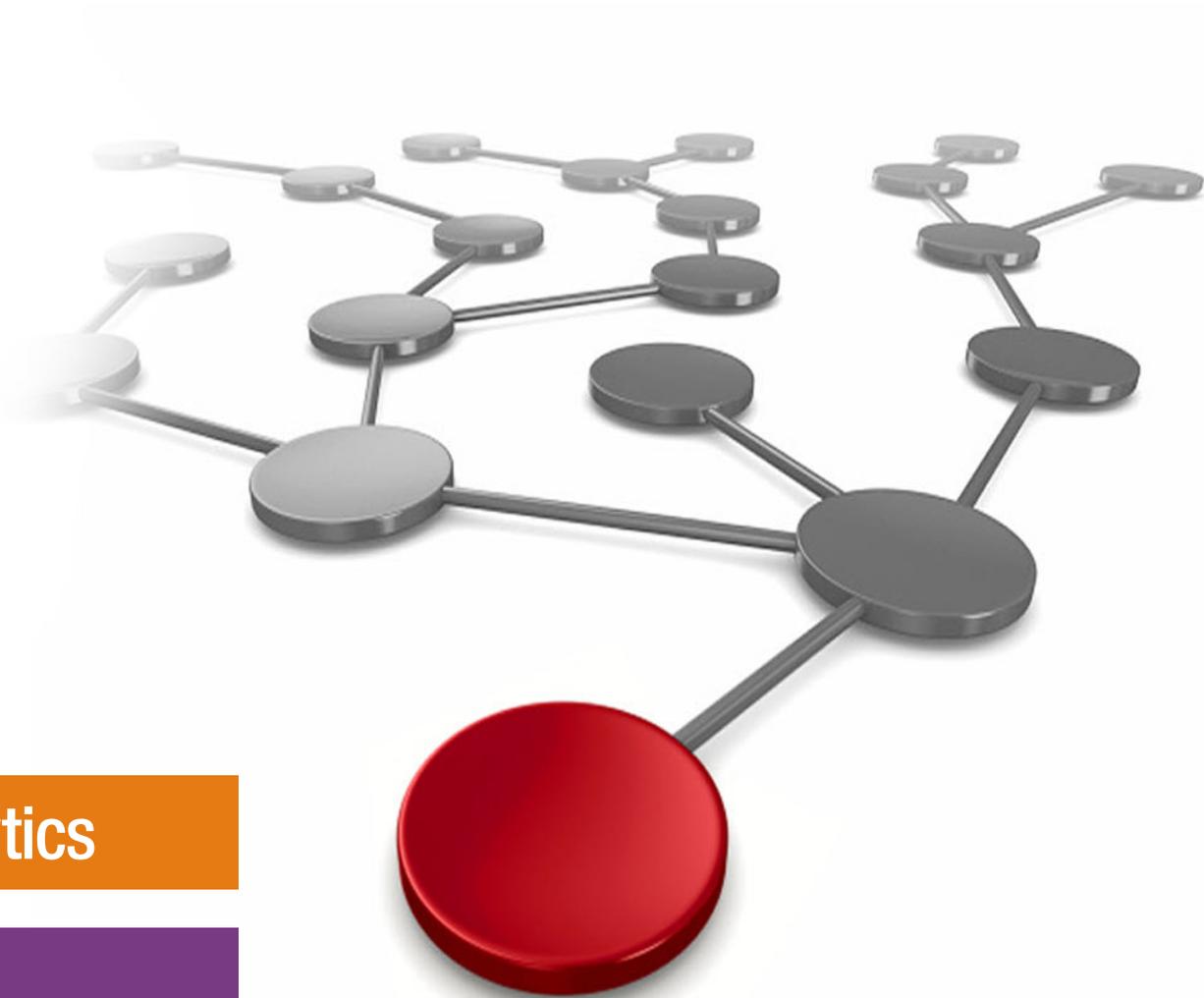


Creating Hybrid Clouds with IBM Bluemix Integration Services

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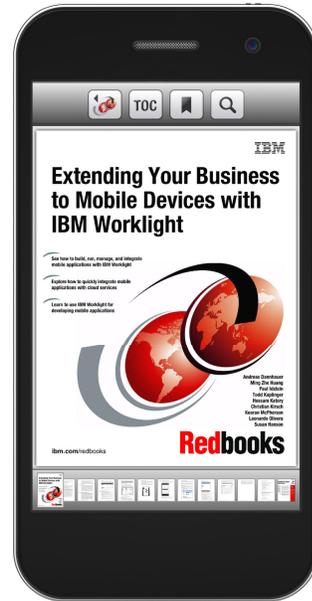
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Creating Hybrid Clouds with IBM Bluemix Integration Services

A *hybrid cloud* is considered as the integration of multiple clouds that are aligned to the unique characteristics of different system types. IBM® defines a hybrid cloud as a secure cloud computing environment that uses services from two or more sources, such as a private cloud, public cloud, or traditional IT sources.

A hybrid cloud transforms roles throughout the organization and allows business leaders and developers to innovate efficiently and faster. Applications that are built around a hybrid cloud infrastructure typically revolve around at least one of the following pillars of hybrid integration (as illustrated in Figure 1):

- ▶ API-centric applications
- ▶ Data-centric applications
- ▶ Event-centric applications

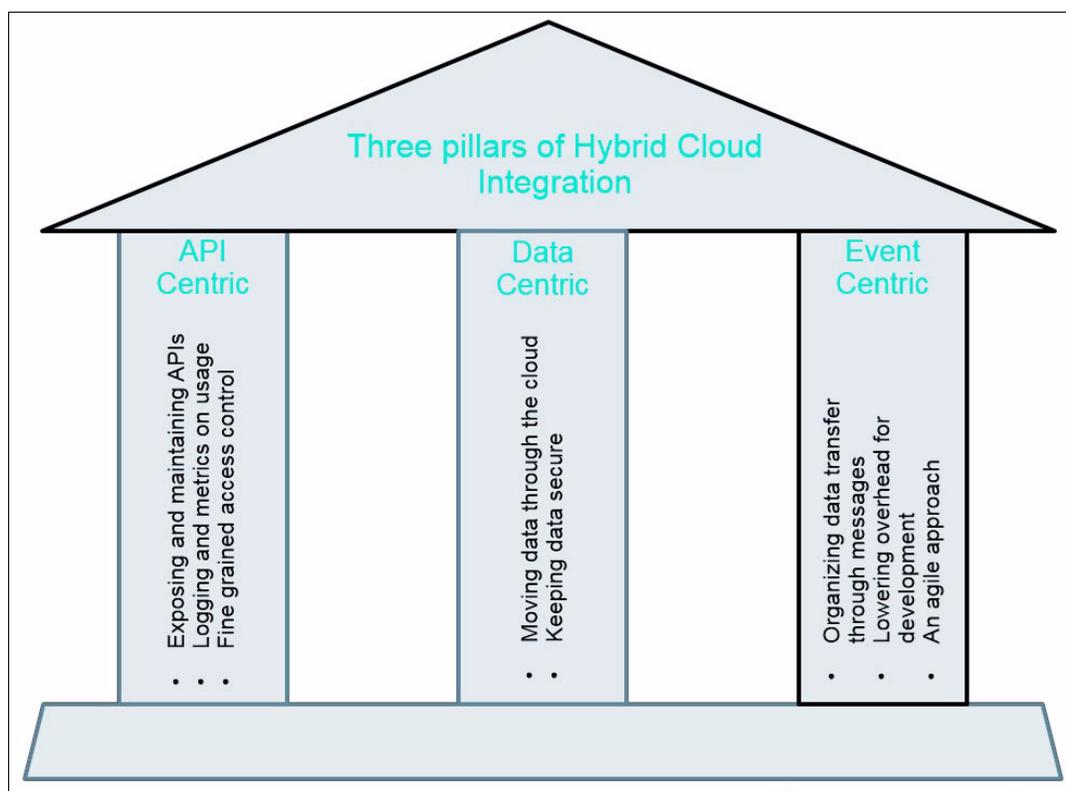


Figure 1 Three pillars of hybrid cloud integration

This IBM Redbooks® Solution Guide describes Bluemix® integration services and how to use them to connect Bluemix applications to on-premise systems.

Did you know?

Companies often wonder whether their master data is secure when that data is accessed via a hybrid cloud solution. The answer is yes! IBM Bluemix integration services provide secure access to systems of record while also providing your customers with the systems of engagement that they demand.

Business value

In today's market, the following business challenges motivate companies to look at hybrid cloud solutions:

- ▶ Lower the total cost of ownership
- ▶ Speed time to market
- ▶ Lower the level of effort for operations
- ▶ Reclaim control of projects that are lost to shadow IT
- ▶ Ease on-ramp to delivering new systems

In addition, many companies are motivated by new customer expectations. Because customers want to be treated as individuals when interacting with a company, the need for a personalized customer experience drives the collection of more historical and real-time information as well as advanced analytics.

Furthermore, customers now demand an easier interaction with companies with the ability to serve themselves. Customers expect companies to support omni-channel interactions with a consistent experience across all channels. Thus, company systems must identify customers in context and coordinate the session state.

IBM Bluemix integration services give you the power and flexibility to access the data and the services that you need to build the compelling applications your customers expect. These integration services give you a range of powerful composable services that can securely connect to data and services wherever they reside. You can quickly and easily connect to a range of endpoints and can expose and manage these endpoints as APIs for use and reuse within your applications.

Solution overview

The applications that are developed for the hybrid cloud environment often revolve around at least one of the following integration pillars:

- ▶ *API-centric applications* focus on taking an application and making its functions available to the web or using one or more other web-based API services in its own application. The API-centric applications pillar also focuses on maintaining the available API lifecycle, usage logging, metrics, security, and access control of the API.
- ▶ *Data-centric applications* focus on storing data in a scalable manner in the cloud or transferring securely data between the varied parts of a hybrid cloud infrastructure. This pillar is all about protecting the application's data from outside as well as inside threats and protecting the data both where it is stored and while it is being transferred.
- ▶ *Event-centric applications* focus on orchestrating numerous data sources and destinations in the cloud. These applications aim to simplify the sending and receiving of data or messages, providing developers time to improve development agility.

The IBM Bluemix integration services offer various functions that include event, data, and API capabilities. In-flow data cleansing and movement helps ensure that the applications see only what is relevant and accurate.

Figure 2 shows the integration services that are offered in IBM Bluemix.

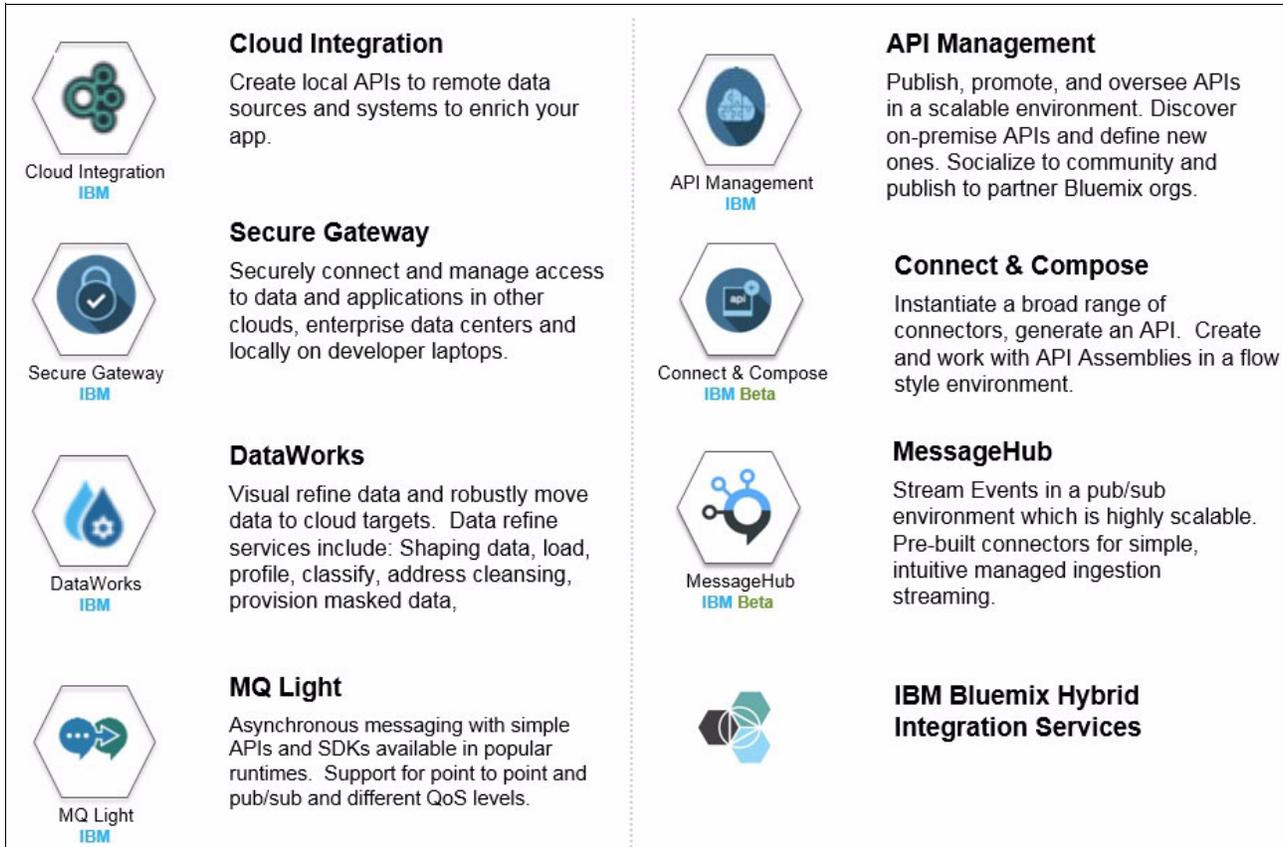


Figure 2 Bluemix integration services

Solution architecture

IBM Bluemix is built on Cloud Foundry, the industry-standard platform for cloud applications, and provides a platform as a service (PaaS) environment for accelerating new application development. It also provides a DevOps toolset of concepts, practices, tooling, and team organizational structures that enable organizations to more quickly release new capabilities to their clients.

Bluemix provides an array of runtime environments and pre-built services to rapidly create applications from a marketplace of IBM and third-party services. The suite of API capabilities that focus on API, event, and data management make up Bluemix integration services. These integration services work to allow systems of engagement to be created easily with data from traditional systems of engagement.

Figure 3 illustrates a Liberty for Java application hosted in IBM Bluemix securely connected and accessing data from an enterprise database. This application is a Java program that enables the user to manipulate the data in an enterprise relational database, which is a typical function of many Java applications.

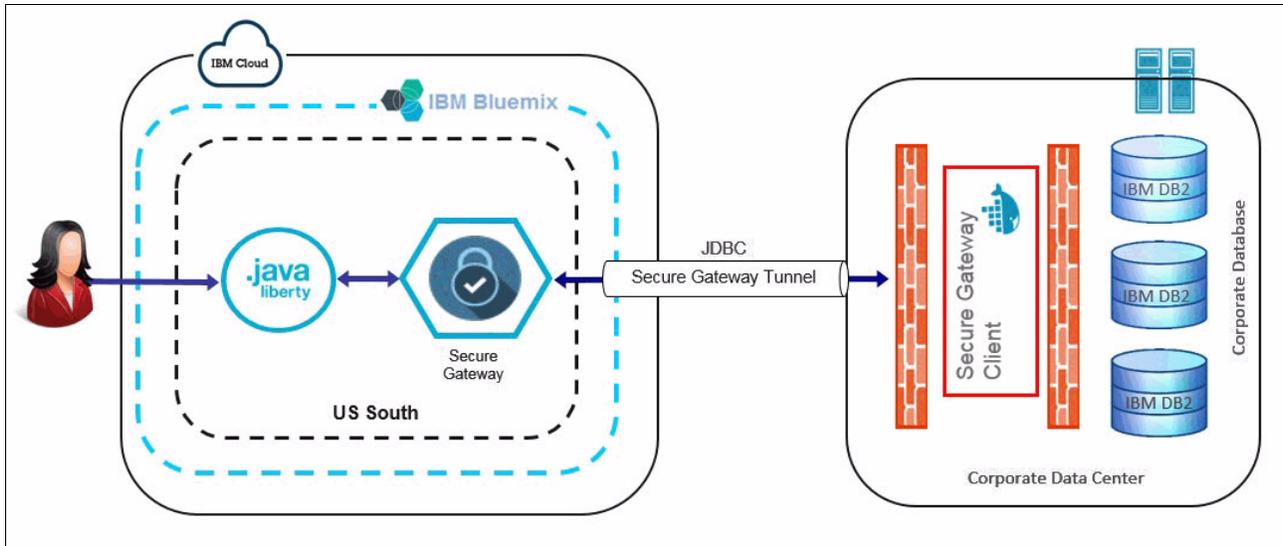


Figure 3 Bluemix application connection to an enterprise system of record

This program runs in IBM Bluemix in a Liberty for Java runtime. The database stores the Java application's data. It is an IBM DB2® database, as is typically used by many Java applications. The Secure Gateway service in Bluemix connects the Java runtime to the back-end system of record.

Figure 4 on page 5 shows the application architecture of a typical mobile systems of engagement application that runs IBM CICS® transactions using IBM z/OS® Connect. The application uses the mobile cloud boilerplate and the IBM Bluemix Mobile Data, Mobile Quality Assurance, and Push notifications services. A NodeJS runtime manages service calls mapping to the UI interactions in the mobile application.

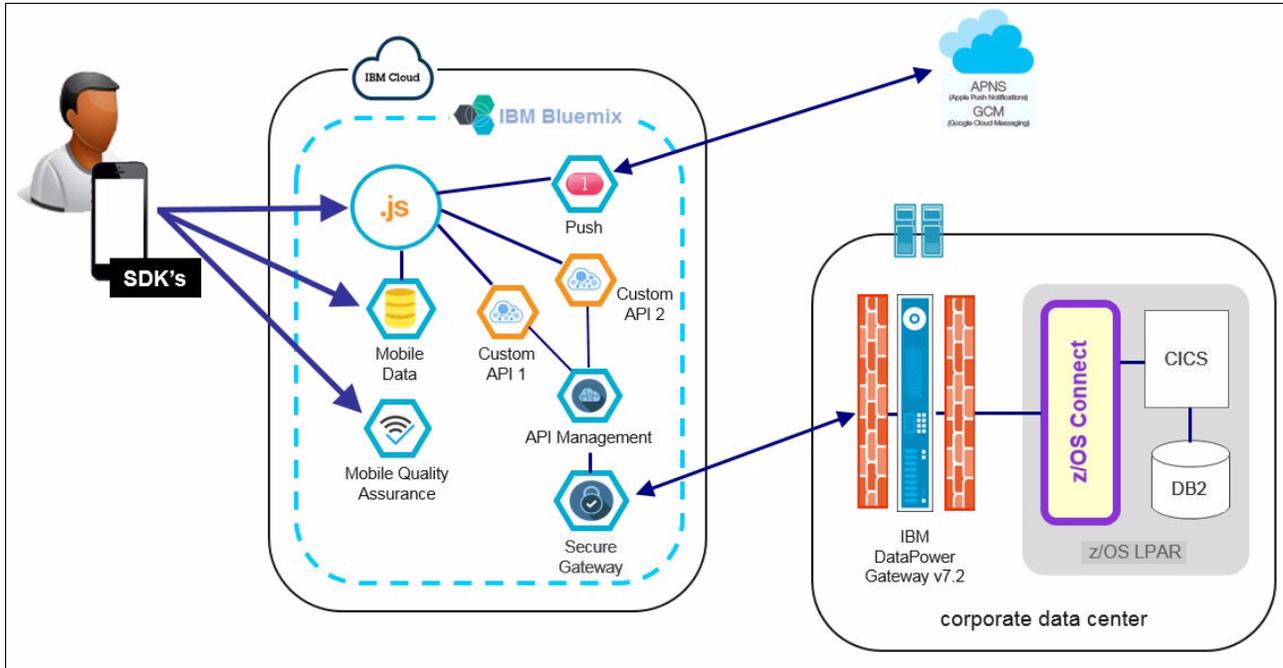


Figure 4 Mobile application that uses a CICS transaction by using z/OS Connect

On the z/OS side, z/OS Connect makes available CICS transactions via a REST/JSON interface. The Bluemix Secure Gateway service securely connects from Bluemix to the client's z/OS mainframe. An IBM DataPower® Gateway virtual appliance provides access into the corporate data center.

The Bluemix API Management service uses z/OS Connect to make available the REST/JSON interface as APIs in the Bluemix catalog over the Secure Gateway. The NodeJS runtime makes calls to these APIs.

z/OS Connect enables better and more manageable connectivity between mobile systems and back-end z/OS programs, applications, and systems. It provides a consistent front-end interface for mobile systems that use REST and JSON. It also shields back-end systems from having to understand those protocols and formats. It enables enterprises to use their investments in z/OS in modern applications and accelerates the development of these applications by using the Bluemix platform.

Figure 5 shows a high-level overview of Bluemix services and the connectivity between them and the on-premises SAP infrastructure.

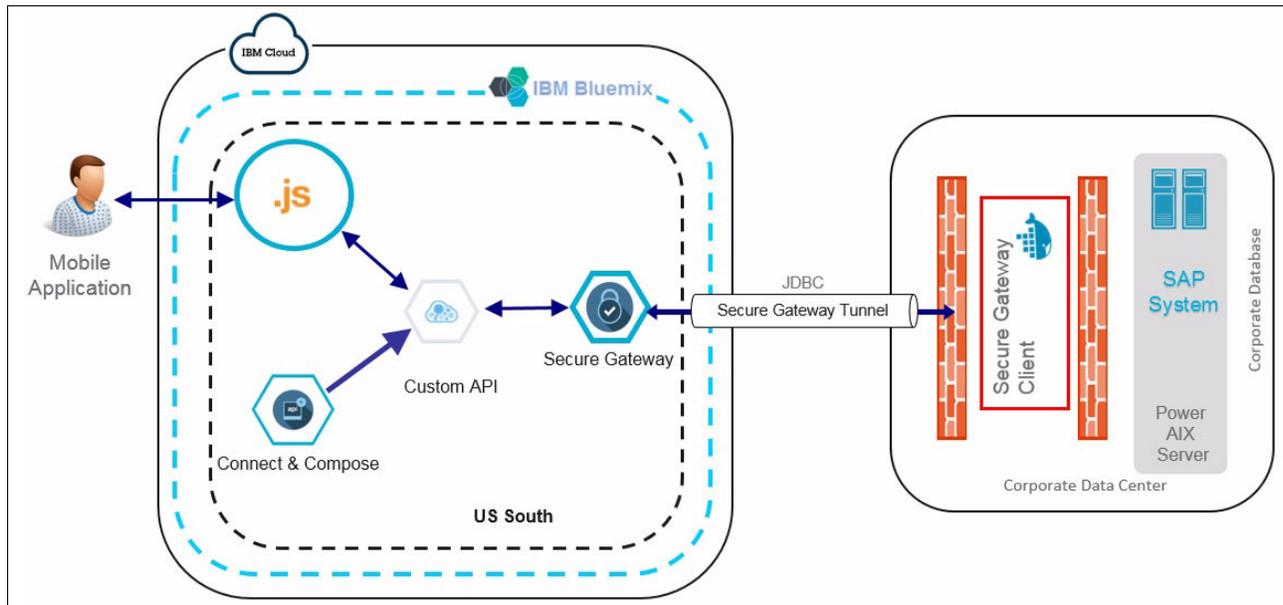


Figure 5 IBM Bluemix applications using enterprise SAP systems

IBM Bluemix Secure Gateway is used to connect the enterprise SAP system in the back-end system. An API is created to use resources from the SAP system by using the Bluemix Connect & Compose service. The Connect & Compose service connects to the Business Object Repository (BOR) and easily brings all of the SAP Business Application Programming Interface (BAPI) to help decide the most suitable API to be used by the application.

The Connect & Compose service can also make connections to remote function call (RFC) and Application Link Enabling (ALE) in SAP. After the application connects to SAP using the Bluemix Connect & Compose service, it can then save and share the new API through the Bluemix API Management service. By using the Bluemix API Management service, users can perform following tasks:

- ▶ Check usage of each API call.
- ▶ Run analytics on the API.
- ▶ Create and approve API plans.
- ▶ Run user and roles management on the API.
- ▶ Create SLL profiles.

Usage scenarios

This scenario describes how a grocery retailer benefits from a hybrid cloud implementation with Bluemix.

The grocery retailer has a private data center. The business requirement for the retailer is to quickly analyze the high-selling products from stores to enable its supply chain without having IT teams spend time on setting their own analytics environment for this problem.

The grocery retailer uses an on-premise database as its secure data storage. Some data for the analytics is stored in purchased transaction-related tables that also contain other sensitive

and confidential data. The objective is to setup an IBM Watson™ analytics environment with secure and limited visibility of the retailer's data.

Figure 6 shows the architecture of the solution that is created for solving this problem.

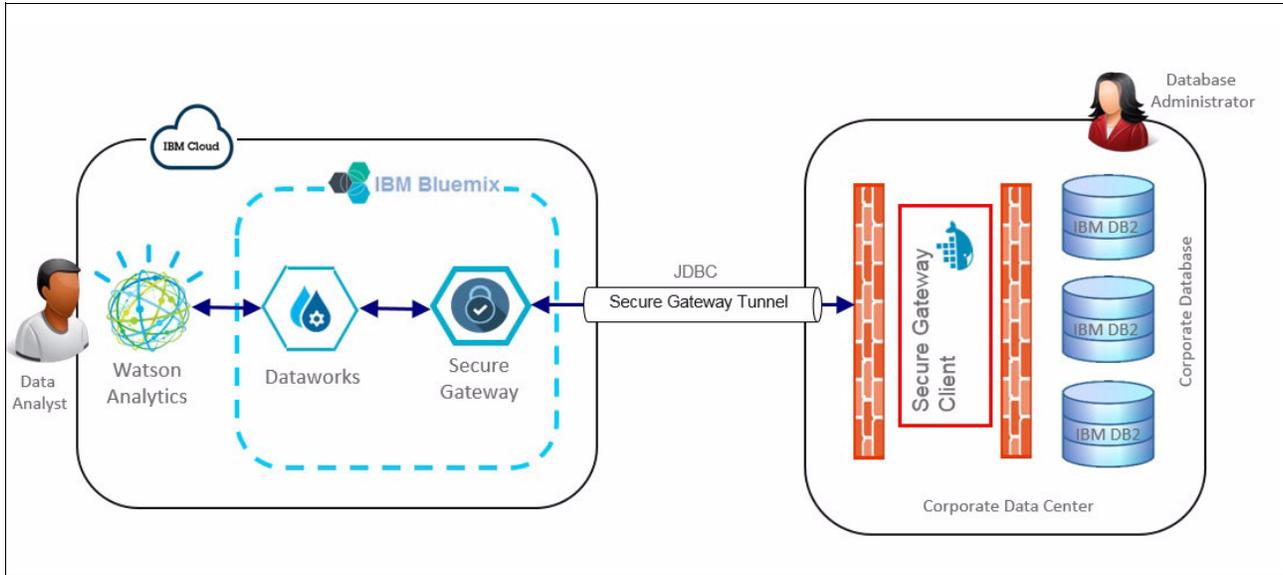


Figure 6 Grocery retailer sales data analytics that uses Watson Analytics

The solution enables the data analyst to import data from an on-premise database into the Watson Analytics system in the IBM cloud. This integration is possible through two Bluemix services (Secure Gateway and DataWorks). The Secure Gateway service provides a secure way to access cloud or on-premise data to applications that are running over a secure passage that is the gateway. DataWorks can be used to load, migrate, refine, and transform data as well as to gain insights from the data.

Figure 7 shows the data exploration and analytics about the transaction details data from the retailer's database. Data analytics show the most popular products that are sold in the grocery store.

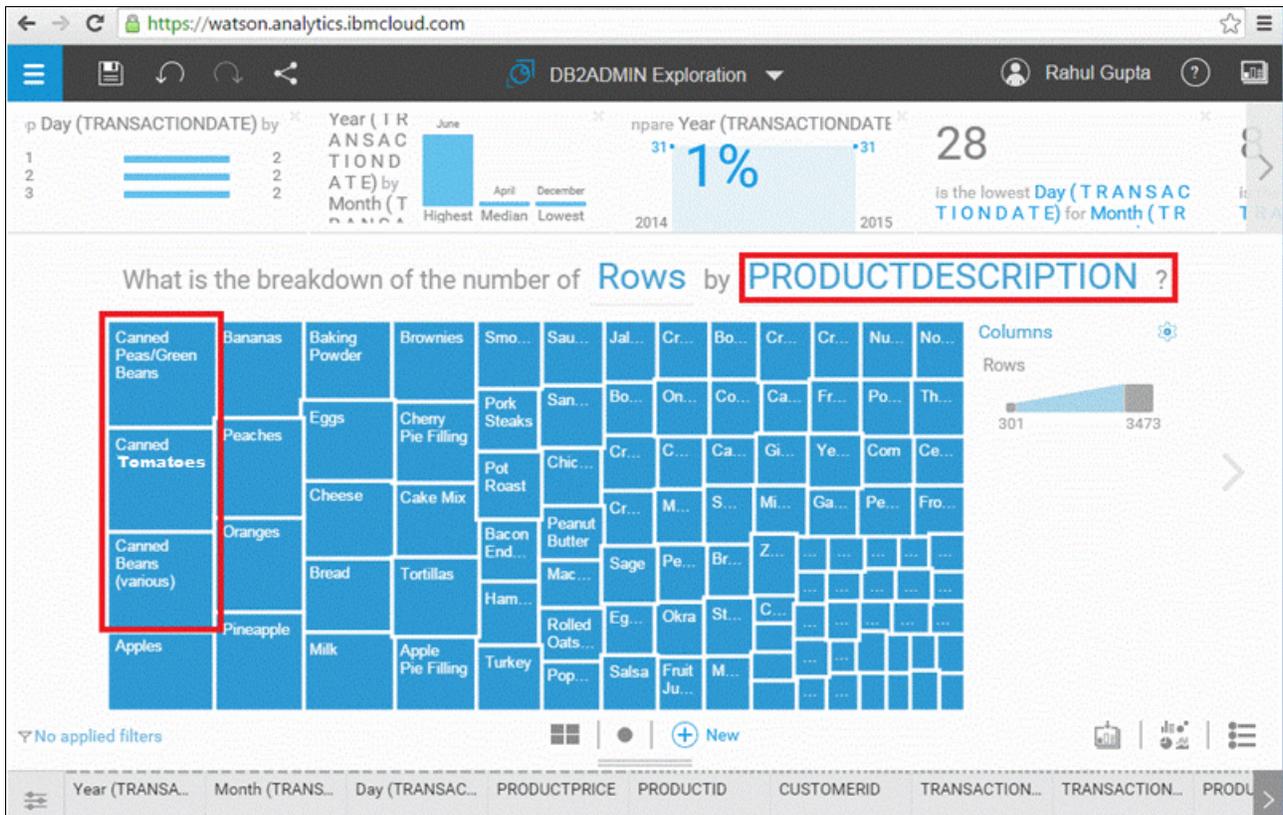


Figure 7 Data analytics on the highest selling product for the grocery retailer

Integration

The Bluemix integration services support platform has native integration with many IBM services, such as DB2, BigInsights®, and Watson. Therefore, your applications can have immediate access to many leading applications from IBM and IBM Business Partners. In addition, you can connect your Bluemix applications to traditional IT (on-premises) systems with the Bluemix Cloud Integration service as part of a hybrid cloud solution. By using the Cloud Integration service, you can create a cloud integration API and publish the API as a private service for your organization.

Supported platforms

For hardware and software, accessing Bluemix integration services requires an Internet connection and a browser.

Ordering information

IBM Bluemix integration services are available by using IBM Passport Advantage® or an IBM Cloud Services Agreement. They are not available as shrink wrap.

Table 1 lists ordering information.

Table 1 Ordering part numbers for IBM Bluemix Platform subscription and support

Program name	Program number	Charge unit description
IBM Bluemix Platform Subscription and Support	5725-S00	Pay Per Use, Per Month, Per Month with Support, Partial Month, Overage

Related information

For more information, see the following resources:

- ▶ *IBM Bluemix Architecture Series: Web Application Hosting on IBM Containers*, REDP-5181
<http://www.redbooks.ibm.com/abstracts/redp5181.html>
- ▶ *IBM Bluemix Architecture Series: Web Application Hosting on Java Liberty*, REDP-5184
<http://www.redbooks.ibm.com/abstracts/redp5184.html>
- ▶ *Hybrid Cloud Data and API Integration: Integrate Your Enterprise and Cloud with Bluemix Integration Services*, SG24-8277
<http://www.redbooks.ibm.com/abstracts/sg248277.html>
- ▶ IBM Bluemix product page:
<http://www.ibm.com/software/bluemix/>
- ▶ IBM Offering Information page (announcement letters and sales manuals):
http://www.ibm.com/common/ssi/index.wss?request_locale=en

On this page, enter IBM Bluemix, select the information type, and then click **Search**. On the next page, narrow your search results by geography and language.

Authors

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Vasfi Gucer is an IBM Redbooks Project Leader with the IBM International Technical Support Organization. He has more than 18 years of experience in the areas of systems management, networking hardware, and software. He writes extensively and teaches IBM classes worldwide about IBM products. His focus has been on cloud computing for the last three years. Vasfi is also an IBM Certified Senior IT Specialist, Project Management Professional (PMP), IT Infrastructure Library (ITIL) V2 Manager, and ITIL V3 Expert.

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