IBM

Mastering the Cloud with WebSphere®

For dummies®
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IBM Limited Edition

- Determine the best hybrid computing approach

- Discover best practices for modern application servers

- Manage the API life cycle

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Mastering the Cloud with WebSphere®

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by Judith Hurwitz and Daniel Kirsch

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Publisher's Acknowledgments

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Introduction

The role of the application server has changed in the era of the hybrid cloud. It has become the foundation for managing microservices and containers and Application Programming Interfaces (APIs) so this new generation of software can be managed in a consistent and predictable way. WebSphere has evolved into a software framework based on a family of products that span from the traditional on premises model to the cloud. With the WebSphere platform, the right services can become an integrated, scalable, and predictable environment.

About This Book

Welcome to *Mastering the Cloud with WebSphere For Dummies,* IBM Limited Edition. This book is intended to help you understand the value and benefit of the evolving WebSphere family. Over the years, WebSphere Application Server has been transformed for the world of hybrid cloud. The WebSphere Application Server family provides a flexible framework to support a hybrid cloud model.

A number of WebSphere capabilities are critical to manage a highly changing computing environment. These benefits include the following:

» The ability to create and manage sophisticated APIs

» A Java-based framework

  Traditional WebSphere is designed to support transactional systems and can reside both on premises and in the cloud, while WebSphere Liberty is based on a lightweight kernel designed to quickly and easily create cloud-native applications.

Foolish Assumptions

The information in this book is useful to many people, but we have to admit we did make a few assumptions about who we think you are:

» You're already using WebSphere Application Server and are interested in understanding how WebSphere can support your changing computing requirements.

» You're moving (or considering moving) to a hybrid cloud environment in order to respond to disruptions in your industry and embrace a new generation of services.

» You understand the huge potential value of an integrated approach to creating and managing the hybrid cloud.

» Your organization is beginning to understand the need for your IT services to be designed with modularity and flexibility.

Icons Used in This Book

The following icons are used to point out important information throughout the book:

Tips help identify information that needs special attention.

Pay attention to these common pitfalls of managing your foundational cloud.

This icon highlights important information that you should remember.

This icon contains tidbits for the more technically inclined.

Chapter **1**

The Future of the Application Server

Application servers have been the foundation of cutting-edge technology since the advent of web applications. With the introduction of cloud computing, application servers have expanded and transformed to support social, mobile, and Internet of Things (IoT). We are now moving into a world where modules of software services are combined together to create new workloads and new applications based on changing market needs. Customers are no longer satisfied with static applications that don't change with their requirements. The challenge for businesses today is how to achieve the appropriate level of flexibility and modularity while still maintaining a predictable and manageable application environment. The application server, which has been the foundation of building predictable transactional applications for decades, has evolved into the backbone of a new generation of cloud-based application services.

This chapter provides an overview of the adapting role of an application server and shows how it can become a key component

of your journey to digital transformation. In order to have the flexibility to compete with emerging companies, you must have an application platform that can grow with you.

The Role of the Application Server

The role of the application server is changing dramatically and helping developers create more complex applications faster, and with a reduced turnaround speed. Before we delve into the modern application server, we want to show you the origins of this technology platform.

In the early computer era, everything from the hardware to the middleware and applications were tightly integrated. You were guaranteed the system's services would work seamlessly together because they were designed specifically to support each element. As distributed computing grew, and applications weren't directly tied to specific hardware, developers needed glue that could hold everything together and define elements such as how applications would communicate, how security would be handled, and how networking would be defined. The application server is a software framework that provides Application Programming Interfaces (APIs), which enable web applications and other services to run in an integrated, scalable, and stable fashion. One of the values of the application server is its ability to monitor the interactions between services so developers can create applications tailored to perform to customer requirements.

However, as the demand on enterprise applications grew, the number of developers and contributions exploded. The components and code became increasingly intertwined in order to complete the task. This resulted in monolithic platforms that were less agile and more expensive to design and maintain.

Traditionally, application servers have been used to create and manage applications in large on premises environments. With the advent of cloud and hybrid cloud computing, IT environments have become even more distributed and application servers are helping developers curb many of the complexities of creating the underlying application framework and instead focus on designing the actual application.

How the Role of the Application Server Has Evolved

The original rationale for the application server was to make it easier to provide consistent and predictable messaging services between on premises systems and web services. As the first major transition to the cloud, it was imperative that organizations be able to manage data and logic across platforms. With the advent of cloud computing, the need for communications and management across a hybrid computing environment became more important than ever before. The application server has evolved and changed to support the architecture for hybrid cloud computing.

REMEMBER The application server has evolved and established itself as the foundation for managing services in a cloud environment.

User Expectations for Modern Applications

Businesses leverage hundreds of different applications to engage and conduct business with customers and suppliers. Only a few years ago, customers were satisfied with moving from one application for their browsers and another application for their mobile devices. Developers found themselves building different versions of the same application to support different environments and different deployment models. This model was successful for many years. However, with the emergence of born-on-the-cloud businesses, established companies are finding they can no longer compete with their existing application development and deployment models. Companies must be able to create new applications and new business models with speed, agility, and predictability.

Take the example of a traditional bank that had been an established leader in the financial services world for a millennium. However, suddenly, a new generation of financial technology (fintech) companies emerged that provided on-demand services unlike anything the traditional bank had ever conceived. Management originally assumed these start-ups could never compete with their level of investment or their existing customer relationships. However, as these fintech companies began to gain market

credibility, it became more and more clear things would have to change. The established banking's management team came up with an important directional change: They decided to transition to a technology company focused on financial services for the constituents they serve, marking a major, but required, disruption for the future success of their business.

Getting to Disruption

Envisioning your company becoming a nimble provider of ever-changing technology services to your customers and partners requires a predictable framework of infrastructure services that can support change and maintain the integrity of the business. While businesses demand services to support disruption, this change must be accomplished without impacting their customers' requirements. To meet these high expectations, applications must integrate and share data with a variety of internal and third-party applications and databases.

The role of modular and flexible application services has become the central element in maintaining customer relationships and satisfaction. The more modular and flexible these services become, the more complex it is to manage these elements in a usable and predictable manner.

Rather than building an application from the ground up, developers are leveraging a variety of reusable services so they can focus on the core application functions in context with the user experience. For example, in many cases developers can take advantage of a platform that enables them to leverage APIs and connect to messaging, networking, and security services.

The Emergence of Hybrid Cloud

The biggest reason small, emerging companies have been able to disrupt major businesses is the increasing adoption of the cloud as a deployment model. Only a few years ago, businesses were debating whether to remain with a data center or move to a public or private cloud. Today, companies are realizing these models are becoming the foundation of the next generation of computing.

DEFINING HYBRID CLOUD

Hybrid cloud is an environment that integrates traditional IT with a combination of public, private, or managed cloud services. In essence, a hybrid cloud becomes a virtual computing environment that may combine services in a public cloud with services from a combination of environments to deliver the right service level and flexibility to meet emerging customer requirements. These services need to be managed as though they were designed to behave as a single unified environment.

Increasingly, the actual delivery model of services is becoming invisible to the end-user. Users need to know they can access the right service at the right time with the right service level. Hybrid cloud is a growing computer environment that can be used to run your business and satisfy the needs of your constituents.

Although each of these elements is designed and managed by individual vendors, all elements can be managed as a single system. A hybrid cloud is a highly effective distributed system, as seen in the figure below, that enables companies to leverage a series of services that best fit the task at hand.
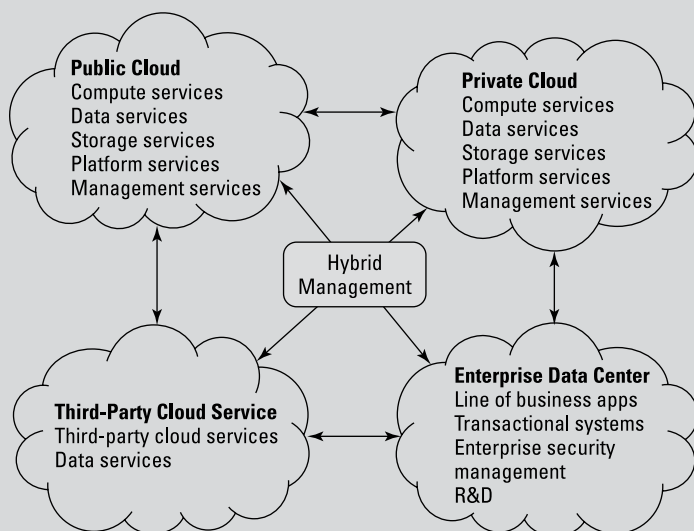
As a result, hybrid cloud is becoming the architectural framework that allows companies to use whichever deployment model best serves their business needs. Business leaders and customers are only concerned about getting the right data to the right constituents in a predictable and secure manner. Flexibility of the hybrid computing model comes from the ability to change deployment models whenever the business needs to change. Throughout this book, we discuss how application servers help organizations quickly and easily create cloud-native applications that can be deployed across hybrid environments.

Application Servers and Hybrid Cloud

An emerging new generation of application servers has evolved to provide the right platform to support the needs of hybrid cloud. However, unlike traditional application servers, the new generation is architected for next-generation applications and deployed either on premises or on the cloud. These next-generation application servers include APIs to support the inclusion of microservices along with other reusable business services. These newly defined APIs are optimized for mobile, the Internet of Things (IoT), and more traditional web applications.

Leveraging your existing resources

Companies moving to a hybrid environment don't have the luxury of replacing all their existing systems and applications with new, built-for-the-cloud services. In addition, some of those applications contain critical business logic and other intellectual property that's instrumental to operating the business. Therefore, organizations want to be able to leverage their existing services in a hybrid environment. Modern application servers are one of the key technologies that allow developers to leverage services previously used for on premises deployments for cloud applications.

The importance of seamless integration

One of the important changes in the development community over the last several years has been the emergence of DevOps as a technique for creating modularity and flexibility to support business change. Developers and operations departments must collaborate closely based on the changing needs of the hybrid

computing environment. Organizational software development and deployment needs have changed dramatically over the last five years. While in the past running web applications as separate silos from the on premises world was acceptable, that's no longer the case. The hybrid cloud environment is rapidly becoming the norm and provides a combination of public, private, and transactional system services that reside in the data center. In addition, organizations are increasingly leveraging Software-as-a-Service (SaaS) applications and platform services for cloud-based software development.

Creating web applications and services for the cloud requires that these applications need to eliminate many of the complex constraints, such as space, time, power, and cost, from traditional computing environments. They also need to work fluidly across hybrid environments. Containers are used to encapsulate the software with everything it needs to run, including the code, runtime instructions, system tools, and libraries.

REMEMBER

The infrastructure needs to support the following characteristics:

» **Elasticity and scalability:** An application should be able to expand and contract very quickly to meet demand. You don't want your website to become overwhelmed and shut down because of a surge in activity.

» **Standardization:** APIs are used to eliminate the need for custom programming when services such as inventory and customer billing need to be accessed together.

» **Portability:** Optimize your infrastructure to use and reuse your applications consistently across hybrid environments.

» **Connectivity:** Connect your existing on premises applications, data, and services to the cloud to drive new value from your current investments.

» **Rapid development:** New applications must be rapidly created to drive innovation and speed time to market.

The emerging application server is designed to support this new world of business disruption and provide your business with the ability to change. Having stable, predictable, and manageable infrastructure services as a platform makes this new generation of cloud-based applications a reality.

The Importance of a Unified Framework

A software framework is an abstraction that enables code and functions to be changed based on changing requirements while maintaining the cohesive development environment. A framework is increasingly important to help organizations that need to rapidly change and evolve applications as the business changes.

REMEMBER

A framework operates the most effectively when it includes a variety of high- and low-level APIs that make it easy to integrate third-party tools and technologies into the environment. These APIs provide a seamless way to add innovative new capabilities to support business change. The proliferation of APIs has to be well managed. The framework also needs to provide the support for the movement to containers and microservices.

Chapter **2**

Explaining WebSphere Application Server

For decades, WebSphere Application Server (WAS) has been the primary Java-based framework for creating, deploying, and managing the overall web-based computing environment. The value of WAS is that it combines the essential element of integration and messaging across services to support the business. As you transition to a hybrid cloud model including Software as a Service (SaaS) and Platform as a Service (PaaS) as well as hybrid delivery models, you need to operate in a well-connected, flexible, and fast environment. The application infrastructure needs to be abstracted to provide this flexibility.

This chapter provides an overview of how WAS continues to evolve to support the hybrid cloud environment. One of the advantages of WAS is that it has become a modular framework

to support the new generation of applications. In addition, new releases of WAS provide a seamless experience for developers already familiar with the framework, ultimately allowing your IT organization to focus on the code that counts rather than a steep learning curve. The new versions of WebSphere can be used to be deployed to both public and private clouds without additional licensing costs.

The following explains WAS traditional versus WAS Liberty:

>> WAS traditional is a secure Java runtime environment that excels at heavy transactional workloads. It includes the full Java Platform, Enterprise Edition (Java EE), and incorporates advanced performance, redundancy, and programming models while also providing workload balancing and a complete set of Java messaging services. WAS traditional licenses can be implemented either in the data center or on the cloud.

>> WAS Liberty is an application runtime environment based on a lightweight kernel designed to create cloud-native applications. WAS Liberty shares the same runtime technology as WAS traditional, and, in addition to traditional workloads, it excels in modern workloads that favor a microservices architecture. Because of this architecture, Liberty can use both Java and Node.js. It can also use the IBM Bluemix cloud platform intended for building, running, and managing application services. The Liberty server is also highly configurable so that the user can use only the services needed.

Both versions support intelligent management services. These two editions serve different purposes within your organization and can work together to solve a variety of issues in developing and deploying scalable application in a hybrid cloud environment.

IBM WebSphere FAMILY EDITION

Businesses require flexibility when deploying applications. It is difficult for organizations to plan their future on premises and cloud requirements. To give clients the flexibility they require, IBM offers WAS Family Edition. Under a common license, the family bundles the following three offerings:

- WAS Network Deployment, including both the traditional full profile and Liberty profile application servers
- WAS, including the single server editions of both the traditional full profile and Liberty profile application servers
- WAS Liberty Core

By offering these products under one license, companies do not need to make deployment decisions based on previous investments. Instead, they can deploy applications to the best suited environment. You can see all the WebSphere offerings at www-03.ibm.com/software/products/en/appserv-was#othertab1.

Using Containers within WebSphere

In its latest version, WAS Version 9 (WebSphere V9) continues to support Java EE 7 and extends support for both on premises and cloud deployments, leveraging the WebSockets protocol. *Note:* You can build HTML5 applications, but the WebSockets protocol is what will allow for improved responsiveness. One of the most significant changes is the support for containers. Containers have been added to WAS because they can dramatically improve resource utilization across a hybrid environment. It is possible to spin up and down lightweight containers very quickly. Containers dramatically improve the portability of application services.

A *container* is a software environment that brings together into a file system all the elements needed to run a piece of code. Therefore, it includes the code for that service, the runtime, system tools, and system libraries so that this service can be installed on the server. The benefit of the container is that it ensures that the software will consistently and predictably run on any environment.

Containers enable developers to build applications by linking pre-vetted elements together. By leveraging containers, developers are able to create applications faster and with fewer errors than in the past. This approach to application development is designed for a distributed computing model based on a hybrid cloud architecture.

By including the code dependencies within the container, the application can be moved to a differed deployment environment more easily. Given this characteristic, it's mandatory for operating in a hybrid cloud environment. Docker is one of the key open-source technologies that supports this technology trend. The core of Docker is an engine that helps developers create, ship, and run the application containers. A Docker environment provides an environment to support services, including a registry that stores, distributes, and shares container images. These programs can run on any deployment environment, including on premises data centers and private clouds as well as virtual machines and public clouds. Unlike a virtual machine, the container doesn't require a hypervisor; therefore, the overhead is greatly reduced.

Supporting Microservices in WAS

WebSphere V9 now supports microservices architecture. With the movement to a flexible hybrid cloud environment, the environment needs to support a services-oriented approach. Microservices are supported within the WAS environment to enhance performance and flexibility.

Defining microservices

A *microservice* is an architectural style for developing a software service that runs its own process and communicates with other services through lightweight Application Programming Interfaces (APIs). Microservices are implemented through containers in order to package a combination of code and dependencies into a standardized, portable unit. In essence, a container is "wrapped" for these microservices.

TIP

By using a combination of microservices, containers, and a DevOps platform, organizations can provide the agility and scalability needed to support digital transformation.

The integration of microservices with containers

The true value to a microservices and a container approach is that they create a fluid approach to building applications. Because each service is isolated from other services, it is possible to make changes quickly without having to re-code large portions of the application. This approach enables continuous development and deployment of applications. Contrast this approach to the traditional monolithic application development process. Changes often took months or even years and required a complete re-engineering of the application.

REMEMBER Containers and microservices are architectural constructs that enable applications to be built and deployed on a variety of deployment models. This approach is essential to utilizing application servers in a cloud environment.

Understanding the DevOps Environment

WAS provides the underpinnings for a new generation of DevOps based on the hybrid cloud. The most important issue is to be able to create applications that can be easily managed and changed. IBM's Bluemix platform is a standards-based platform that supports a hybrid environment for both on premises and cloud-based development and deployment.

TIP Make sure you focus on the ability to optimize your environment so you're ready for the hybrid cloud.

Explaining Bluemix

IBM Bluemix is a cloud Platform as a Service (PaaS) that supports organizations that want to respond quickly to user demand for change. It is an integrated DevOps environment to build, run, deploy, and manage applications on the cloud. Bluemix allows organizations to expand capacity to scale applications in the cloud. Using the Bluemix platform makes it faster for developers

to create an application that can be optimized to run anywhere. The services you would typically need to buy to set up, configure, and troubleshoot your new applications are already included to help you provision your applications. The capabilities of Bluemix streamline the process of building new applications and making changes to existing applications.

The Changing Role of APIs and API Management

APIs have always been important in combining services together to manage a computing environment. APIs provide clearly defined techniques for enabling consistent and predictable communications between application services. APIs also abstract the underlying implementation details so that services can be applied easily to different deployment models.

A variety of APIs help organizations manage their computing environment by linking all the necessary elements together to support a hybrid cloud environment. These include the ability to connect the right services together and to integrate them with other applications that reside on a variety of platforms. In addition, sophisticated cognitive APIs provide the ability to add advanced analytics to services.

Leveraging WebSphere Connect APIs

As APIs become more important in the hybrid cloud environment, it's critical to be able to manage the life cycle of these APIs across both on premises and cloud environments. With the proliferation of APIs, there is a requirement to manage performance in context with corporate governance policies.

WebSphere Connect is designed to help organizations create, use, and manage APIs. A cloud-based application integration platform centralizes the development and administrative functions that pertain to APIs. It also ensures a consistent development environment to provide a centralized place for creating, managing, and monitoring APIs and their performance.

One of the benefits of WebSphere Connect is that it enables developers to use their existing WAS skills and assets to create new RESTful APIs. Once created, these APIs will be vetted and tested and then cataloged so they can be shared throughout the organization. The WebSphere Connect platform enables developers to browse the catalog and discover the right one to use. These APIs can be extended to support different deployment models such as mobile, Internet of Things (IoT), or web applications.

Enabling Integration APIs

Integration between on premises workloads and cloud is one of the most important set of APIs within the WebSphere environment. WebSphere Connect supports APIs that can connect to back-end applications and data. Prebuilt integrations help developers connect to the cloud without development or customization.

Supporting Watson APIs

A number of cognitive services are available from Watson that can speed the development of new applications. For example, one Watson API provides language translation services. In this way, a developer can enable an application to be used in a variety of different languages without re-coding. Other useful Watson APIs include Speech to Text and Cognitive Insights.

WHAT IS WATSON?

IBM Watson is a solution platform that learns based on ingesting unstructured data pertaining to a specific area to create a cognitive system. A cognitive system combines natural language processing, machine learning and advanced analytics, with a set of APIs. The outcome of a Watson solution is a system that is able to collaborate with practitioners in order to get answers to difficult problems. Watson is powerful because it can take massive amounts of subject matter data into a curated corpus or data source that evolves and learns as the level of interaction increases. To make these capabilities more accessible, IBM created a set of defined APIs that enable developers to add cognitive capabilities into more traditional applications.

Change with consistency is paramount

Cloud computing has dramatically changed the way applications, data, and logic are managed. The application server that made it possible to consistently manage between on premises applications and web-based services is now even more important in the hybrid cloud world. Likewise, the application server itself has been transformed into a set of services that reside on a flexible framework.

Packaging for reuse

The application server has evolved into a framework that supports change while maintaining intellectual property that supports operational integrity. The modern application server is designed to support a new generation of APIs and API management. In addition, the app server supports containers and microservices. There are a variety of DevOp services make it possible to create predictability and scalability in your hybrid cloud environment.

Optimizing Your Hybrid Cloud Strategy

You are on your journey toward creating a flexible hybrid cloud environment to support both your existing environment and your public and private cloud services. Your goal is to create a plan and strategy that helps your organization be agile and flexible. In a rapidly changing market, you want to be prepared to address new customer requirements without having to reskill your employees. You want to minimize risk while improving innovation. Therefore, you need to optimize your computing environment and provide connectivity between your on premises resources and a variety of cloud services. With this flexible foundation in place, you are free to create new services that can be used across the company to meet changing customer expectations.

IN THIS CHAPTER

» **Understanding the value of hybrid cloud**

» **Managing mission-critical workloads**

» **Making the case for application optimization**

» **Seeing the need for application portability**

» **Gaining control and management**

Chapter **3**

Optimizing Next-Generation Deployments

I n the new world of digital disruption, organizations need to be able to optimize their intellectual property so they can support customer changing requirements. It is no longer enough to run an application in a single location and meet customer expectations. You need to plan a deployment strategy that enables you to react quickly based on performance, flexibility, governance, and price.

In this chapter, we address the approaches and techniques for running applications anywhere based on a hybrid cloud model. By leveraging IBM WebSphere Application Server in Bluemix, it's possible to take advantage of "pay-as-you-go" pricing models to reduce costs. In other words, you have the flexibility to move workloads without having to purchase new licenses or be sub-jected to migration fees. This operates hand-in-hand with your need to ensure application security and meet data governance requirements.

Optimizing with Hybrid Cloud

Hybrid cloud is an environment that integrates traditional IT with a combination of public, private, or managed cloud services. The value of hybrid cloud is that it allows IT managers to be able to optimize the entire IT environment. Therefore, hybrid cloud becomes a virtual computing environment that may combine services in a public cloud with services from a combination of environments to deliver the appropriate service level at a competitive price to meet emerging customer requirements. All services need to be managed as though they were designed to behave as a single unified environment.

While the IT organization is concerned about security, compliance, reliability, and price, the business user demands quality and availability of services and choice of provider. In reality, the actual delivery model of services is becoming invisible to the end-user. Users aren't concerned about whether they're accessing services on the cloud or on premises; instead, they want access to their desired services at their convenience. In a hybrid computing world, it's possible to deliver services to the customer that best fit the business strategy.

With the maturation of hybrid cloud, administrators are able to optimize their environments to meet user expectations and workload requirements. For example, a public cloud deployment might make sense for cost considerations, but regulations and security requirements may dictate the need for the application to be deployed on premises. Likewise, an application and its data may need to be deployed on a specific cloud within a defined geography because of regulatory requirements.

Users don't care whether a service is hosted on the cloud or on premises; their priorities are speed, consistency, and reliability.

REMEMBER

Optimizing to Manage Mission-Critical Workloads

One of the greatest challenges for the enterprise is having the flexibility to transform workloads to meet customers' needs. Companies discovered that relying on a single deployment model

in a data center was making it difficult to remain competitive with emerging companies that were "born on the cloud." Companies realized monolithic applications and large software architectures made it difficult to change, move, and improve their workloads to meet business needs. Therefore, the best approach is to "lift and shift" workloads to the cloud so they can be replicated on either public or private clouds.

The Business Case for Application Optimization

Hybrid cloud is providing one of the most important transformations for increasing business agility. The cloud has fundamentally changed the way businesses plan and pay for IT services. For example, just a few years ago organizations had to procure physical systems based on a combination of its known requirements and future needs. Few organizations can anticipate the future, so many companies would purchase systems based on peak workloads, leading to excess servers and high initial costs. To avoid the lengthy and costly procurement process, many leading organizations have begun investing in a hybrid cloud model. A hybrid cloud environment allows organizations to cut costs by using clouds to provision capacity and storage on demand.

Shifting the cost model and saving money

The impact of a hybrid cloud model is being experienced by organizations of every size. Take for example a traditional on premises invoicing application used by a large business. The application may only hit peak use at the end of each quarter, but the systems to support the application needed to be robust enough to support the peak times. In reality, most of the time the system is largely underutilized, but the business must still pay for supporting the hardware, software, and maintenance of the system.

REMEMBER

Hybrid cloud has completely changed the cost model for applications. Rather than needing to pay large upfront infrastructure and licensing costs for a new project, organizations can adopt flexible "pay-as-you-go" pricing models so they only pay for what they use.

The cost savings that organizations can realize by adopting a hybrid cloud model and a modern application server aren't only realized by groups deploying new applications. Organizations that have already deployed applications on the cloud can experience tremendous cost savings by adopting a hybrid cloud strategy. When organizations adopt an application server operating on a hybrid cloud model, and the technology that makes a hybrid environment possible, they are no longer captive to their cloud vendor's pricing power. Take for example a cloud vendor that changes its pricing model in a way that drastically increases your costs. If you don't have the tools to allow you to economically shift the workload to a better priced alternative, you'll be locked into your cloud vendor.

Finally, organizations can also experience significant cost savings by adopting a "lift-and-shift" strategy. *Lift and shift* means moving existing on premises applications to the cloud, unchanged. By moving existing applications to the cloud, organizations gain flexibility to scale resources depending on demand and lower their CAPEX (capital expense) and OPEX (operating expense) costs.

It's important to note that you need to think about the application as well as its dependencies when pursuing a lift-and-shift approach. To make the lift-and-shift strategy easier, organizations have begun implementing containerization technology so the application dependencies are encapsulated in a portable container. IBM WebSphere Application Server on cloud makes it easy to "lift and shift" your existing on premises applications to cloud. We discuss more about containers and microservices in Chapter 4.

Choosing the right deployment method

If you have a complex application with a lot of business processes, it might not make sense to move it to the cloud. For instance, it might make more sense to keep an application containing highly sensitive data in the data center or in a private secure cloud. On the other hand, new "born-on-the-web" and mobile applications are typically better suited for cloud development and deployment. With the IBM Bluemix platform, applications can be developed on the cloud and then deployed to the appropriate deployment model

including public cloud, dedicated cloud, on premises, or a hybrid environment. Determining the best environment depends on a variety of factors, including availability requirements, security, and the need to scale to support many users.

When evaluating existing applications and the cloud, you need to develop a business case for moving to the cloud. There may be business or technical benefits that an organization might gain through moving an application to the cloud. On the other hand, the costs and time to re-code and move an application to the cloud might not outweigh the benefits. For example, a complex legacy application that was built more than 15 years ago includes complex business logic that includes dependencies to a vast number of services in the data center. Despite the age of the application, it still manages to execute the necessary tasks without disruption. Untangling the application's dependencies and moving the application to the cloud likely doesn't make fiscal sense. That said, there are applications that are no longer efficient and can't easily be changed to adopt to new customer demands. In this case, it makes more sense to salvage the logic elements that remain important and rebuild the rest of the services in a modular and flexible manner to support the web and mobile deployment models.

IBM WebSphere Application Server V9 provides this type of flexibility that enables you to leverage the code within aging applications and move new modular code to a hybrid cloud based infrastructure. One of the benefits of WebSphere V9 is that it enables you to move your existing licenses between on premises and cloud models.

Gaining access to advanced capabilities

In addition to changing the way companies think about IT costs, developing applications in a cloud platform like IBM Bluemix gives developers access to a standards-based hybrid development and deployment environment. A developer using the IBM Bluemix platform has access to a wide variety of Application Programming Interfaces (APIs) such as Watson data services, translation services, and voice-to-text capabilities.

Take the example of a developer who is tasked with creating an application on IBM Bluemix to support a company's field technicians. The goal is to help technicians more easily communicate with customers to improve satisfaction and response time. Ideally, the technicians need to be able to capture the subtleties of customer communications. For example, a problem might have been resolved, but it took twice as long as the customer expected. Therefore, a customer survey seems to be saying that the problem was resolved. In fact, the customer's response included biting sarcasm. The developer enabled the customer's response to satisfaction surveys to be voice recorded. Wanting to ensure that the written communications from employees reflect a customer's true feeling, the developer has integrated the Watson Tone Analyzer API as part of the application. Before any message is sent to a customer, the message is first, in near real time, scanned by Watson Tone Analyzer. The Tone Analyzer uses linguistic analysis to detect the emotions, social tendencies, and writing style of the note. If a message demonstrates dissatisfaction, a customer care manager can contact the dissatisfied customer directly and resolve the problem.

TIP

By leveraging a cloud-based DevOps platform like IBM Bluemix, developers can leverage third-party services to enhance applications.

Gaining Portability with a Modern Application Server

The way a business uses technology to solve business problems is constantly changing. Application servers in a hybrid cloud environment gives organizations the ability to gain maximum flexibility. A decade ago, the data center was the primary deployment model for applications. A hybrid cloud model with a proliferation of DevOps tools based on increasingly sophisticated application servers has changed the model of creating and deploying applications significantly. Organizations are therefore looking for application servers that have added modular services, such as microservices and containers that can deploy applications on premises, to a private cloud, or to a variety of public cloud options.

The need for portability

TIP

One of the primary benefits of hybrid cloud is the capability to maintain agility and flexibility to support changing customer needs. Therefore, moving workloads across deployment models is essential. You need to be able to run the same application in different clouds and move between public and private clouds depending on the workload and security and governance demands. For example, you may want to experiment with an application in the cloud, but move it on premises before it goes into production. Alternatively, an application might be deployed on one cloud, but because of pricing concerns you may want to move it on premises or to an alternative cloud. Oftentimes capacity planning can't easily be done because of the diversity of workloads and the fact that many applications are offered to massive audiences through mobile application stores. As a result, it helps to have the capability to easily burst to a public cloud and retain capacity in your private cloud for workloads.

Containers and microservices for supporting portability

What does it take to move a data center workload to a cloud? Many organizations are adopting microservice and container architectural models to help with portability. The maturation of enterprise container technology gives developers the ability to build applications that can be moved to different deployment models. Docker has emerged as the open-source approach for creating interoperable containers and as an alternative to virtualization.

With Docker, it's possible to package an application and its dependencies into a lightweight container that can run on any Linux server. This means that containers are an efficient way to manage resource utilization. These containers help create an encapsulated environment for applications, making it simpler to deploy and move the application in either public or private clouds. In addition, Docker is useful in creating and managing microservices. Microservices are an architectural approach for building small business services that can be run inside a container. Combining several microservices can create a single deployable application. This level of modularity provides an organization with an efficient way of moving data and applications depending on changing

business and technical requirements. By adopting this architectural approach, tested and proven microservices can be reused so that developers can focus on innovation and user experience.

IBM WebSphere Application Server V9 includes native support for Docker. By adopting Docker in the DevOps process, organizations are able to easily move applications between development, test and production. WebSphere Application Server Developer Tools allow developers to natively code and test applications locally in Docker while they develop in their Eclipse environment.

Optimizing for Management

As you move to a hybrid cloud environment, you need to be able to manage distributed workloads across it. In the new release of WebSphere V9, administrators have enhanced capabilities with the Liberty Collective Controller. In addition to managing WebSphere Application Liberty servers, administrators can manage Node.js and Liberty Docker containers. You can create rules that define commands so that the entire life cycle of the server is managed. In addition, auto-scaling and health policies are available for Docker containers and Liberty cluster members.

IN THIS CHAPTER

» **Managing hybrid cloud deployments**

» **Explaining the API life cycle**

» **Looking at the role of WebSphere Liberty**

» **Connecting data services**

» **Bringing the elements together to support hybrid clouds**

Chapter **4**

Extending Applications with Hybrid Connectivity

While the need for connectivity has always been a requirement, there is a new level of urgency in the world of hybrid cloud. In an era where a "born-on-the-web" competitor can create an innovative business initiative based on new business models, the only way existing market leaders can compete is to leverage a connectivity model that provides a sophisticated level of flexibility to bring together the needed data and services to create new business models.

In this chapter, we discuss the connection between Application Programming Interfaces (APIs), microservices, and containers and how they have to work in unison to support a hybrid cloud environment. We explain how IBM WebSphere Application Server Version 9 and IBM WebSphere Liberty offerings provide solutions to address these issues.

The Dynamic Nature of a Hybrid Cloud Environment

Hybrid cloud is different from any other computing environment because of its ability to seamlessly link data, applications, networks, and systems as though they were one unified system. But even here there is a twist. Hybrid clouds are dynamic. An organization may connect to hundreds of different Software-as-a-Service (SaaS) applications and make use of dozens of public cloud data services. The same organization may create APIs and microservices to support new innovative business services that it is offering to its customers and suppliers. Organizations may also purchase APIs and microservices from third-party software companies. Likewise, innovative IT leaders will discover new ways to make critical back-end transactional services available to support changing customer demands. This is the fluid new world, which is rapidly becoming the new normal.

Connecting to the Cloud

In the world of hybrid cloud, it is imperative to be able to connect workloads between the data center and the cloud. With the advent of microservices and containers, it is easier than ever to begin to transform the way we work with the intellectual property that has been buried inside of traditional applications. You can also take advantage of the investment in software development and important customer data through new connectivity approaches. By using new generation APIs, you can create new innovative applications and continue to gain value from the technology investments you have made over the years. While APIs have been available for decades, the new generation of API creation and management has transformed the flexibility of building and managing applications and data.

The API Economy

In today's world of ever-expanding interconnectivity, organizations increasingly use APIs to bring together ecosystem partners and unlock new sources of value. The API economy — the commercial exchange of business functions and capabilities using APIs — has captured the attention of not only software developers but also strategists, marketing leaders, and partnership executives seeking to move to the next level of marketplace differentiation.

To take advantage of these capabilities, companies must understand the forces driving API usage, as well as the potential business models and monetization strategies APIs can help create. Successful organizations will see APIs not just as technical tools, but as sources of strategic value in today's digital economy.

Looking at the API Life Cycle

There was a time when APIs were simply a tactic to provide a workaround to a software problem. With the advent of web services and cloud computing, things began to change. There was suddenly a need to provide modular services with codified and well-documented APIs so services and data could be brought together in a predictable and manageable way. In fact, a growing marketplace for APIs can provide solutions to complex integration problems.

Because APIs are mandatory for the creation and operation of a hybrid cloud environment, there must be a life cycle for API creation, testing, monitoring and optimization, and management. The stages of the API life cycle are covered in this section.

API creation

In today's API economy, it is no longer acceptable to develop new APIs in isolation. Rather, developers are now using tools and frameworks to create APIs that can then be tested, secured, and managed. The most pragmatic way to create APIs is to download a developer toolkit to design the API. After the API is designed and configured, the code must be validated.

EXPOSE APIs WITH WEBSPHERE CONNECT

WebSphere Connect provides developers with the ability to expose existing WebSphere applications as APIs so they can be connected to the cloud without having to rewrite the applications. WebSphere Connect also supports the ability to expose back-end applications and data as APIs so they can also be connected to the cloud. One of the benefits of WebSphere Connect is that it supports end-to-end API management.

WebSphere Connect is also intended to make it easier to create and manage APIs and then publish them directly from API Connect. API Connect is an end-to-end life cycle solution that enables developers to automate the creation, securing, and management of APIs through a single console. Through this console, developers can discover data managed within the data center and in important third-party data sources. API Connect provides a self-service portal to assist in the creation of new APIs and microservices through the use of Node.js and Java runtimes. One of the benefits of API Connect is its built-in security and governance for policy enforcement. Deep analytics services are also built into the platform.

Designing and connecting your next high impact API is only part of the process. The rise of hundreds of new APIs and microservices also gives way to the potential for security holes. By providing developers with an easy and secure connection to your internal data, administrators can manage security and governance over APIs and the microservices. With the integrated WebSphere Connect and API Connect solution, IT can set and enforce API policies to secure back-end information assets and comply with governance and regulatory mandates. By using integrated tooling to build, debug, and deploy APIs and microservices, you can ensure a smoother path to secure APIs and microservices.

API testing

API testing is a critical component in overall integration testing to make sure the API functions correctly and reliably. As with different types of code, APIs should be tested for performance, runtime errors, security, and end-to-end integration. The growing use of

APIs in a hybrid cloud environment means that testing is more important than ever. An error within a widely used API can lead to massive problems within the overall environment.

API optimization

API optimization is critical in a hybrid cloud environment where there may be a variety of deployment models that include mobile, public, and private cloud. An API has to operate as well in a mobile environment as it does on a browser. The API has to be optimized to support changing data connectivity and integration across networks.

API management

API management is the overall portal that manages all the approved APIs that expose business services. An organization may use hundreds of both public and private APIs to connect data and services. In addition, these exposed APIs are often the centerpiece of conducting business with partners and customers.

REMEMBER

APIs need to be predictable, configurable, and consistent in order to support a hybrid computing environment.

Using Hybrid Cloud to Manage APIs

APIs are at the center of creating a hybrid environment that brings together application services and data across on premises and a variety of cloud models. APIs are the technique for exposing services so they can be used to create a consistent and predictable computing platform. These APIs have to work hand-in-hand with microservices and containers.

Using IBM WebSphere Liberty to Support APIs

WebSphere Liberty is an application runtime environment intended to create cloud-based applications based on the Java EE (Enterprise Edition) platform. It provides a set of services including

development and testing services. These libraries can also run on WebSphere Application Server traditional. The Liberty platform also makes it easier to develop applications that leverage microservices.

WebSphere Liberty is optimized for the cloud. One of the key reasons for its value is it has a small kernel that enables services to be loaded and initialized by default at start-up. It is therefore well suited for a resource-sharing model of the cloud. These services can be deployed and moved across clouds in a hybrid computing environment.

The Java APIs that are included in WebSphere Liberty are architected for the needs of new services-based applications. The Liberty app accelerator is focused on fast-tracking the DevOps process. Hosted on IBM Bluemix, the Liberty app accelerator is intended to make it easier to design microservices. It gives developers an easy-to-use directory structure as a starting point for building, testing, and deploying applications.

The Liberty app accelerator is the first step for your chosen DevOps toolchain.

TIP

Other capabilities within WebSphere Liberty simplify the ability to integrate services into lightweight systems for continuous delivery and operations. One of the characteristics of WebSphere Liberty is that it has simplified configuration so that developers can select from a variety of operational models and integration with provisioning and management tools.

Connecting Data Services to the Hybrid Cloud

One of the changes with the introduction of WebSphere V9 is that it is possible to deploy the app server either on premises or in a public or private cloud. One of the requirements to execute on hybrid cloud is the ability to connect services to cloud and data services. Using API Connect, WebSphere V9 makes it easier to access and connect to cloud services including a variety of data and analytic services such as Watson, Cloudant, and dashDB.

IBM Watson services

IBM Watson offers a series of APIs that provide sophisticated services to support application development. Watson APIs include language translation services, the ability to translate text to speech, the need to interpret visual data, and the ability to use Watson's discovery service to apply advanced analytics to an application. The Watson services enable applications to bring together both structured and unstructured data to enhance the usability of data.

Cloudant database services

IBM Cloudant is a managed, scalable, NoSQL cloud database as a service. Cloudant is based on open-source Apache CouchDB and includes APIs that enable it to operate with WebSphere to support a hybrid cloud environment. Cloudant provides integrated data management and an analytics engine. Through WebSphere Connect, it can leverage key services such as advanced analytics. Because Cloudant is a database as a service, it can scale linearly based on its ability to automatically add nodes. There's also an on premises version of Cloudant.

IBM dashDB

IBM dashDB is a hybrid cloud data warehouse solution for transactional and analytic workloads based on a Massively Parallel Processing (MPP) architecture. It is designed to operate in a hybrid computing environment. IBM dashDB supports SQL so that developers don't have to learn a different language in order to use its capabilities for moving data workloads between public and private clouds. IBM dashDB is designed so there is no single point of failure. dashDB includes built in security services. One of the benefits of IBM dashDB is that it can accelerate data migration up to ten times faster than some traditional options.

Bringing the Elements Together in Hybrid Cloud Deployments

When developing and managing microservices in containers, APIs are used to connect those services to data services across a distributed environment. Therefore, it is necessary to manage the

automation of these deployments. WebSphere is designed to be integrated with IBM's UrbanCode Deploy to support on premises applications. UrbanCode Deploy provides the tools to support the automation of consistent deployment and rollbacks of applications. It can provide automation of provisioning and de-provisioning of cloud environments as well as orchestration when changes are made to components and services. UrbanCode Deploy provides the DevOps organization with visibility into what has been implemented within distributed environments and the changes that have been made. Because of the ability to manage services across deployment models, UrbanCode Deploy is an important element for managing services so they can be more easily connected to cloud services.

Chapter **5**

Creating Next-Generation Applications that Drive Business Innovation

U ser experience, performance, reliability, and security have never been more important. Customers interact with a variety of services that can be on premises, in the cloud, or in a mobile environment. Customers have no knowledge (nor do they care) where a service resides — they simply want the antici-pated results. Many organizations have created libraries of mobile applications to support customers, employees, and partners. In addition, these applications have become the primary way many customers interact with businesses. Rather than stopping into a bank to make a deposit, or standing in line to place an order for lunch, many customers now reach for their phones to complete these chores.

Unfortunately, applications aren't static; they must change as the business changes. New competitors are increasingly emerg-ing with innovative ways to engage customers or streamline pro-cesses. There are new ways of partnering to add related services to entice customers to spend money. For continued success, you

need to be constantly updating applications to meet changing business and customer needs.

In this chapter, we focus on the process of creating new applications that support business transformation in the context of a hybrid cloud and modern application server. This chapter also shows you how reusable business services can effectively and efficiently be used to create new applications. The use of well-defined Application Programing Interfaces (APIs) and microservices are the foundation of this next-generation application creation.

Creating Next-Generation Applications

More than ever, companies are required to create new, innovative applications that are intended to take the business in new directions. This business climate requires a different approach to the software development process. Given the requirements for speed and accuracy, development organizations have to be able to build on a hybrid cloud platform. Economically speaking, it no longer makes sense to build new applications from scratch. Rather, development organizations are increasingly using a combination of programs, such as WebSphere Liberty and IBM Bluemix, as the foundation for building, running, and managing applications no matter what the deployment model may be. The myriad of APIs connect a variety of services together that streamline the code based on new business processes. More on WebSphere Liberty in Chapter 4.

There was a time when making a reservation with an airline required the help of an experienced agent who understood how to navigate a maze of menus and applications to determine the best flying time and airline to help the customer. Today, most individuals never communicate directly with a travel agent. Rather, customers act as their own agents, navigating around a portal to find a flight that leaves at the right time and is offered at the right price. In addition, customers routinely compare prices and even book hotels and rental cars through the same application. Customers expect to have the same experience and same levels of ease of use and performance no matter where they're located and no matter what type of device they're using.

TIP

To meet high customer expectations, many organizations are adopting modern application servers to manage and deploy applications in a hybrid cloud environment. A modern application server, like IBM WebSphere Application Server, gives organizations these three key benefits:

» **Reduce costs.** A modern application server allows organizations to reduce infrastructure and application costs. These cost savings can be experienced when rolling out new applications, by shifting on premises applications to the cloud, or by having the flexibility of moving applications between clouds.

» **Gain the ability to scale.** Deploying applications to a hybrid cloud gives organizations the ability to scale applications up or down depending on demand. Rather than trying to estimate an application's requirements, you can grow the cloud environment to meet demand.

» **Manage distributed workloads.** In a hybrid cloud environment, applications can be distributed across multiple clouds or on premises. A modern application server gives administrators the ability to monitor key performance and business metrics across all the organization's applications.

Creating Applications with Bluemix

TIP

One of the benefits of IBM Bluemix is that it makes it easy to rapidly build, test, and deploy an application on demand. The runtimes available in Bluemix enable developers to easily deploy these applications to the right model including on premises, clouds, or mobile environments. Bluemix can also be used as an on premises, development environment behind an enterprise firewall.

Bluemix provides developers with immediate access to a variety of services and APIs, including Watson, to support images, videos, text analytics, natural language processing, and sentiment analysis. A Watson–based classifier can reveal insights from unstructured data. The outcome of this analysis can help an organization gain a better understanding of their business data.

Creating and Managing Microservices with WebSphere Liberty

Modern application servers need to provide an environment where developers can create, deploy, manage, and scale microservices. An organization could have hundreds of microservices, but if they aren't managed in an intuitive way, the value of microservices may not be realized.

IBM's WebSphere Liberty provides administrators and developers with a visual management console to fully manage the microservices life cycle. Through the Liberty Administrative Center, administrators can create, deploy, configure, monitor, start, stop, and restart servers and applications. Liberty Server includes features that incorporate advanced analytics and reporting to help support high availability, reliability, and scaling of microservices. These features help customers successfully handle complex workloads without causing services disruptions or slowdowns. These features include

» **Auto-scaling** allows Liberty servers to start, scale out, and stop based on scaling policies defined for CPU, memory, and JVM heap metrics.

» **Dynamic routing** of HTTP requests to members of Liberty collectives without needing to regenerate the HTTP server plug-in configuration file when the environment changes.

» **JVM elasticity** gives the Liberty scaling controller the ability to automatically install Liberty software onto a registered host and create a new Liberty server dynamically.

These capabilities allow WebSphere to provide a highly available, reliable, and scalable environment for microservices.

Implementing a Containerized Approach to Development

Microservices are becoming the most important technique for creating modular services supported by well-defined APIs. Managing and deploying these services increasingly depends on containers.

Containers are virtual software objects that include all of the elements needed to run an application. A container has the benefits of resource isolation and allocation, but is more portable and efficient than, for example, a virtual machine. Within the context of WebSphere, it is possible to use IBM containers based on open source Docker container technology. This container platform is built within the Bluemix development cloud service and enables developers to deploy, manage, and run application components.

REMEMBER

Developers can use the cloud-based Bluemix Container Service for Java or Node.js applications by using the WebSphere Liberty image that's registered to the container catalog.

Creating New Services to Support Business Change

As organizations begin to evolve their computing environments, they are faced with decisions. What are the right first steps to take to transform? Do you start by connecting services and data together? If your applications are modular and flexible, that may be the right answer. However, you may decide that you need to create new business services to support innovation and creativity to overtake a new competitor. In reality, an organization must take a holistic approach to managing an emerging hybrid cloud environment that demands flexibility to change existing applications and create new services. Those services need to be linked together through APIs in order to create a seamless environment to support customers.

Mastering the Cloud with WebSphere For Dummies

Chapter **6**

What's Next? Applications in Action

In this chapter, we provide a hypothetical example of how a company can use WebSphere Application Server and a hybrid cloud model to transform the business in order to remain competitive in the marketplace. We use Colossal as the hypothetical example. Colossal is a 100-year-old company that used to be a powerful brand in the market. Colossal had long been known as an innovator, but that was before the surge in online retailers. Now, the management team is scrambling to come up with innovative ideas that will combine the personalized attention of the physical stores with innovative online services.

The Retail Challenge

The retail industry is in the midst of massive changes. Brick and mortar establishments are rethinking their business strategies with the advent of new challengers. New online retailers have already disrupted many traditional retailers — and those online retailers aren't standing still. For example, some online retailers

are opening brick and mortar stores, while other online retailers are enabling customers to customize clothing to their precise dimensions. In addition, clothing retailers are offering the equivalent of a personal shopper.

Faced with these competitive threats, retailers can't stand still. Unlike many emerging competitors, traditional retailers often have aging infrastructure that can't easily be changed to transform their business models.

Starting with Infrastructure

It was clear to keep up with the competition, Colossal had to dramatically change its technology infrastructure. However, it wouldn't be economically feasible to replace its existing systems and networking infrastructure. Even if this were possible, the transition would simply be too slow in light of competitive threats.

After investigating its options, the CIO and CMO jointly came up with a solution. They decided they would leave the back-end transactional system with its full traditional WebSphere platform in place. In this way, transaction management would be secure and well managed behind the firewall. With assurance that its transaction management would perform at the necessary speed, predictability, and security, the team moved to the next stage of reinvention.

Leveraging the Cloud Foundation

Colossal decided that to gain maximum flexibility, a hybrid cloud environment was the best option to pursue. Therefore, the company began by first discovering what applications were installed and, more importantly, which applications were in use. The next step was to discuss what was hidden inside these applications. While some applications were well written and designed, many other applications were aging and not able to be changed to meet the shifting business strategy. However, these applications still had some critical business process and data that were important and needed to be preserved.

Understanding What's Next

The same discovery process was applied to Colossal's physical infrastructure. The existing infrastructure was a combination of servers and networks that were holding the company back. These systems couldn't be easily upgraded. In fact, the company had continued to add more and more servers each time the business was concerned it wouldn't have the resources to keep up with demand.

With a firm understanding of its existing IT environment, the company put an action plan together. The new strategy had five components:

» Keep transactional systems in place to manage high volume transaction management with the right level of scalability and security.

» Replace its existing collection of servers with cloud services. The company used a combination of some public cloud services, managed services for specialized requirements, and a private cloud for sensitive supplier data.

» Decouple important intellectual property from applications through the use of containers while maintaining security and consistency.

» Build new business services based on microservices.

» Use IBM Bluemix platform services with WebSphere Liberty to create and manage cloud-based services.

With these elements in place, the company was able to dramatically change its approach to building and deploying new services. There was a lot of work involved in transforming the computing infrastructure so it provided the flexibility needed to transform its business. But the team, consisting of the CIO, CMO, CFO, and CTO, were pleased with the results. The CFO was delighted that the company was able to reuse its WebSphere licenses in the cloud. The CIO was pleased that the IBM Bluemix environment provided a cloud-based software development and deployment environment that made change and innovation faster. The CTO had access to hundreds of codified and vetted APIs that could link the right services stored in containers together. This made it easier to bring together data services from across different business units. New microservices could be built and reused to create new innovative applications to support customers.

Getting to Innovation

Armed with its new hybrid cloud environment, powered by Web-Sphere, containers, API management, and microservices, the Colossal team was able to transform its traditional brick and mortar retailer into an innovative player. The traditional stores were turned into a showcase for new technologies and innovative apparel. Customers returned to the store because it became an experience that allowed them to customize their purchases. Using computer vision, customers could experiment with a variety of options and ideas before coming to the store. Other customers could experiment with new designs and purchase them online and then go to the store for a customized consultation with a designer.

Getting to Predictability

Colossal's management was pleased with the results. The new computing infrastructure was able to adapt to changing business models. If a business unit came up with a risky but potentially innovative idea, it was now possible to experiment without investing in new infrastructure. If the experiment was successful, it was easy to scale to meet demand. Customers' private data was never compromised because of the sophisticated security built into WebSphere's platform. The company also created new software development and deployment teams that could collaborate using cloud-based services including IBM Bluemix.

Be Ready for What's Next

Retail remains a competitive and ever-changing market. Colossal has to remain on guard. Management is always watching the market to see what new technologies might be introduced that can help the company innovate. The team has to watch carefully to see what new competitors may appear to challenge its new strategy. But with a new flexible and modular infrastructure, built on WebSphere's modern application server, the company is ready for whatever comes next.

IBM WebSphere: The turning point for cloud and hybrid

IT leaders look to the cloud as the future for business transformation. But the journey to the cloud isn't without complications because of the need to balance existing apps with next-gen apps. Therefore, IBM introduced WebSphere Application Server on cloud platform, a next-gen application infrastructure set of entry points to capitalize on the benefits of a hybrid cloud. By using IBM WebSphere on cloud, businesses can accelerate their time to market by simplifying the creation of APIs and microservices and reduce costs by moving all or part of their applications to the cloud — quickly, securely, and reliably.

Inside…

- Prepare for hybrid cloud deployments
- Optimize existing applications and infrastructure
- Connect to valuable cloud services
- Create portable applications with IBM Bluemix®
- Developing with microservices and containers

IBM

Judith Hurwitz is President of Hurwitz & Associates, and **Daniel Kirsch** is Principal consultant at Hurwitz & Associates. Both authors are strategy consultants and thought leaders in emerging and disruptive technologies that benefit customer growth.

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