBM will work with your organization to develop a migration strategy around your business drivers. Second, IBM will deploy a series of tools to automatically collect data about your physical and virtual environments, and your current cloud consumption. Third, IBM will work with you to migrate a handful of applications to IBM Cloud Private (ICP) as a proof of concept or as a production ready deployment.

This paper focuses on Quick start and assessment. This step primarily focuses on defining a strategy, scope, and a proof point.

Based on technical and non-technical assessments, you’ll get both an “as-is” and a “to-be” view of your environment, including a draft blueprint for your IBM Cloud Private (ICP) platform, a high-level plan and a cost case. We’ll also provide a target outcome for each application — retire, retain, rehost, replatform, refactor/re-architect, or repurchase — with cost justification and migration effort.

The quick start is targeted to produce results in two weeks, with the overall assessment taking four to eight weeks. The timeline is highly dependent on your organization’s commitment to the quick start and the effort to provide IBM the necessary access to the network and servers under evaluation.

Overview
By now, you’ve hopefully had the opportunity to learn about some of the benefits of migrating to a cloud environment such as IBM Cloud Private (ICP). However, deciding to move to the cloud is only the first step in what could be, depending on the scale and scope, a long and involved migration process. Getting this migration right can have important benefits for your company as it starts this new chapter: everything from reduced costs, op-ex instead of cap-ex, agility and time to market, improved security, and optimized cloud operations once the migration is properly done.

In this paper, we’ll introduce the IBM approach to cloud migration, with special focus on the Quick Start and Assessment phases. You’ll get a look at some of the workshops, methodologies, and tools IBM uses to help guide our customers through these phases. The next paper in the series will focus on planning, migration and modernization, and maintenance.

IBM’s point of view is that Cloud migration is a journey that essentially starts with an assessment of where an organization starts with respect to cloud adoption and subsequently executing multiple workstreams or steps that help achieve the cloud journey objectives. This is an iterative process centered and powered by DevOps and Security principles and practices. Hence, IBM describes its Cloud Innovate migration & modernization methodology as a full lifecycle. IBM’s Cloud Application Migration & Modernization Methodology is split into 4 distinct but iterative/interlinked tracks, which is illustrated in Figure 1.
Once you have a concrete strategy in hand, you will progress to the Discovery & Insights phase. During this phase, IBM will continue to collect data about your business and technical environment, and then use this data to help your business conduct a series of assessments to determine what your ideal cloud migration might look like. This includes identifying how to handle each individual application during the migration, what kind of security and compliance requirements your applications might have, and what kind of cost savings you might expect once the migration has been executed.

Once the assessments have been completed, the IBM team will turn out a series of deliverables, and then jointly review them with the stakeholders in your company. After we’ve had a chance to incorporate your team’s input, we will then finalize the deliverables, and use them to support you through the next phases of your migration.
Strategize & Mobilize

IBM will look to start the engagement in three ways: strategy, data collection to define scope, and a demonstrable proof point of our methods and outcome. First, IBM will work with your organization in developing a modernization and migration strategy around your business drivers. The drivers will be used in determining the type and depth of the assessments, and the target migration path for each application.

Second, IBM will deploy a series of tools to automatically collect data about your current cloud consumption and your physical and virtual environment. The tools will be minimally invasive, installed in your data center with the data captured remaining on premise.

The first tool captures data about your existing cloud consumption, looking to identify shadow IT, security and compliance issues, and potential cost savings. The second tool evaluates your physical environment, capturing data about storage, compute, and switches, looking for excess capacity. This feeds the Infrastructure Assessment. The third tool collects data about your applications, their underlying technology and interconnectivity. This data will be used to feed the Application Discovery and Affinity Assessment. The goal of these automated assessments is to build a better understanding of your environment and determine the scope of the work to be performed.

Finally, IBM will work with you to migrate several applications to the cloud as a proof of concept or as a production ready deployment. We will walk you through an abbreviated assessment, selecting applications for quick wins. We will work with your team to build an IBM Cloud Private (ICP) environment with sufficient security to meet the demands of the applications. Lastly, we will migrate the applications to IBM Cloud Private (ICP) using the same methods and tools planned for the larger migration.

The strategize & mobilize phase is targeted to start producing results in two weeks, with the overall assessment taking four to eight weeks. The timeline is highly dependent on your organization’s commitment to the quick start and the effort to provide IBM the necessary access to the network and servers under evaluation.

When planning your cloud migration strategy, there are a variety of different factors you must keep in mind, including your organization’s key business and technology initiatives, the security and compliance constraints you must account for, and the service levels you expect to be able to meet.

IBM’s goal during the Strategy phase is to help you identify what’s important to your cloud migration, so that it can be recorded and used to define the parameters you will need to set for your assessment models. When using these models, you’ll start by categorizing your applications, then apply a level of importance to the drivers in those categories, and finally develop a plan to ensure that all functional and non-functional requirements are met. For example:

- When migrating a client-facing application, you would need to prioritize user experience.
- For an application that needs to comply with Payment Card Industry Data Security Standard (PCI DSS), you would need to make sure data is encrypted at rest and in transit.
- For a commodity application, cost savings would be the most important factor.
Below is an example of a model of categories and drivers.

- **Categories**
  - **Business**
    - User Experience
    - Accessibility
    - Speed to market
    - Market data capture
  - **Technical**
    - Enterprise architecture alignment
    - DevOps maturity level
    - System uptime, high availability
    - Cost savings
  - **Security and compliance (FFIEC, PCI DSS)**
    - Data encryption at rest
    - Data encryption in transit
    - Single sign on
- **Service levels / Mandated**
  - Versions of software supported
  - n-premises hardware supported
  - Security patches applied within a maximum of 72 hours
  - Firefox ESR compatible

**Discovery & Insights**

Each organization starts their cloud migration from a different point. For instance, some already have parts of their IT on the cloud or have existing plans to move or build applications on the cloud. In addition, each organization starts with different levels of documentation and collectable data about their infrastructure and applications.

The purpose of the Assessment phase is to account for these unique aspects within your business. IBM will work with you to determine what assessments are needed, based on the drivers you defined during the Strategy phase, the work your company may have already started, the amount of data you have available to work with.

In discovery, we are validating your application landscape, infrastructure, OS/software stack, network/security/compliance, regulatory constraints, and business drivers required to build a migration roadmap in support of business benefits.

In Insight (Analysis), we identify the insight of the discovery and determine the opportunities for application migration, modernization and rationalization. In this track, we also reconfirm the early adopters and refine the mechanics required to migrate application into the Secure Hybrid Cloud while the modernization strategy is being developed. This way IBM ensures both tactical and strategic view points and benefits are realized for the Client.

IBM Advise on Cloud strategy and the disposition identified by BlueCAT tool will be verified and reaffirmed based on the actual dataset collected in the discovery phases. During Insight, active security testing is considered, to ensure visibility into vulnerabilities that are potential targets of threat actors.

**Business Value**

Understanding of your overall application portfolio, a single source of truth for enterprise planning and cloud enablement program. Continuous discovery and automatic data-refresh model gives an opportunity to handle a large migration program with live data and avoid data out-of-synch. Revalidate your investment strategy and appropriate allocation of fund based on disposition identified early.

Support to achieve understanding of the applications and platform security position using IBM tailored security practices, to enable a strategic remediation plan for the applications security threats and compliance gaps.
The dimensions of assessment during the discovery phase are as below.

- Cloud Consumption Assessment
- Infrastructure Assessment
- Capabilities Assessment
- Application Discovery and Cloud Affinity Assessment
- Privacy, Security, and Compliance Assessment
- Financial Assessment

**The six Rs**

The assessments are used to determine which applications can benefit from modernization, which applications should be migrated to the cloud, and which applications you can safely get rid of. The effort and cost involved with each option are considered when making these decisions. IBM will help you arrive at six different outcomes for how each application may be handled during the cloud migration. We refer to these outcomes as the six Rs:

1. **Retire** or decommission the application because it is of limited value or offers duplicate capabilities.
2. **Retain** the application on premises, with or without additional modernization.
3. **Rehost** the application on IBM Cloud Private (ICP) with minimal changes (commonly known as a “lift and shift”).
4. **Re-platform** the application is Operating platform change to other as per IBM cloud, and/or Application Middleware change to cloudify an application such as: AIX to Linux, Windows to Linux, Mainframe to UNIX, App Containerization.
5. **Re-platform** the application is Operating platform change to other as per IBM cloud, and/or Application Middleware change to cloudify an application such as: AIX to Linux, Windows to Linux, Mainframe to UNIX, App Containerization.
6. **Re-architect/Re-engineering** the application such as:
   a. Application Deployment architecture change or application conversion for:
      1. Nihil venitinciam essimpo eossi rumquuntur.
      2. Major Application packaging architecture changes to IBM Cloud private platform
   b. Any custom application changes
   c. Complex / Highly complex application migration
   d. Oracle to DB2, ADABAS to Oracle
   e. Application functionality change
   f. Application re-structure to microservices

**Cloud Consumption Assessment**

The Cloud Consumption Assessment provides visibility into line-of-business consumption of cloud resources, along with their associated risks and cost. The assessment is based on a NetApp solution, leveraging Cisco Cloud Consumption Service to discover cloud service providers and data. This tool will be installed as part of the quick start.

Discovery can be used as a tool to identify business need, and to establish lifecycle management and oversight of the cloud services being used. The assessment will evaluate potential risks and recommend immediate mitigation. It also identifies overall cloud spend and opportunities for reducing costs.
How well you know your environment determines the path you take and how fast you can run!

**Figure 2: The Six R’s**

**Infrastructure Assessment**
The infrastructure assessment targets storage, compute and switching infrastructure. The assessment uses NetApp OnCommand Insight across your data centers to determine excess capacity and applications no longer in use, allowing you to right-size operations to meet business demands. This tool is used as part of the quick start.

**Capability Assessment**
Just as organizations each have their own set of goals and objectives when it comes to maximizing new technologies such as cloud, they may also have capabilities that miss the mark on utilizing new technologies. During a Capability Assessment, IBM will help you map your technologies to your capabilities, which can help you identify where the gaps exist.

The Component Business Model (CBM) is a strategic management framework IBM uses to identify opportunities for improvement or innovation with regards to a company’s capabilities. CBM helps analyze an enterprise by partitioning it into a manageable number of independent, discrete, modular and reusable business components. A business component is a logical view of part of an enterprise that includes the resources, people, technology and know-how necessary to deliver capabilities to the organization.

This consultative model splits up a business into its key components, then focuses on improving them with the business’ core competencies. Sometimes, this leads to merging of components if the current organizational structure is inefficient, or of outsourcing non-core components. By boiling things down to a one-page map, the CBM gives insight into the structure of an enterprise, setting the stage for its transformation.
The CBM can be used in many ways, the most powerful of which is to create a heat map: a model that identifies the components that provide the greatest opportunity for improvement, innovation and transformation. In addition, the CBM is increasingly being used to create industry-specific predefined assets, which include an encompassing business architecture, with per-component information on processes, performance indicators, applications and services. With 10 distinct patents, the CBM represents a key aspect of IBM’s intellectual property.

**Application Discovery and Affinity Assessment**

Although much of the work for the Application Discovery and Affinity Assessment is done by the tools deployed during the quick start, there is still information that needs to be gathered through workshops and questionnaires.

**Portfolio**

As a company grows organically or by acquisition, its application portfolio grows along with it. The result is often a large, costly and inefficient portfolio, which can make it difficult for organizations to build the flexible models today’s fast-paced business world demands. Without these business models, companies may find it difficult to anticipate and respond quickly to changes such as new regulatory requirements, more demanding customers, and faster time-to-market requirements.

Reviewing the portfolio is the first step toward optimizing for success on the cloud. For one, reviewing the value an application provides, compared to how much it costs, often identifies opportunities to save money by retiring non-essential applications. In addition, reducing the total number of applications in a portfolio also allows the organization to better focus on maintaining and modernizing the applications they can’t live without. Knowing which applications are essential and which aren’t plays an important part in ensuring an efficient cloud migration.

Here are several factors you should take into consideration as you start your application modernization initiative:

- Extending and leveraging the value locked in existing assets and investments
- Removing complexity and constraints for enhanced agility and flexible architectures
- Improving alignment between business processes and IT
- Reducing the cost of maintenance and change

Leading application portfolio management methods provide a structured approach to examining applications to optimize spending and investment. Figure 3 shows the major steps involved in this approach.
The data collection and verification phases are accomplished by reviewing tailored questionnaires with the application owners (AOs) or subject matter experts (SMEs). The questionnaires contain between 50 and 150 questions, prepopulated through data collected during the quick start, that are specific to the project at hand.

Based upon the responses, each application is categorized according to strategic/non-strategic and critical/non-critical value. Each application is further measured against the following key measurements: business value, functional, data, technical, and total cost of ownership.

Understanding each application within this measurement framework provides insights such as:

- Impact on the business
- Fulfillment of business needs
- Accuracy and timeliness of the data
- Size, complexity and maintainability
- Development and maintenance costs

Finally, once the application portfolio has been assessed, processes to maintain the data collected should be established. These processes are collectively known as application portfolio management (APM).

**Cloud Affinity Assessment**

All successful cloud implementations require moving the right workloads to the right elements of the cloud environment. An assessment for cloud affinity is the process of deciding which workloads go where — with what level of effort — based on dozens of workload attributes. By capturing IBM’s direct cloud experience in a set of affinity analysis algorithms, we can help you make more accurate and effective decisions during the assessment. In addition, these algorithms help automate what has traditionally been a tedious manual process, dramatically speeding up the assessment.

The algorithms are built into BlueCAT, IBM’s cloud affinity tool. BlueCAT can evaluate an existing workload’s affinity for different cloud services models, such as software as a service (SaaS), platform as a service (PaaS) and infrastructure as a service (IaaS). The tool can also be used to determine ideal deployment options such as public, private and dedicated clouds. Finally, it can be used to validate business value by calculating high-level effort and value scores, understanding the priorities of the workloads to be migrated, and identifying workloads that should be retained on the existing infrastructure.

As shown in Figure 4, there are several chart formats to help you visualize and understand the BlueCAT analysis.
Lastly, depending upon the maturity of the application portfolio management system, companies may already know which applications and workloads are good candidates for cloud, while still being unsure about the architecture of those applications. Not every application is well-suited to migrate to the cloud in its current architecture. Cloud affinity can help determine if an application or workload is ready to go as is, or if significant effort would be needed to make it cloud-ready. We may also recommend alternatives for applications that are not well-suited for the cloud, rather than having you perform an expensive and time-consuming transformation.

**Cloud Migration Assessment**

Application architecture plays an important role in infrastructure attributes, in addition to the role it plays in determining cloud viability. Older operating systems like Windows 2003 and older hardware technology like Intel 80286 can affect the performance of an application, not to mention leading to significantly higher licensing and support costs every year. The cloud migration assessment helps identify the best target infrastructure to be virtualized in the cloud. It also helps identify lifecycle management issues that can be addressed during the migration.

The assessment uses automated server discovery tools such as Tivoli Application Dependency Discovery Manager (TADDM); Galapagos, an IBM tool used to gather middleware data; and Script Collected Manual Discovery (SCMD). These tools help gather the needed data to determine the feasibility of migrating a workload to a cloud target. IBM also brings in an integrated cloud transformation toolkit that provides analytical frameworks to understand variety of data points needed for making cloud affinity analysis, and migration or modernization planning activities. This toolkit also leverages client’s tooling (wherever applicable) and integrates the discovery data.

Additionally, data that cannot be automatically scanned by a tool — such as corporate financial freeze periods or code release freezes — are collected by questionnaires and combined with the scanned data to build a complete picture of the migration. Understanding the complete picture helps to create a low-risk migration plan.

Additionally, Application Containerization Assessment is also undertaken for container-enabled application transformation. Application containerization affinity is determined based on Application Architectural, Technology and Operational characteristics.
**Application Discovery and Affinity Recap**

At the end of the discovery and affinity assessment most applications will be designated as Retire, Retain, Rehost, Replatform, or Refactor. There will be set of applications that are not feasible to be migrated to the cloud but are still needed for business or regulatory purposes. Applications built on mainframes or mini computers can fall into this category. The software can be repurchased. This is where you move to a different product hosted on premise or in the cloud or use a SaaS platform. The application can also be rearchitected. This is where the functional and non-functional requirements are extracted and used when building a new application on the cloud.

**Privacy, Security and Compliance Assessment**

During the Privacy, Security and Compliance Assessment, you will analyze your existing on-premises applications to ensure that they are compliant with internal controls and external regulations such as ISO 27001, FedRAMP, SOC and HIPAA. A readiness assessment for the European Union’s General Data Protection Regulation (EU GDPR) can also take place. This effects all countries that do business with EU citizens including the United States.

Furthermore, if the assessment identifies applications that are not secure and compliant, IBM will help you determine the cost and effort required to make them secure and compliant on premise. The additional cost to make an application compliant on-premise needs to be factored into the cost savings calculation during the financial assessment.

**Financial Assessment**

The Financial Assessment is used to evaluate and compare total cost of ownership. When looking at a migration effort, existing costs can be understated, representing department-level charges rather than the total cost to the enterprise. Also, included in the total cost of ownership needs to be the additional costs to resolve deficiencies in the application if it were to remain on premise. The deficiencies would have come out during the other assessments. IBM can work with you to determine your total cost of ownership, which can help you conduct a more accurate comparison.

For all applications that have cloud affinity, an individual cost to host on IBM Cloud Private (ICP) will be calculated. This cost case will include both the cost of migration and the anticipated monthly recurring cost after migration.

These costs would then be compared to the TCO of your optimal IBM Cloud migration strategy. Optimal does not mean the lowest cost, but the cost necessary to meet the application criteria you laid out during the quick start phase.

**Determining the ideal outcome for each application**

Once you’ve finished your assessments, each one will have given you different insights you can use to build a complete and effective migration plan. The capabilities assessment will identify gaps in required business functionality. The application discovery and affinity assessment will list applications that should be retired, retained on premises, or migrated to the cloud. The privacy, security and compliance assessment will factor into the type of migration. The financial assessment will provide a more complete view when it comes to comparing total cost of ownership.
IBM will conduct a series of workshops with your team to review the findings of the assessments. Together, we'll make collaborative decisions about the ideal outcome for each application.

Let's look at the six Rs again and look at some of the reasons you might choose each outcome.

- **Retire.** The application does not provide enough value to justify its costs. The functionality in the application is no longer required or exists elsewhere in the portfolio.
- **Retain on premises.** The application is not ready for the cloud, possibly because you upgraded it recently and are not ready to make changes to it again, or possibly because you are more comfortable keeping it on-premises. In such cases, you may still be able to move the application's support environment to the cloud. You can revisit such applications for migration in the future. Where the application's technical stack is preventing the move to the cloud, other drivers may lead you to choose Re-architect/Repurchase.
- **Rehost on IBM Cloud Private (ICP) with minimal changes.** There is a cost benefit to moving the application, based on a straight comparison of migration, software licenses, cloud resources, and network usage costs. Such 'lift and shift' migration is common in large legacy migration scenarios where you want to get the migration done quickly and can explore re-architecting later.
- **Re-Factor on IBM Cloud Private (ICP), while updating software and OS versions, and making some changes like using Amazon Relational Database Service (RDS) managed databases instead of self-hosted databases.** There is a cost benefit to moving the application, based on a straight comparison of migration, software licenses, cloud resources, and network usage costs.
- **Re-Platform on IBM Cloud Private (ICP), Workloads are running local, but are not capable for a direct move into a consolidated- or cloud hosting- environment. However, the application-installable can be re-platformed with an optional upgrade of software versions.** Associated applications have to be ported (re-compiled, rewritten, etc.) to work on a standard cloud stack. It requires a combination of tools and manual effort leads to Economical savings in medium term.
- **Re-architect takes advantage of modernizing applications by rebuilding them with better architectures and using IBM Cloud Private (ICP) and third-party cloud services to improve efficiency and consumption of resources, thereby reducing compute, storage, network and operating costs.** The cost comparison may be more complicated but will most likely be beneficial because of IBM Cloud Private (ICP)'s usage-based pricing model. You may also be able to reduce maintenance costs through DevOps practices. A valid strategy for Re-architecting is to first rehost or re-platform then once the application is in IBM Cloud Private (ICP), re-architect.

**Deliverables**

After you've completed the assessment process, you'll come away with several deliverables that can be used to help support your cloud migration.
Application Modernization and Cloud Migration Strategy
Produced during the quick start and hardened during the Assess phase. It explains the business, technical, and regulatory drivers used in performing the analysis.

Modernization and migration assessment
Describes the existing environment along with the intended future state. Lists each application that has been assessed, along with its target outcome: Retire, Retain, Rehost, Refactor/ Rearchitect, or Repurchase. Includes a target implementation architecture and cost analysis.

IBM Cloud Architecture Center: Reference Architectures (Blueprint) for IBM Cloud Private
IBM has a suite of offerings across public, private and dedicated cloud models. IBM's architectures provide practices for building apps on the cloud. The reference architectures define the basic pattern, while implementations provide specific technology, practices, and tool choices to build and deploy that pattern. Following are key references from IBM cloud architecture perspective.

Infrastructure Architectures (Link)
Regardless of whether you are working in Containers, in a Platform as a Service such as Cloud Foundry, or in Infrastructure as a Service, some combination of compute services, network services and storage services underlies it all. The issue is that not all infrastructures are alike. While some cloud vendors will tell you that the only path to the cloud is to adopt their proprietary infrastructure approach, that doesn’t work in all cases and for all enterprises.

This infrastructure architecture covers multiple situations to meet the needs of the enterprise. It embraces on-premises infrastructure, cloud-based (off-premises) infrastructure and hybrid infrastructures that combine the two. The infrastructure architecture also addresses the need to support the virtualization services currently in the enterprise (such as VMware), virtualized services in the cloud, both on VMware and on open-source platforms, and also addresses how to seamlessly move between the two. Finally, the infrastructure architecture covers both how to sustain and preserve your existing infrastructure investment, as well as shows you how to expand into or move to a cloud-based model to take advantage of the benefits the cloud has to offer. Reference link for infrastructure architecture diagram.

Virtualization Architectures (Link)
Extend your existing datacenter to the cloud simply and quickly. IBM® Cloud for VMware Solutions enables you to deploy a software-defined datacenter to the cloud while seamlessly reusing your existing skill set, tooling, and processes. IBM Cloud for VMware Solutions enables you to seamlessly integrate or migrate your on-premises VMware workloads to the IBM Cloud by using the scalable, secure, and high-performance IBM Cloud infrastructure and the industry-leading VMware hybrid virtualization technology. IBM Cloud for VMware Solutions allows you to easily deploy your VMware virtual environments and manage the infrastructure resources on IBM Cloud. At the same time, you can still use your familiar native VMware product console to manage the VMware workloads.
Private Cloud Architecture (Link)
The private cloud architecture provides container-as-a-service (CaaS) and platform-as-a-service (PaaS) enablement for private workloads. Usually, a containerized platform is based on container-based orchestration, such as Kubernetes. A container platform that is based on Kubernetes can enable developer agility and operational simplification for middleware, data, and analytics services. Reference link for an editable architecture diagram.

High-level plan and cost case
The cost case for moving to IBM Cloud Private (ICP) needs to compare total cost of ownership, not just the cost savings associated with the applications. On-premises acquisition and operation costs around physical servers, network, storage and resources to maintain need to be included.

Soft costs associated with moving to the cloud, including increased speed and agility, increased reliability, and faster response to business needs, should be highlighted.

The high-level plan for migration is based on the estimated time required to migrate each application, applied to a timeline that includes ramp up and hyper-care. Included in the plan would be the commitment of business and technical resources to assist in the migration.

Next steps
Following the strategize and mobilize phases, you would then move on to plan and implement your cloud migration. The migration should be prioritized based on business drivers such as cost savings and quick wins. The next paper in this series will provide more details about these next steps. The third paper in the series will discuss IBM’s approach to DevOps and the benefits that IBM Cloud Private (ICP) brings.

For more information
To learn more about IBM Cloud Migration Services, visit us at ibm.com/services/cloud, or contact your IBM representative.