IBM Services Cloud Modernization and Migration for IBM Cloud

Part 2: Planning, Migrating, and Managing
Abstract
IBM’s cloud enablement offerings extend to all the major cloud providers as part of its multi-cloud approach to transforming the enterprise. This is the second in a series of papers that will focus on IBM to help customers modernize and migrate applications to IBM Cloud.

In this paper, there will be a discussion on building the virtual data center, including account structure, region, and network connectivity, and defining the processes, standards, and conventions to better manage your IBM Cloud environment. IBM will walk you through planning the overall migration for each application, looking at the resources needed and tasks to be performed. The paper will also look at tasks specific to rehosting, replatforming, and refactoring an application.

Finally, the paper touches on rearchitecting an application, as well as managing and optimizing the resources based on IBM’s Cloud Garage Method and IBM Cloud Innovate Method.

Overview
This is the second whitepaper in our series on how IBM is simplifying cloud migration for our customers. We will pick up where the previous paper in the series left off.

In that paper, IBM Services Cloud Modernization and Migration Assessment for IBM Cloud, we described a quick start where we discussed creation of cloud enablement strategy, gathered information about your data center and cloud consumption, and did a proof point deploying sample set of your applications to IBM Cloud. We discussed conducting a series of assessments. These are the first steps towards making sure your company’s unique business drivers are properly addressed during the migration process. We then described how we evaluate the costs and effort involved with migrating individual applications, before helping you arrive at a recommended outcome for each one: retire, retain, rehost, re-platform, refactor, re-architect/re-engineering, or repurchase.

Through this, we discussed the deliverables that needed to be created during the assessment phase that includes blueprint for IBM Cloud that provides architectural guidance from IBM Cloud platform perspective. We also discussed supplying a customized list of reference deployments you could use when deploying your applications to IBM Cloud.

The information provided in the previous paper was intended to help you establish the building blocks for a cloud migration plan. Now, in this paper, you’ll learn how to create such a plan, and then put it into action to migrate your applications to IBM Cloud.

The paper will elaborate on the different types of application migration we introduced in the previous document:

1. **Retire** or decommission the application is that the target application will be marked for retire and notify the application team for application decommission process kick-off

2. **Retain** the application is that the target application will not be migrated to IBM Cloud platform and it will remain in current infrastructure environment
3. **Rehost** the application is that the workload Like for Like application migration to target cloud (lift & shift or similar) and make the application work on the target IBM Cloud infrastructure.

4. **Replatform** the application is that the 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. **Refactor** is that the application upgrade OS/Database/Middleware such as W2K3 or Win2008 to Win 2012, RHEL 7 below, Oracle 8 to 11g/12c, Microsoft SQL 2005/008 to 2014/16, Containerization etc.,

6. **Re-architect/Re-Engineering** the application is that the application upgrade OS/Database/Middleware such as W2K3 or Win2008 to Win 2012, RHEL 7 below, Oracle 8 to 11g/12c, Microsoft SQL 2005/008 to 2014/16, Containerization etc.,

   a. Application Deployment architecture change or application conversion for:
      1. from IaaS to PaaS, CaaS, or Serverless architectures
      2. Major Application packaging architecture changes to IBM Cloud platform
      3. Database modernization, e.g. SQL to NoSQL

   b. Changes like:
      1. Any custom application changes
      2. Complex / Highly complex application migration
      3. Oracle to DB2, ADABAS to Oracle
      4. Application functionality change
      5. Application re-structure to microservices

Cloud Innovate is IBM’s solution delivery methodology built on years of cloud experience, deep expertise and industry best practices. Delivering a holistic approach, Cloud Innovate covers the full engagement lifecycle and integrating all aspects of solution delivery — through each stage of your cloud transformation journey.
We discussed about analyzing current application portfolio(s) and establishing a roadmap, target architecture, operating model, governance model in the previous paper. We also discussed analyzing the portfolio data and establishing detailed insights which then led to establishing the migration strategy and wave plan. This paper will focus on subsequent execution & operations stages.

**Strategize/Mobilize & Discovery & Insight**

We discussed about analyzing current application portfolio(s) and establishing a roadmap, target architecture, operating model, governance model in the previous paper. We also discussed analyzing the portfolio data and establishing detailed insights which then led to establishing the migration strategy and wave plan. This paper will focus on subsequent execution & operations stages.

**Design & Build**

In the design phase, we define the migration/modernization roadmap and implementing the migration and modernization by executing the identified pattern/factors Six Rs. This phase we will have detailed migration plan for all workloads to migrate to IBM Cloud. Also, we will prepare prescriptive steps to move applications to IBM cloud in an accelerated fashion.

During build, we follow an agile sprint-based migration methodology breaking application portfolio into smaller units to run in parallel to make sure early benefits are realized. This delivery methodology is supported by toolchain and automation framework.
**Detailed Migration Planning**

During this phase, you will prioritize the applications you intend to migrate based on factors such as importance to the business, ease of deployment, criticality, regulatory requirement, RTO/RPO, changes that may be ongoing and other parameters while doing the assessment. Once the applications have been prioritized, we will help you create a migration schedule that maximizes throughput. The planned implementations will start with only a few migrations, and then use continuous feedback to improve the quality and pace of the migrations. The project schedule will feature migration waves at fixed intervals, with applications cutting over to production in batches.

Time taken to migrate applications vary and depends on several variables, including the complexity of the application, the type of migration occurring, and any business constraints that may affect the application.

In the previous paper, we discussed a quick start where IBM migrated applications as a way of walking your team through the process. The proof point should have exposed unexpected issues and the feedback incorporated into the planning thereby instilling confidence in the plan for all stakeholders. Post each migration batch, a specific retrospective session is planned which focuses on lessons learned from migrating the applications.

*Figure 3: Application cutover is performed in regularly scheduled batches.*
Application migration design

During the assessment phase, each application is aligned to a target migration approach along with target reference architecture.

This reference architecture, along with the standards set in the implementation architecture, will be used by the IBM migration team when deploying the application into IBM Cloud. Other artifacts created during the design phase include Technical solution design (TSD), migration technique, detailed migration plan, migration test plan, migration tools deployment plan, migration checklist, and deployment and operations information for a run book.

Application deployment

Following are the high level stages involved in Application Migration/deployment.

- Migration start stage:
  - **Requirements**: An IBM engineer gathers the remaining application data necessary to design the solution and execute for the chosen migration type. This includes the non-functional requirements as well as operations & service management requirements.
  - **Develop migrate scripts**: The IBM engineer iteratively designs and deploys the solution in a sandbox, including data migration. The engineer leverages a series of tools from IBM's own toolbox, as well as third-party tools.
  - **Develop operations scripts**: Scripts are developed for installation and configuration of monitoring integrations across application, software/middleware, and infrastructure as well as other system management integrations. This needs to be aligned on a per application & component basis.
  - **Develop test scripts**: The client team develops a test plan and a series of automated or manual test cases, collaborating with the IBM engineer.

- Support environment migration stage:
  - **Execute migrate scripts**: The IBM engineer deploys the application to the first support environment, which is often an integrated development environment.
  - **Execute operations scripts**: Operations scripts are executed that configures monitoring and system management aspects for the migrated application to function.
  - **Execute test scripts**: The client team executes the test plan.
  - **Review**: The client team and the IBM engineer hold a joint review.
  - **Feedback**: The teams make any adjustments to the migration scripts and documentation that may be needed based on the results of the review.
  - **Signoff**: The teams jointly sign off on the migration.
  - This effort is then repeated for any additional support environments. Dev-Integration → Test → UAT → Performance → Production.

- Application ready to migrate stage:
  - **Production ready**: The application is ready to migrate to production and will be moved at the end of the next sprint.

- Production/DR migration stage:
  - The process, scripts and documents used for migrating the support environments are also used for production/DR.
  - **Operational readiness**: Once the migration scripts & operations scripts are executed, detailed operations tests are conducted to ensure operational aspects are tested and application supportability is ensured.
  - **Cutover**: The users are now pointed to the new production environment.

Scripts for cutover to production would need to be same as the ones created for establishing the support environments. These scripts are to be written in a highly parameterized and configurable way to ensure different environment scenarios are addressed.
**Migration types**

This section of the paper will provide a closer look at different types of application migration you might choose to undertake. As the different types of migration progress from simpler to more complex, there will be overlap of the activities involved.

<table>
<thead>
<tr>
<th>Label</th>
<th>Name</th>
<th>Pattern Description</th>
<th>Sample Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>R1</td>
<td>Retire</td>
<td>- Application functions identified as duplicate</td>
<td>- Leverage equivalent business functions into another application/SaaS</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Application no longer required for business</td>
<td>- Application End-of-Life</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Application decommission on source through application decommissioning process</td>
<td></td>
</tr>
<tr>
<td>R2</td>
<td>Retain</td>
<td>- Client will keep application and its hosts in the source environment</td>
<td>- Core mainframe application with hi compute and performance characteristics</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Dependency on integrating service management</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Specialized environment and equivalent services not available in target platform</td>
<td></td>
</tr>
<tr>
<td>R3</td>
<td>Re-Hosting</td>
<td>- Like for Like application migration to target cloud</td>
<td>- Simple to Medium Y2K, P2V</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Minimal effort to make the application work on the target cloud infrastructure (Minimal application layout change)</td>
<td>- Storage: Local to DASD</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Storage migration will be needed (without conversion)</td>
<td>- RHel 7 and above</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- UAT - Some level of application testing</td>
<td>- Win 2012 and above</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- Lift &amp; shift</td>
</tr>
<tr>
<td>R4</td>
<td>Re-Factoring (Up-Version)</td>
<td>- Upgrade OS/Database/Middleware (Same Platform)</td>
<td>- W2K3 or Win2k8 to Win 2012</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Storage migration will be needed (without conversion)</td>
<td>- RHel 7 below</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Some level of application changes</td>
<td>- Oracle 8 to 11i/12c</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Application reinstallation on the target</td>
<td>- MS SQL 2005/I0B to 2014/16</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- UAT is highly recommended</td>
<td></td>
</tr>
<tr>
<td>R5</td>
<td>Re-Platform</td>
<td>- Changing one platform to other</td>
<td>- AIX to Linux</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Changing One OS to Other</td>
<td>- Mainframe to UNIX</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Middleware change to cloudify an application</td>
<td>- Weblogic to WebSphere</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- UAT required</td>
<td>- WAS @ AIX to WAS@Linux</td>
</tr>
<tr>
<td>R6</td>
<td>Re-Architect/ Reengineering</td>
<td>- Language Conversion</td>
<td>- Any custom application .csh</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Application architecture changes</td>
<td>- Complex / Highly complex application migration</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Application Deployment architecture changes</td>
<td>- Oracle to DB2, ADABAS to Oracle</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Database modernization</td>
<td>- Application functionality change</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- UAT required</td>
<td>- Application containerization</td>
</tr>
</tbody>
</table>

*Figure 4: IBM Cloud Innovate — Migration Types.*
**Rehosting**

Rehosting is a lift and shift and confirmation of connectivity. No changes are made to the application, the software or the versions. Potential cost savings from rehosting an application would come from a like-for-like comparison of compute, storage and network charges, with labor costs remaining about the same. You need to perform the following activities.

- Select host(s) workload web, application component.
- Install migration toolchain for host-based migration.
- Validate target platform, network connectivity, access/credential.
- Source to target connectivity through migration tools.
- Pre-migration remediation activities such as resolving hard-coded IP addresses etc.
- Review and alignment of all software licenses including 3rd party licenses of custom-off-the-shelf products and libraries etc.
- Pre-migration checklist.
- Migration execution steps using migration toolchain.
- Post-migration checklist (including fix/refactor).
- Performance acceptance testing including failover testing for high availability applications that needs failover capabilities.
- Perform required security and compliance audits.
- The data migration strategy would depend on several factors. IBM and its partners have a series of tools that can assist you in data migration.

Involvement of relevant business and IT stakeholders throughout the process is key to ensure issues are identified and addressed quickly.

---

**Replatform**

Re-platforming is changing one platform to the other or changing an Operating system to another. It may require middleware changes to port application on cloud and also code changes to an application, based on the complexity of application and compatibility to target platform. In terms of total cost of ownership, it is like rehosting, in that the savings would come from a like-for-like comparison of compute, storage and network charges, with labor costs remaining about the same. You need to perform the following activities.

- Select app workload web, application component.
- Install Base OS/MW/DB component (or as applicable for container host).
- Identify, source & validate MW component/module configuration.
- Identify, source & validate application other runtime modules.
- Review and alignment of all software licenses including 3rd party licenses of custom-off-the-shelf products and libraries etc.
- Remediation of any issues that prevented the application from being re-platformed such as application dependency on the source operating system, file systems, hard-coded hostnames and IP addresses, even compilers and then containerization.
- Install Application component (e.g. web module, app module, integration module).
- Install DB component (schema, objects, integration module).
- Perform database migration.
- Perform data migration & delta synch.
- Validate database configuration (schema, data, objects etc.).
- Perform custom software package installations. Third-party, COTS and application-dependent packages in the source environment would all need equivalent packages in the target environment.
- Because of the changes you’ll make, the application should be tested more thoroughly than a rehosted application would be.
- Perform any required security and compliance audits.
**Refactor/Re-architect**

Refactoring takes advantage of IBM and third-party cloud services to improve efficiency and consumption of resources, thereby reducing compute, storage, network and operating costs. Depending on requirements the application might need to be re-architected and rebuilt. Like rehosting and replatforming, the user experience after Refactoring would be like the user experience when running the application on premises.

- IBM collaborates with your team and reviews the application to determine what configuration or coding changes are needed.
- If new application needs to be custom built or rearchitected, extracting the functional and non-functional requirements and implementing them within a new application.
- Because of the changes you will make to the application, a thorough end-to-end testing is recommended.

**Delivery Execution**

IBM uses an Agile based migration delivery factory model which is emphasized on IBM Cloud Innovate method, Talent Model (Migration, Modernization and Rationalization experts), IBM Tooling framework and end-to-end delivery model. IBM Cloud Innovate method for Application Cloud migration is further outlined below from delivery perspective.

---

![Diagram](image-url)

*Figure 5: Cloud Innovate — Migrate to IBM Cloud — Agile Delivery Method*
IBM Cloud Transformation Toolkit (ICTT)
The IBM Cloud Transformation Toolkit for Cloud Migration and Modernization is targeted at creating a toolchain that helps in accelerating the Cloud adoption for enterprises.

IBM Cloud Transformation Toolkit aligns with and supports the IBM Cloud Innovate method. ICTT is Unified Interface for Cloud Transformation method.
The toolkit is a complete end to end solution for discovery, analysis and automation migration of client IT infrastructure to target public, hybrid and private cloud infrastructures, and for modernization of legacy applications to modern architectures.

It consists of components like BlueCAT (Strategy and Consulting tool for Advise on Cloud adoption), Discovery & Insights (ingestion of discovery data, generation of insights reports), Automation and Orchestration (automation of migration to cloud), SCOPE+ (common information repository, wave planning, progress tracking and audit), Microservices code generation (for modernization) and integration with additional tools.

ICTT components can be used in 4 major areas of IBM Cloud Innovate Method i.e., Advise on Cloud, Migrate to Cloud, Modernize for Cloud and Rationalize for Cloud.

**Application Operations on Cloud**

Design-build stage ensures necessary operations configuration are performed on each of the applications and operations testing is performed. Thus, supportability of these applications is ensured per the service level agreements and appropriate non-functional requirements.

**The Method**

Application Operations on cloud ensures the operational readiness and on-going operations of the migrated or modernized applications through a systematic framework described in the following figure 7.

---

**Figure 7**: Cloud Innovate — Application Operations on Cloud Method
Following are key steps in application Operations on cloud method:

**Activate service:** Each of the applications including the platform is reviewed for its supportability per the desired service level agreements. This includes agreements with dependent service providers, product vendors, security requirements review and so on. Then incident management framework is configured, and the operations service is activated.

**Monitor:** Monitoring framework is configured as per the operational needs of the application and platform.

**Analyze:** Application and platform monitoring data is analyzed for issues (current and potential future issues) and automation scripts are written wherever applicable.

**Plan:** Outstanding incidents are reviewed and assigned to resolver groups and tracked on a continuous basis.

**Execute:** Incident/problem management is performed that includes high severity incident management as per application and platform needs.

**Learn**

You have access to the data being used by IBM to manage your infrastructure. You can use IBM AppOps on Cloud to perform the work while your staff focuses on building and enhancing systems in support of the business.

Now that you’ve migrated your applications to the cloud, you can start taking advantage of the tools that IBM Services and IBM Cloud offers to optimize your applications.

Using DevOps Insights, part of IBM Cloud Continuous Delivery service, all of your development data is analyzed and it helps in measuring how effectively you are developing code and also identifying error-prone code.

With Availability Monitoring, it alerts you when operational problems exist and DevOps Insights shows you which new code is being pushed and when. Understanding the operational metrics is essential to a smooth transition to production and continuous availability.

You can use analytics to improve the time to root-cause analysis and service restoration after failure. Also, to review operations analytics based on the changes that were made in previous sprints. Such reviews help the team identify areas for improvement and learn how its app is being used.

Analytics can go beyond traditional monitoring. Data can also be captured about how users are interacting with the application. IBM Digital Analytics solutions can analyze visitor behavior trends in near real-time.

**DevOps**

Moving to the cloud is an opportunity to look at your DevOps maturity level across applications and for an individual application. The assessments and the move of the application by rehosting, replatforming, or refactoring should have provided sufficient data to review your overall application development lifecycle management and inefficiencies in specific applications. The next paper in the series will discuss IBM’s approach to building DevOps in an enterprise.
**IBM Cloud Reference Architecture Details**

In the previous paper we elaborated IBM Cloud Reference architecture blueprint covering Infrastructure and Virtualization architecture. Here we will be talking about Network, Security and Identity and Access management.

**Network**

You can choose any mode of connectivity from the options provided by IBM Cloud such as IBM Cloud Direct Link, IBM Cloud Virtual Private network (VPN) or Customer managed VPN/IPSEC Channel.

Direct Link allows you to connect your on-premises or collocated infrastructure directly to the IBM Cloud private network with Direct Link. IBM Cloud can enable a private and secure 1Gbps or 10Gbps connection to your IBM Cloud servers across the private network. This means that no traffic across your Direct Link and between your servers touches the public network or otherwise interferes with your public network traffic.

IBM Cloud virtual private network (VPN) provide access to your private network over SSL, PPTP, or IPSEC VPN gateways. IBM Cloud’s VPN access is designed to allow users to remotely manage all servers securely over the IBM Cloud private network.

You may want to manage your own VPN tunnel and endpoints for access to your IBM Cloud hosted environment. In this situation, you can broker VPN management through an Internet-facing gateway that provides VPN termination and lifts traffic off of the public network and moves it to the private network.

In this case, the VPN gateway (at least) must be Internet routable and reachable; no other servers need to be exposed to the Internet. There is a step-by-step guide to install and configure an IBM Cloud Vyatta gateway device as a VPN to access any server behind the Vyatta device.

**Security**

Your IBM Cloud Environment needs to be safe and secure.

By configuring IBM Cloud Activity Tracker you can capture and record API call logs made by users and applications within the IBM Cloud. With this you can view, search, and export API access logs for IBM Cloud runtimes and services.

**IBM Managed Security Services** allow you to secure and monitor your resources on the cloud.

In IBM Cloud—Cloud Foundry environment, all security logs are sent automatically to an internal Security Operations Center powered by IBM Security QRadar®. IBM Cloud uses the IBM Security QRadar tools to consolidate Linux logs to monitor privileged access on Linux. Tenable Network Security’s vulnerability scanning tool, Nessus, detects any issues with network and host configurations so issues can be resolved.

IBM Cloud administrators ensure that fixes for operating systems are applied at appropriate frequencies. IBM Endpoint Manager enables automated fixes. IBM Cloud also uses IBM QRadar Security Information and Event Management (SIEM) to monitor successful and unsuccessful login attempts by application developers. The IBM Cloud platform comes with built-in intrusion detection.
Accounts, users and groups
IBM Cloud allows you to have users and groups for your account. IBM Cloud provides different types of user group such as Administrative users, Developer users, and Application users. Each of these user groups can have multiple roles based on the services they use in IBM Cloud. Users can be restricted to use only specific services. For example, you can enable developers to access only development and staging spaces and restrict production spaces.

The web application’s audience determines the authentication model that is used. For an unprotected website, you don’t need authentication. For websites that require sign in, authentication is often handled by Security Assertion Markup Language (SAML), an OpenID Connect-based (OIDC) repository, or by one of the App ID Service Social Login options.

Identity and Access Management
By configuring and integrating with IBM Cloud components of Identity and Access Management (IAM) service, you can control who can do what in your IBM Cloud environment and from where. IAM can integrate with your existing corporate directory. You can set up multifactor authentication, identity federation, and SSO (Single sign-on). Fine-grained policies can be configured for access management.

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

Resources
IBM Cloud Adoption Framework
ibm.com/cloud/garage/adoption

IBM Cloud products and services
ibm.com/cloud

IBM Cloud Innovate
ibm.com/services/campaigns/cloud-innovate-infographic/

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>API</td>
<td>Application Programming Interface</td>
</tr>
<tr>
<td>CaaS</td>
<td>Container-as-a-Service</td>
</tr>
<tr>
<td>CAT</td>
<td>Cloud Affinity Tool</td>
</tr>
<tr>
<td>COTS</td>
<td>Commercial Off-The-Shelf</td>
</tr>
<tr>
<td>DB</td>
<td>Database</td>
</tr>
<tr>
<td>IaaS</td>
<td>Infrastructure-as-a-Service</td>
</tr>
<tr>
<td>IAM</td>
<td>Identity &amp; Access Management</td>
</tr>
<tr>
<td>ICTT</td>
<td>IBM Cloud Transformation Toolkit</td>
</tr>
<tr>
<td>IPSEC</td>
<td>Internet Protocol Security</td>
</tr>
<tr>
<td>MW</td>
<td>Middleware</td>
</tr>
<tr>
<td>OIDC</td>
<td>OpenID Connect</td>
</tr>
<tr>
<td>OS</td>
<td>Operating system</td>
</tr>
<tr>
<td>PaaS</td>
<td>Platform-as-a-Service</td>
</tr>
<tr>
<td>PPTP</td>
<td>Point-to-Point Tunneling Protocol</td>
</tr>
<tr>
<td>RPO</td>
<td>Recovery Point Objective</td>
</tr>
<tr>
<td>RTO</td>
<td>Recovery Time Objective</td>
</tr>
<tr>
<td>SAML</td>
<td>Security Assertion Markup Language</td>
</tr>
<tr>
<td>SCOPE</td>
<td>System Consolidation Object Processing Environment</td>
</tr>
<tr>
<td>SLA</td>
<td>Service-level Agreement</td>
</tr>
<tr>
<td>SSL</td>
<td>Secure Sockets Layer</td>
</tr>
<tr>
<td>SSO</td>
<td>Single Sign-on</td>
</tr>
<tr>
<td>TSD</td>
<td>Technical Solution Document</td>
</tr>
<tr>
<td>VPN</td>
<td>Virtual Private Network</td>
</tr>
</tbody>
</table>
Authors

Venkatraman Krishnamoorthy
Venkatraman Krishnamoorthy is a Senior Architect and Migration and Modernization Lead at IBM Services. He is focused on providing migration and modernization solutions for multiple clients globally. He brings expertise in areas of Enterprise Architecture, Technology Consulting, Product Development, Cloud Migration Design, planning and execution.

Shweta Jain
Shweta Jain is a Senior Architect and Modernization Lead at IBM Services. She is focused on providing migration and modernization solutions for multiple clients globally. She brings expertise in areas of application portfolio assessment, Migration Design, planning and execution.

Balakrishnan Sreenivasan
Bala Sreenivasan is an IBM Distinguished Engineer & Cloud Migration Factory Technical Leader at IBM Services. He is focused on delivering cloud transformations for IBM’s largest enterprise customers, where he brings extensive experience and expertise in enterprise architecture, DevOps and cloud migrations.