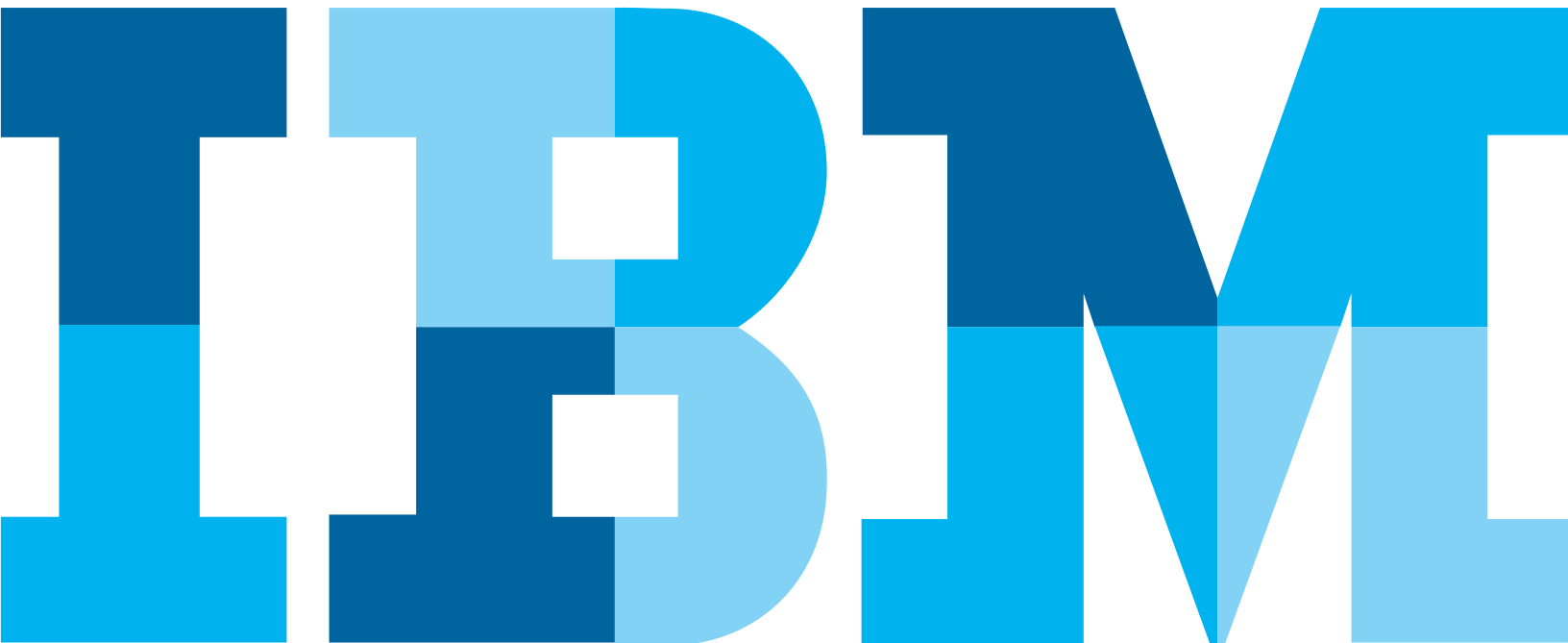


IBM Cloud Modernization and Migration with Amazon Web Services (AWS)

Part 1: Quick Start and Assessment



Abstract

IBM'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 Amazon Web Services (AWS) and IBM's collaboration with them to help customers modernize and migrate applications to the cloud.

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 AWS as a proof of concept or as a production ready deployment. Moving into the assessment, we will have a strategy, a scope, and a proof point.

Based on technical and non-technical assessments, you will get both an "as-is" and a "to-be" view of your environment, including a draft blueprint for your AWS virtual data center, a high-level plan, and a cost case. We will 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 have hopefully had the opportunity to learn about some of the benefits of migrating to a cloud environment such as AWS. 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, operating expense (opex) instead of capital expense (capex), agility and time to market, improved security, and optimized cloud operations once the migration is properly done.

IBM is working with AWS to help our joint customers simplify the process of migrating to the cloud. In this paper, we will introduce the IBM approach to cloud migration, with special focus on the Quick Start and Assessment phases. You will 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 follows a five-step approach to cloud migration, which is illustrated in Figure 1.

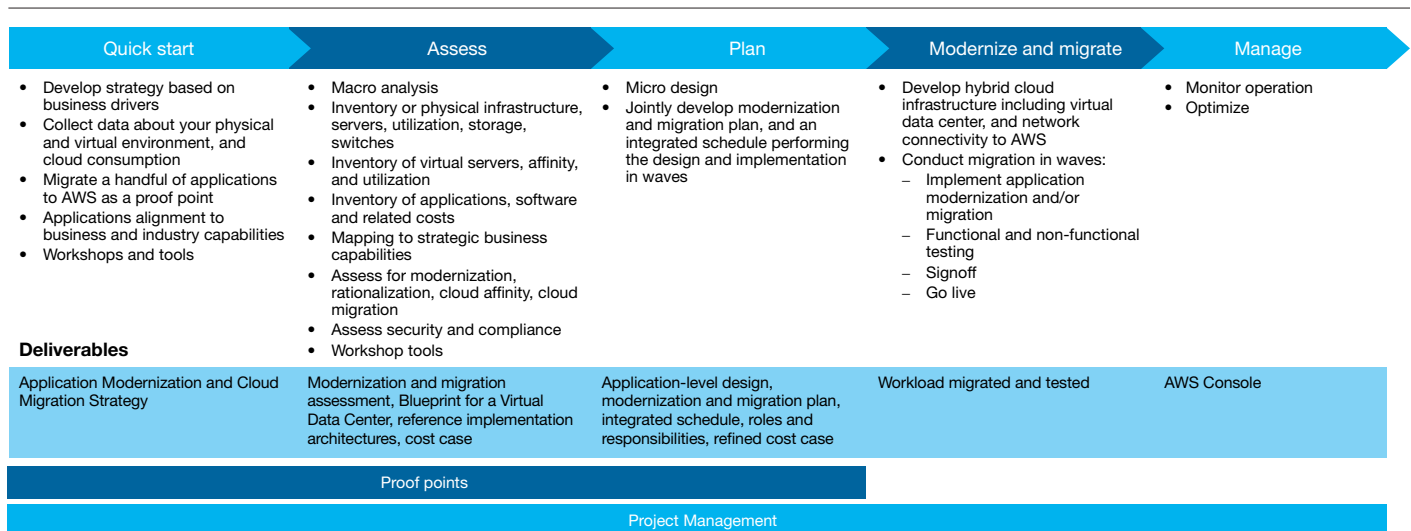


Figure 1. IBM's five-step approach to cloud migration

Every organization is different, so there cannot be a one-size-fits-all approach to cloud migration. Before you can hope to have a successful move to cloud, you must spend some time thinking about why you are migrating to cloud, and exactly what you hope to accomplish by doing so.

This is what you will be doing during the Quick Start phase. By identifying your key business drivers, and aligning your cloud migration strategy to those drivers, you can put yourself in the best position going forward to make sure those goals are met. IBM will assist you during this phase by iteratively gathering data about your environment, servers, applications, and how you use them. We will also develop a proof point during this phase.

Once you have a concrete strategy in hand, you will progress to the Assess 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 have 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.

Quick start

IBM will look to quick 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 Cloud Consumption Assessment uses this. 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 establish an AWS account with sufficient security to meet the demands of the applications. Lastly, we will migrate the applications to AWS using the same methods and tools planned for the larger migration.

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.

Strategy

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 is 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 will

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.

Here 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
 - On-premises hardware supported
 - Security patches applied within a maximum of 72 hours
 - Firefox ESR compatible

Assessment

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, and the amount of data you have available to work with. The assessments you might perform include:

- Cloud Consumption Assessment
- Infrastructure Assessment
- Capabilities Assessment
- Application Discovery and 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. AWS and 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 AWS with minimal changes (commonly known as a “lift and shift”).
4. **Replatform** the application on AWS. This could include updating software and OS versions, and other minor changes.
5. **Refactor/Re-architect** the application on AWS to take advantage of AWS and third-party cloud services.
6. **Repurchase** the application. When an application contains required business functionality, but cannot remain on premises or be migrated to the cloud, it needs to be replaced. The replacement can be purchased and deployed on premises or in the cloud. If purchasing a replacement is not an option, then the new application needs to be custom built.

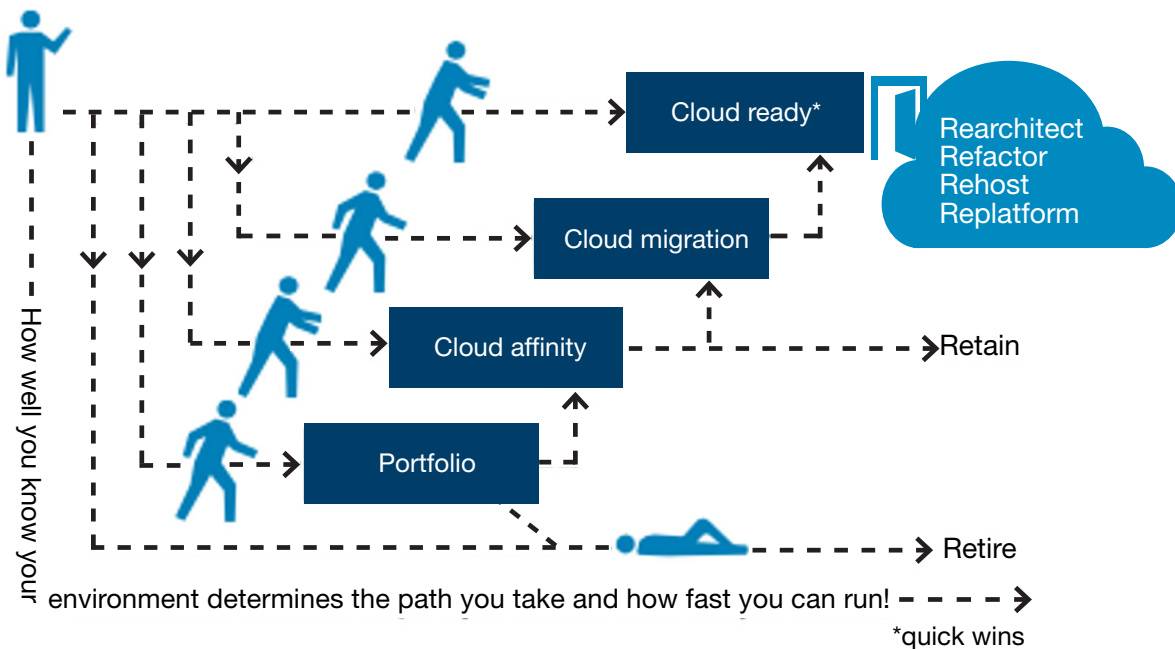


Figure 2. The six Rs

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.

Cisco uses a software-based collector that runs on a server/virtual machine that resides in your network to collect data from Internet gateways (via Netflow) or web security gateways. The collector collects network statistics and logs, removes any personally identifiable information, and then submits a summary report to the Cloud Consumption server.

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 regard to a company's

capabilities. The 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 cannot live without. Knowing which applications are essential and which are not 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.

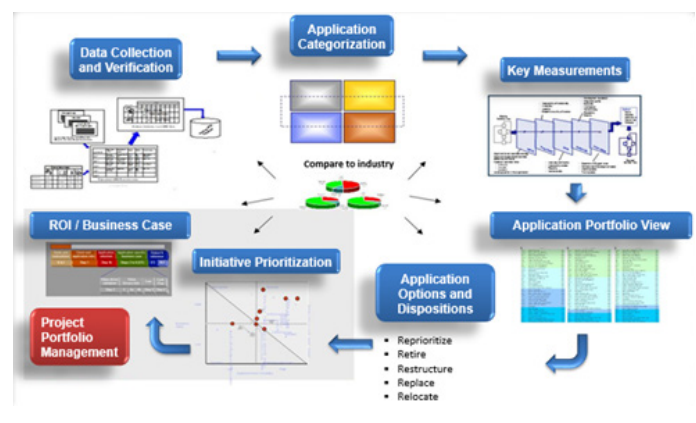


Figure 3. The application portfolio modernization process

The data collection and verification phase is 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, which 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.



Figure 4. Sample 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 the 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

All 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.

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.

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. In addition, 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 AWS 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 total cost of ownership of your optimal AWS 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 have 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 the total cost of ownership.

IBM will conduct a series of workshops with your team to review the findings of the assessments. Together, we will make collaborative decisions about the ideal outcome for each application.

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

1. **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.
2. **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 Rearchitect/Repurchase.
3. **Rehost** on AWS with minimal changes. There is a cost benefit to moving the application, based on a straight comparison of migration, software licenses, AWS 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.
4. **Replatform** on AWS, 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, AWS resources, and network usage costs.
5. **Refactor/Re-architect** takes advantage of modernizing applications by rebuilding them with better architectures and using AWS 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 AWS' usage-based pricing model. You may also be able to reduce maintenance costs through DevOps practices. A valid strategy for refactoring is to first rehost or replatform then once the application is in AWS refactor.
6. **Repurchase**, buying a new AWS Cloud-based application to replace on-premises application. Where moving to the cloud based on business and regulatory requirements makes sense, even though technical aspects of the application prevent migrating it or make it cost-prohibitive.

Deliverables

After you have completed the assessment process, you will come away with several deliverables that can be used to help support your AWS 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.

Blueprint for the AWS Virtual Data Center

The blueprint describes the AWS virtual data center, outlining the account structure, connectivity to client and third-party networks, and public connectivity. It also standardizes user access through roles, shows the geographic location where the applications are deployed, and describes the reference deployments customized to your applications. These reference deployments, sometimes called quick starts, are used to provide the structure around the systems being migrated. They specify the network (virtual private cloud) and subnets, availability zones, security groups, etc. that the virtual server (EC2 instance) will reside in.

AWS has five pillars of a [well-architected framework](#)—security, reliability, performance efficiency, cost optimization, and operational excellence—and a set of best practices that align to those pillars. The blueprint adheres to these best practices.

Checklist of concepts defined in your blueprint for AWS Virtual Data Center

- **Billing and account management**
 - **Security and access management: AWS API and console, operating system, network, data access**
 - **Asset management: provisioned AWS resources**
 - **Business continuity: high availability, resilience, disaster recovery, backups**
 - **Monitoring and integration into the incident management process**
 - **Configuration and change management**
 - **Release and deployment management**
-

High-level plan and cost case

The cost case for moving to AWS 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 quick start and assessment 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 AWS brings.

For more information

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

Resources

AWS Cloud Adoption Framework

http://d0.awsstatic.com/whitepapers/aws_cloud_adoption_framework.pdf

<https://d0.awsstatic.com/whitepapers/AWS-Cloud-Transformation-Maturity-Model.pdf>

AWS products and services

<https://aws.amazon.com/products/>

AWS total cost of ownership calculator

<https://aws.amazon.com/tco-calculator/>

Calculate your AWS service usage

<https://calculator.s3.amazonaws.com/index.html>

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