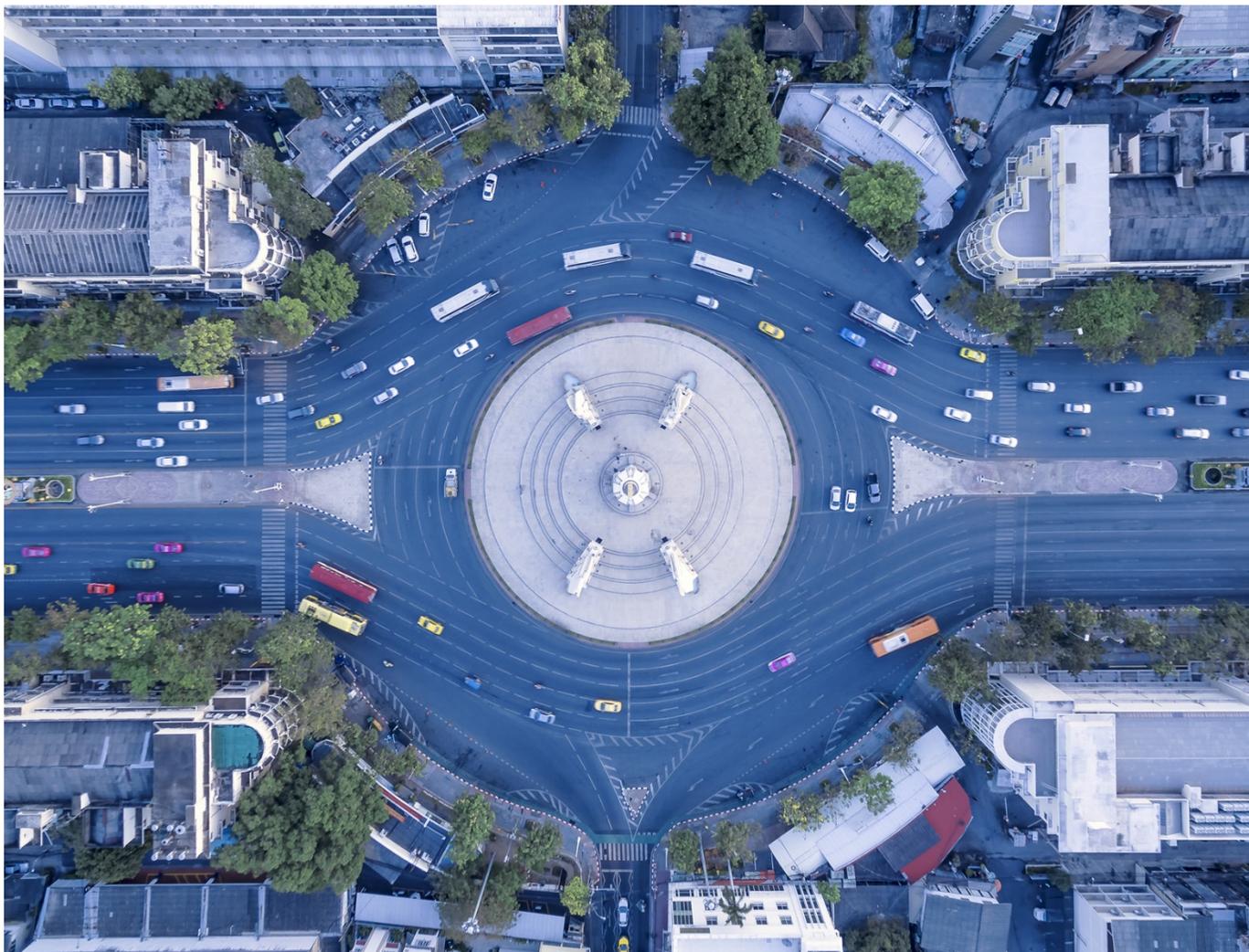


Integrating faster into a hybrid multicloud environment

How IBM Cloud Pak for Integration accelerates your journey to the cloud



The digital transformation

Every company faces the digital transformation challenge. In order to survive in today's fast-paced high-tech world, enterprises strive to innovate and deliver faster with digital technology as a core part of their business model. To achieve business demands, IT organizations are leveraging cloud architecture to maximize their deployment, development and operationality agility.¹

Yet most enterprises have migrated only 18%² of all their workloads to the cloud. These are the workloads that tend to have little or no dependencies on other applications, databases, servers, or storage and thus can be transitioned relatively easily. The remaining 82% of workloads are still on-premises due to their complexities and dependencies on other applications and infrastructure requirements that can make transformation a challenge.

Complex application environments require integration with various microservices along with on-premises and/or third-party databases, and multiple end-user applications over private cloud, public cloud, hybrid cloud or multicloud. Integration of these environments can require substantial time and expense. Without an agile integration platform to deliver, develop and operate in a cloud infrastructure, complex enterprise applications can require months, or years, of development resources to modernize. Consequently, many organizations struggle to complete their digital transformation journey because they simply cannot afford to invest the effort to integrate their applications into a cloud architecture. In this paper we will examine application transformation challenges and how IBM Cloud Pak™ for Integration can accelerate the journey to the cloud.

Integrating into a hybrid multicloud environment

Moving into a cloud environment entails **application modernization** due to fundamental differences between monolithic and cloud application architecture. Figure 1 illustrates the evolution of traditional applications to cloud enabled applications in terms of architecture, infrastructure and delivery.

Traditional enterprise application architecture contains monolithic applications that may be exposed through Service Oriented Architecture (SOA), while cloud applications are developed with microservices.

Cloud application services are decentralized, focused and light weight, to take advantage of a **dynamic infrastructure**.

The infrastructure is based on the cloud, which encompasses all types of clouds (private cloud, public cloud, hybrid cloud, and multicloud) in order to address different types of business needs.

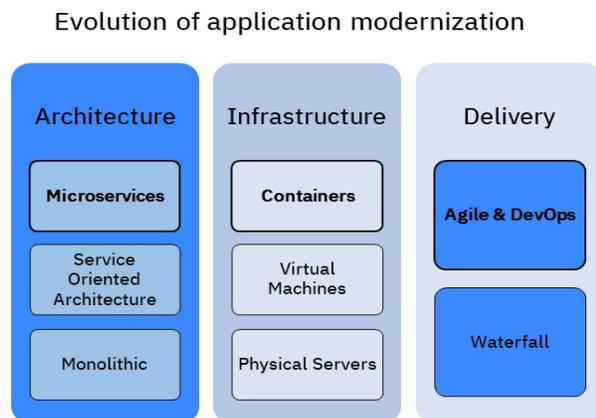


Figure 1: Visual of application modernization

¹ IBM blog - <https://developer.ibm.com/integration/blog/2019/09/08/integration-modernization-the-journey-to-agile-integration-a-view-from-the-field/>

² <https://www.ibm.com/blogs/cloud-computing/2019/03/05/20-percent-cloud-transformation/>

Increasingly enterprises are embracing DevOps tooling and agile development methodologies to provide continuous **delivery** as opposed to earlier waterfall that emphasized sequential completion of project phases.

How does IBM Cloud Pak for Integration help application modernization?

Traditional integration is portrayed by monolithic centralized deployment using enterprise service bus (ESB) where all connections are deployed on dedicated integration servers. On the other hand, modern integration architecture decentralizes services to bring agility. Figure 2 highlights three key attributes that IBM Cloud Pak for Integration provides to enable an agile integration

architecture: fine grained deployment, decentralized ownership and cloud native infrastructure.

IBM Cloud Pak for Integration offers a microservices cloud architecture in which monolithic integration is broken down into smaller components

of integration services that are more manageable and specialized.³ This **fine grained integration deployment** improves agility where one integration flow can be modified or deployed independently of other flows.

The move towards fine-grained integration enables the decentralization of integration teams. At first this may seem a challenge for centralized integration developers, however, Cloud Pak for Integration is designed to simplify microservices development so that application developers can increase their productivity. Modern agile **decentralized ownership** makes it simple to build and re-use, govern integrations and best practices, and deploy without affecting other services.

IBM Cloud Pak for Integration provides the operational agility of **cloud native infrastructure**. Cloud native deployment techniques enables granular management of microservices with integration runtimes to run in a containerized environment. This agile integration is lightweight and independent, making it easy to manage containerized environments that can provide continuous delivery and enhanced tooling.

Cloud Pak for Integration is an enterprise-grade solution that enterprises can leverage for a hybrid cloud, across multiple cloud providers and on-premises to operate with agility and efficiency. Cloud Pak for Integration runs on Red Hat® OpenShift®, a platform based on Kubernetes® that facilitates containerized applications and workloads to run anywhere on the

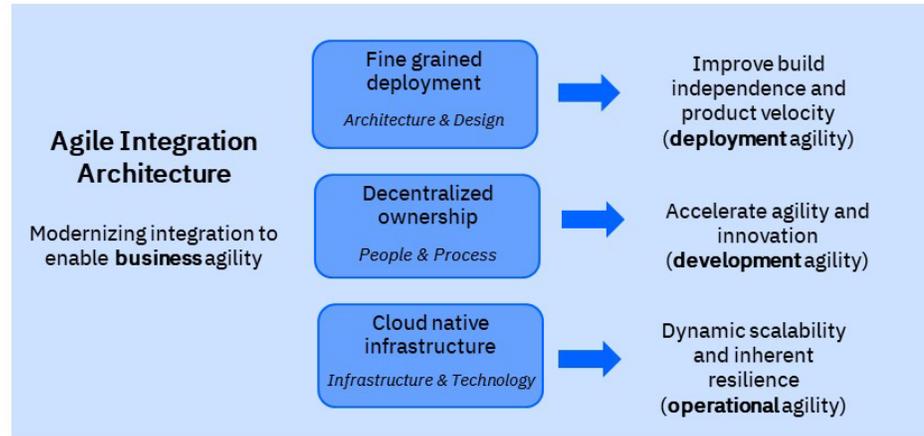


Figure 2: Overview of agile integration architecture for business agility

³ <https://www.ibm.com/cloud/architecture/architectures/evolution-to-agile-integration>

cloud, on premises, and across multiple cloud providers. Cloud Pak for Integration is built on an open source Kubernetes platform with enterprise-grade end-to-end security. It provides key attributes that enterprises require in terms of security, scalability, flexibility, updates, patches, and performance. Most of all, it is designed to simplify application integration capabilities as enterprises transition from traditional applications to a containerized cloud environment.

A significant benefit of Cloud Pak for Integration is its event streaming capability. Cloud Pak for Integration includes IBM Event Streams that enables event driven reactions in real time to provide more engaging customer experiences. The event streams platform uses Apache Kafka to deliver messages easily and reliably.

IBM Cloud Pak for Integration versus Do-It-Yourself (DIY) programming

To examine how IBM Cloud Pak for Integration facilitates application integration into a hybrid cloud environment, we compared the development effort of implementing Cloud Pak for Integration versus manual programming (DIY) to integrate a microservices-based stock trading application with another application. The test entailed using pre-built IBM Event Streams connectors available in Cloud Pak for Integration to retrieve notifications and to publish them to a third party chat application instead of manually configuring connectors using Java code. IBM testing showed that application integration time for a developer can be reduced by 50% using IBM Cloud Pak for Integration compared to integration with traditional Java programming.⁴

Test environment

The following figure illustrates the workflow of the stock trading application when using Cloud Pak for Integration versus Java programming (figure 3) in a hybrid multi cloud environment.

Test environment for IBM Cloud Pak for Integration versus Do-It-Yourself

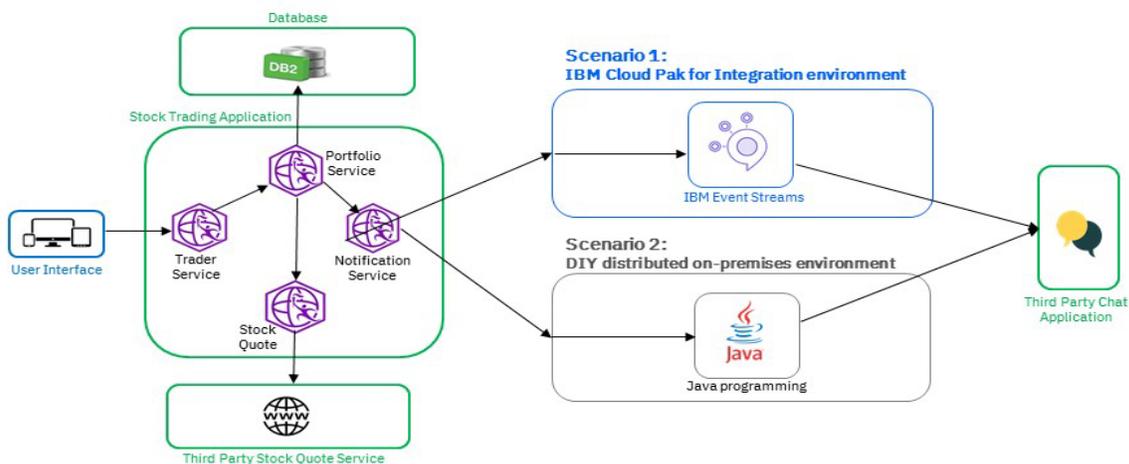


Figure 3: Test environment for a stock trading application using IBM Cloud Pak for Integration event streams versus DIY Java programming

⁴ Application integration measured time of a developer to create a Java message driven bean (MDB) in a container (16 hours) versus using IBM Cloud Pak for Integration Event Streams (8 hours) to retrieve notifications from MQ and publish them to a 3rd party chat application for an IBM internal-use stock trading application. Measurements were performed in an IBM lab environment. Results will vary according to programming expertise and complexity of the integration requirements.

Use case details

The **stock trading application** was comprised of four microservices (purple icons in green application rectangle in figure 3):

- **Trader service** provides the user interface in which users login and request to see their stock portfolio account details.
- **Portfolio service** receives the processing requests from other services. It performs create, read, update, delete (CRUD) operations against the user account information in the third-party database. Users submit requests for portfolio status through trader service or place requests to buy or sell the shares where portfolio pulls the current market price from stock quote service.
- **Stock quote service** pulls the stock price from a third-party application whenever a user places a request to buy or sell shares.
- **Notification service** examines the loyalty level of the user portfolio. For example, if the level of the user changes from bronze to silver, a notification about this level change is created and will be published in the third-party application. IBM MQ was used in the test environment with the stock trading application to publish notifications in the chat application.

For the DIY scenario we measured the development effort of creating a Java message driven bean (MDB) so that Java™ EE applications could receive and process messages asynchronously. The MDB was developed and integrated in the containerized environment with WAS Liberty server. Notifications from the MDB were then integrated with the third-party chat application.

Developer Productivity

For the Cloud Pak for Integration scenario we measured the development effort of connecting the trading application to the chat application via IBM event streams. Testing found the Cloud Pak for Integration implementation effort to be significantly simpler with 50% less time required³ than developing the MDB and configuring with the chat application. Cloud Pak for Integration provided a ready to use framework, alleviating the need for extensive manual coding.

Impact of Cloud Pak for Integration

To understand the impact of Cloud Pak for Integration for an IT organization, we examined the business value of using Cloud Pak for Integration using a return on investment (ROI) model over five years for a financial institution in North America. In addition to developer productivity, other business values such as application benefits, application implementation and benefit accrual were included in the ROI model.⁵

⁵ An IBM IT Economics assessment performed for a N.A. financial institution examined the company's estimated costs, developer productivity and business benefits using IBM Cloud Pak for Integration for a portion of company's applications.

- **Application development productivity:** Full time equivalent for one developer to integrate seven applications over one year with an annual labor rate of \$150,000.
- **Developer productivity:** Integration efficiencies through use of containerization and Cloud Pak components were estimated to accelerate integration efforts by 50%.⁶
- **Application benefits:** Quantified business benefits based on client anticipated revenue from client projections. For this institution an average of \$68,571 per year for each application was estimated.
- **Application implementation:** Applications in the model were estimated to complete by end of year one and application revenue benefit was estimated to accrue from year two to year five.
- **Benefit accrual:** Application benefits were estimated to accrue on a gradual basis, with 50% in year two, 75% in year three and 100% in year four and five.
- **Perpetual licensing:** The model assumed the purchase of 18 IBM Cloud Pak for Integration VPC licenses⁷ with a 10% discount. Years two to five included the cost of services and support (considered operating expense in the model).

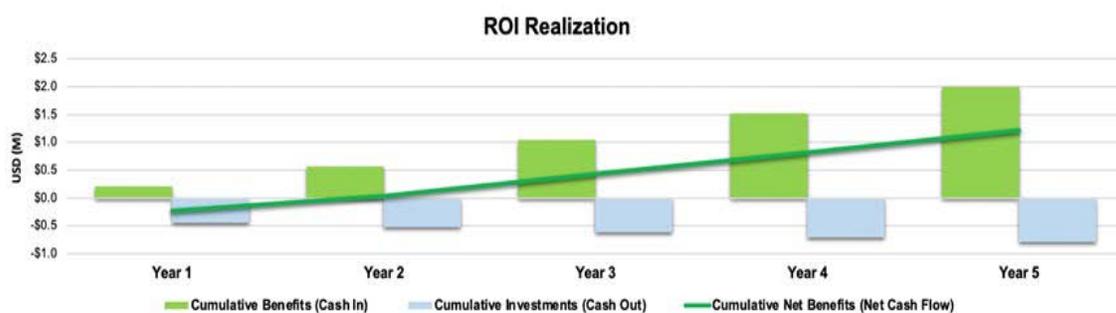
Findings from ROI model

In the cost comparison model, integration of seven microservices-based applications using IBM Cloud Pak for Integration for the financial institution provided a 152% return on investment over five years.⁸ The following table (figure 4) shows the financial institution's investment (cash out) for development effort and software licensing versus benefits (cash in) from Cloud Pak for Integration tooling and anticipated revenue generation resulting from faster time to market and the cumulative net benefits (net cash flow) over time. Due to the anticipated benefits for its IT staff and business operations the business could achieve a payback in less than two years (23 months).

⁶ Saving percentage was based on proof of concept performed by the financial institution, data from other client assessments and IBM testing.

⁷ Based on a customer assessment with a sizing of 4.5 VPCs per application. This includes production, dev and QA environments.

⁸ An IBM IT Economics five year return on investment model was used to examine seven microservices-based applications running in containers on x86 servers. Model examined development effort (one full time developer equivalent and IBM Cloud Pak for Integration software costs versus anticipated business benefits and benefit accrual over years 2 to 5 (50% in year two, 75% in year three and 100% in year four and five) based on client data in IT Economics assessments. IBM Cloud Pak for Integration perpetual license cost is based on U.S. prices as of September 2020 with a 10% discount. Efficiency savings for developer productivity is based on efforts from IBM development testing and client data from IBM IT Economics assessments. For additional information on the cost model contact the IBM IT Economics team, IT.Economics@us.ibm.com.



Benefits	Year 1	Year 2	Year 3	Year 4	Year 5	TOTAL
Benefits (Cash In)	202,500	360,000	480,000	480,000	480,000	2,002,500
Cumulative Benefits (Cash In)	202,500	562,500	1,042,500	1,522,500	2,002,500	
Investments	Year 1	Year 2	Year 3	Year 4	Year 5	TOTAL
Investments (Cash Out)	(440,640)	(88,128)	(88,128)	(88,128)	(88,128)	(793,152)
Cumulative Investments (Cash Out)	(440,640)	(528,768)	(616,896)	(705,024)	(793,152)	
Net Benefits	Year 1	Year 2	Year 3	Year 4	Year 5	TOTAL
Net Benefits (Net Cash Flow)	(238,140)	271,872	391,872	391,872	391,872	1,209,348
Cumulative Net Benefits (Net Cash Flow)	(238,140)	33,732	425,604	817,476	1,209,348	
Return on Investment						152%

Figure 4: ROI model over five years and breakout of costs and benefits for a financial institution modernizing seven applications

Benefits of Cloud Pak for Integration

Cloud Pak for Integration can optimize IT operations in the following areas:

- **Code quality:** Integration toolkit patterns minimize the percentage of potential coding errors caused from developing code from scratch that connect applications.
- **Process length:** Streamlined end-to-end processes using a cloud-native framework shortens time to delivery.
- **Productivity:** Increased productivity enables efficiencies and saved time for developers, operators, and administrators.
- **Cost savings:** Fast and secure application connectivity boosts IT and business productivity, thus minimizing costs for the business as a whole.
- **Revenue growth:** Shorter time to market accelerates revenue generation for existing and new client opportunities.

Maximizing business productivity with modern integration

Integration is a fundamental part of digital transformation. Consequently, the journey to the cloud needs to be fast, agile and non-disruptive to the needs of the business. Cloud Pak for Integration provides a cloud native infrastructure with containerization and tooling to address enterprise hybrid multicloud requirements. Cloud Pak for Integration provides a platform that facilitates agile integration so that businesses can deliver modernized solutions quickly and cost-effectively.

If your business is looking for agile application integration capabilities for the cloud, consider asking for a no-charge IT Economics assessment at IT.Economics@us.ibm.com to help you on the journey to the cloud.

About the authors



Husnal Walia is an IBM Technical Support Specialist for the IBM IT Economics Consulting and Research team. Her assignments include networking for the Competitive Project Office, lab assets management, z/OS® system programming, and competitive research to examine the competitive position on IBM products and services in the marketplace. Before joining IBM, she had more than 13 years of experience in finance and IT projects working with multi-national companies.



Klaus Bonnert is a Master Certified IT Specialist and a Technical Specialist for the IBM IT Economics Consulting and Research team. In this role he is focusing on competitive research for IBM software and cloud solutions. Klaus has over 15 years of experience in architectural design and implementation of integration solutions. Before joining IBM, he was working as a Sales Account Manager and Consultant for several software companies.



Srirama (Sri) Krishnakumar is a Senior IT Business Management Consultant at IBM. His current focus includes helping customers with their IT strategy around on-prem, cloud, and blockchain networks.



Alex Feinberg is an IBM and Open Group Master Certified IT Specialist and the Marketing and Communications Manager for IBM IT Economics Consulting and Research team. With over 30 years of software experience, Alex has led the design and development of many complex applications and can frequently be found presenting at workshops and conferences. His current area of focus is competitive analysis of the IBM Z® and LinuxONE platforms, especially in the areas of security and hybrid multi-cloud.



Susan Proietti Conti, PMP® is an IBM Executive Project Manager and Program Director for the WW IBM IT Economics Consulting and Research organization. She manages IT Economics projects and helps clients leverage IT Economics to increase IT efficiencies and reduce costs.



©Copyright IBM Corporation 2020

IBM Corporation
New Orchard Road
Armonk, NY 10504
U.S.A.
10/20

IBM, ibm.com, IBM logo, IBM Z, IBM Cloud Pak, and z/OS are trademarks or registered trademarks of the International Business Machines Corporation.

A current list of IBM trademarks is available on the Web at <https://www.ibm.com/legal/us/en/copytrade.shtml>, and select third party trademarks that might be referenced in this document is available at https://www.ibm.com/legal/us/en/copytrade.shtml#section_4.

Adobe, the Adobe logo, PostScript, and the PostScript logo are either registered trademarks or trademarks of Adobe Systems Incorporated in the United States, and/or other countries.

Cell Broadband Engine is a trademark of Sony Computer Entertainment, Inc. in the United States, other countries, or both and is used under license therefrom.

InfiniBand and InfiniBand Trade Association are registered trademarks of the InfiniBand Trade Association.

Intel, Intel logo, Intel Inside, Intel Inside logo, Intel Centrino, Intel Centrino logo, Celeron, Intel Xeon, Intel SpeedStep, Itanium, and Pentium are trademarks or registered trademarks of Intel Corporation or its subsidiaries in the United States and other countries.

Java and all Java-based trademarks and logos are trademarks or registered trademarks of Oracle and/or its affiliates.

The registered trademark Linux® is used pursuant to a sublicense from the Linux Foundation, the exclusive licensee of Linus Torvalds, owner of the mark on a worldwide basis.

Microsoft, Windows, Windows NT, and the Windows logo are trademarks of Microsoft Corporation in the United States, other countries, or both.

OpenStack is a trademark of OpenStack LLC. The OpenStack trademark policy is available on the [OpenStack website](#).

Red Hat®, JBoss®, OpenShift®, Fedora®, Hibernate®, Ansible®, CloudForms®, RHCA®, RHCE®, RHCSA®, Ceph®, and Gluster® are trademarks or registered trademarks of Red Hat, Inc. or its subsidiaries in the United States and other countries.

RStudio®, the RStudio logo and Shiny® are registered trademarks of RStudio, Inc.

TEALEAF is a registered trademark of Tealeaf, an IBM Company.

UNIX is a registered trademark of The Open Group in the United States and other countries.

Worklight is a trademark or registered trademark of Worklight, an IBM Company.

Zowe™, the Zowe™ logo and the Open Mainframe Project™ are trademarks of The Linux Foundation.

All statements regarding IBM's future direction and intent are subject to change or withdrawal without notice, and represent goals and objectives only.

The information contained in this documentation is provided for informational purposes only. While efforts were made to verify the completeness and accuracy of the information contained in this documentation, it is provided "as is" without warranty of any kind, express or implied. In addition, this information is based on IBM's current product plans and strategy, which are subject to change by IBM without notice. IBM shall not be responsible for any damages arising out of the use of, or otherwise related to, this documentation or any other documentation. Nothing contained in this documentation is intended to, nor shall have the effect of, creating any warranties or representations from IBM (or its suppliers or licensors), or altering the terms and conditions of the applicable license agreement governing the use of IBM software.

References in these materials to IBM products, programs, or services do not imply that they will be available in all countries in which IBM operates. Product release dates and/or capabilities referenced in these materials may change at any time at IBM's sole discretion based on market opportunities or other factors and are not intended to be a commitment to future product or feature availability in any way.

19036219USEN-00