Enterprise Integration with Mulesoft

Learn how to leverage MuleSoft to power Enterprise Integration

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Dedicated to

To Joseph Bulger, a friend, a mentor, or a colleague, who always inspires me with his positive attitude toward work & life. I have learned a lot from him, how to achieve your goals in life even when there are obstacles preventing you from reaching them.

— Gaurav Aroraa

About the Authors

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  - Microservices by Examples Using .NET Core (BPB)
  - Data Analytics: Principles, Tools, and Practices… (BPB)

  Recently, Gaurav has been recognized as a world record holder for writing books in exceptional technologies. He has more than 12 patents on his name in disciplined technologies.

  — ***Gaurav Aroraa***

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  — ***Radhika Atmakuri***

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  — ***Tanuja Mohgaonkar***

About the Reviewer

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In life, it's hard to understand things when you don't find support. My family is one such support system, and I am the luckiest to have them. I would like to thank my wife, Shuuby Aroraa, and my little angel, Aarchi Arora, who gave me permission to write and invest time in this book.

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I would also like to acknowledge the valuable contributions of my colleagues and co-worker during many years working in the tech industry, who have taught me so much and provided valuable feedback on my work.

Finally, I would like to thank all the readers who have taken an interest in my book and for their support in making it a reality. Your encouragement has been invaluable

— Gaurav Aroraa

Foreword

- As a MuleSoft Developer Advocate, I'm responsible for evangelizing MuleSoft. Even before I became a Developer Advocate, I was a MuleSoft Ambassadress and a Meetup leader. I've always been passionate about learning MuleSoft and exploring MuleSoft. I've written several blogs, co-authored a book based on MuleSoft, hosted several MuleSoft Meetups, and have been a global speaker at conferences to drive MuleSoft and Salesforce adoption.

  So, to begin with, what is **MuleSoft**? Yes, you must probably hear that it's a middleware integration tool. But there's so much to offer when it comes to the integration ecosystem. *MuleSoft is Recognized as a Leader in Gartner Magic Quadrant for Integration Platform as a Service, Worldwide (iPaaS)*, and the credit goes to **MuleSoft's Anypoint Platform**.

  You can manage your entire API lifecycle - build, manage, deploy, and secure APIs with MuleSoft. You can build composable and reusable APIs, bring value to data in siloes by connecting different end systems, and much more. You have hundreds of in-built connectors, which help you to unlock data and connect different end systems seamlessly. You can also connect to your legacy systems.

  MuleSoft's Anypoint Studio is an Eclipse-based native studio that helps you to implement APIs and build Mule applications. Its low-code integration capabilities and transformation capabilities make integration an easier task.

  MuleSoft's capabilities don't just limit to integration space; with MuleSoft's Automation suite comprising of **MuleSoft's Robotic Process Automation (RPA) and MuleSoft Composer**, you can take integration to the next level.

  With MuleSoft's RPA, you can automate your day-to-day manual task. MuleSoft's Composer enables you to seamlessly integrate with external end systems in Salesforce's ecosystem.

  This book covers all the fundamental topics which will you help you design a REST API using Anypoint Platform's Design Center. It explains how to implement the API and build, test, and debug a Mule application using the Anypoint Studio. It also explains deploying the Mule application on CloudHub and managing the APIs. Every chapter covers the core capabilities of MuleSoft. You can also learn about **Non-functional requirements (NFRs)** and how to implement the same using MuleSoft.

As a reader, if you're completely new to MuleSoft, APIs, and integration tools, this book will help you onboard on your MuleSoft journey. After finishing the book, you'll have a better understanding of MuleSoft, core concepts of APIs and integration, different capabilities of MuleSoft, and so on. The chapters in this book are sequenced in a perfect manner to onboard a newbie and make them integration ready. This book also covers prerequisites to get started with MuleSoft, like concepts related to HTTP/HTTPS, REST APIs, and so on.

On completing the book thoroughly, you should be able to clear the fundamental certification - MCD Level 1 (MuleSoft Certified Developer).

— Akshata Sawant, Senior Developer Advocate, Salesforce

LinkedIn: */akshatasawant02/*

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- Today's digital age is seeing an acceleration of the transformation of applications across industries. I have been working with multiple clients in their transformation journeys over the last few years, and I have noticed that strong technology choices, extreme automation, focused automation & agile product-centric delivery have accelerated the desired outcomes. Irrespective of the application disposition (Move / Migrate / Build / Transform / Retire), the role of integration in connecting different applications, systems & data sources is extremely critical. Being a Thought leader in Hybrid Cloud Transformation with over 26+ years of experience in the IT industry, I have led several of such complex modernizations & transformations across industries, discussed the future of the technical landscape with tech leaders, built competencies across integration software & assess the comparative applicability of this software in the context of specific clients' needs.

  As a leading provider of Integration software, MuleSoft enables organizations to connect different applications, systems, and data sources seamlessly. With MuleSoft's Anypoint Platform, companies can build, design, and manage APIs (Application Programming Interfaces) that enable communication between different applications. MuleSoft has multiple connection offerings, supported by out-of-the-box templates, which allow faster deployment with minimum

re-work or errors. Some of these unique features have made Mulesoft one of the most popular choices in the industry.

This book introduces the reader to the concept of Integration and how it fits into the world of applications. It then introduces Mulesoft with all its features, providing a comprehensive guide to the readers with a solid understanding of the platform and how to use it to solve integration challenges. The authors have done an excellent job of breaking down complex concepts and providing clear, practical examples to make learning simple & fun. They have also included case studies and real-world scenarios that demonstrate the benefits of using MuleSoft in different industries and use cases. The book covers the entire lifecycle of transformation, from designing API contracts & connectivity, writing Mule applications using Data Weave, using Anypoint Studio IDE to develop and test, including test-driven development, handling errors & debug issues, and also details the recently launched CloudHub 2.0, orchestrated containerized integration platform as a service (iPaas). In summary, whether you are an Architect, Developer, Tester, or business leader, this book has something for you.

As someone who has seen the impact of Mulesoft on multiple organizations' application landscape, I was thrilled to see a book like this. It starts from the basics, covering the fundamentals of integration & Mulesoft, in particular, and then deep dives into the various features of the product. It also outlines the architectural perspectives of Mulesoft to me as it traverses a learner's journey from novice to experienced to expert proficiency.

I hope you appreciate the book as much as I did. I hope you enjoy working on Mulesoft and are armed with the required knowledge to use it to solve your integration challenges.

Cheers!

Deepak Gupta

New Delhi, India

Preface

Integration of enterprise applications is a complex task that requires a comprehensive understanding of the latest technologies and programming languages. MuleSoft and its supportive tools have become increasingly popular in the field of enterprise integration applications.

This book is designed in such a way that a novice or advanced-level reader can refer to this book. This book will be helpful for all novice readers who wish to start their career in the field of integration using MuleSoft. There is no prerequisite to start with the contents of the book. The reader may or may not be technically sound and can be from any technology or any programming language. The book is also designed to provide a comprehensive guide to all readers and integrate enterprise applications with MuleSoft. It covers a wide range of topics, including the basics of RESTful services, Data Weave, Anypoint Platform, Designer, Mule RPA, and inside using a use-case.

Throughout the book, you will learn about the key features of MuleSoft and how to use them to integrate enterprise applications that are efficient, reliable, and easy to maintain. You will also learn about best practices for writing and integration of APIs. The usage of Data Weave, an overview of Cloud Hub2.0, Non-functional requirements, and analysis and code-coverage by writing Munits test cases.

This book is intended for everyone who wants to start with MuleSoft and wants to learn how to integrate enterprise applications. It is also helpful for experienced developers who want to expand their knowledge of these technologies and improve their skills in building robust and reliable applications. The current book is available as a ready reckoner for experienced professionals.

With this book, you will gain the knowledge and skills to become a proficient developer in the field of enterprise integration using Mulesoft. Our intention is to get you ready for the next-generation integration platform using uleSoft.

Chapter 1: Introduction to the Integration World – touches almost all landscapes of the integration world. A good start to dive into the integration world. It explains the integration technologies and why part of the requirement of integration tools like MuleSoft. Comparative analysis with cross-interaction technologies with MuleSoft. This chapter sets a good background for all who want to see themselves

placed in the world of Integration. This chapter also presents a detailed overview of the history of MuleSoft by explaining API-LED connectivity concepts.

Chapter 2: RESTful World – An Introduction – covers RESTful concepts and different concepts of HTTP protocols, Statuses, methods, etc. This chapter provides an understanding of the RESTful world in today's modern development era. In the end, readers will be able to understand HTTP verbs, methods, and various statuses. This chapter contains code examples to explain the concepts, which does not mean that you need a development background. The code examples can be skipped. The main objective of this chapter is to collect a basic understanding of the RESTful world.

Chapter 3: Anypoint Platform – An Introduction – explains all the tools provided by Mulethe Soft Platform and helps to make yourself ready to start actual development. This chapter can be skipped or overviewed or can be taken as a reference purpose for advanced-level readers.

Chapter 4: Designing API – describe the concepts of 'Designing API contracts and API-led connectivity'. This topic is to establish a standard and structured approach to building APIs that are reusable, scalable, and easy to maintain. Furthermore, you will learn how API contracts define the interface of an API, including input and output data types, expected behavior, and other details, which helps to ensure that all parties involved in developing and using the API understand its functionality and can build their applications accordingly. Following by API-led connectivity. In this topic, you will understand that API-led connectivity involves breaking down an organization's IT systems into individual building blocks that can be reused across multiple applications and environments. By the end of this chapter, you'll get acquainted with three layers viz Experience, Process, and System.

Chapter 5: Anypoint Studio – An Inside Story – Anypoint Studio, which is an Integrated Development Environment (IDE). By the end of this chapter, you will gain an understanding of the various component of this IDE, viz. Editor, Compiler, Debugger, and so on.

Chapter 6: An Introduction to Data Weave – shows the basic concepts of Data Weave. Overs all aspects of Data Weave, writing, and explaining.

Chapter 7: Developing a Project – Connectors at a Glance – covers the phases involved in an API lifecycle and which components of the Anypoint Platform are involved in each phase. You will learn connectors briefly and the advantages of the connectors, and how we can create custom connectors and publish them in the exchange.

Chapter 8: Error Handling and Debugging – An Insight Story – covers the various ways of handling errors in Mule by following the best practices. Also, you'll learn how we can debug the Mule application to troubleshoot application-related issues easily.

Chapter 9: Test-Driven Development Using Munit – explains what Test Driven Development is and what are the various advantages of following TDD. You will also learn through the various steps involved in the TDD approach. You'd also go through the different ways to create Munit test cases for the flows and the various scopes involved in Munit test cases. We have gone through various event processors and matchers that are useful in writing Munits. The chapter also covers how to write Munits using the Munit Test Recorder and what are the limitations of using the Test Recorder.

Chapter 10: An Overview of NFRs and Mule RPA – covers the implementation of Non-Functional Requirements using API Manager by applying policies and so on. The chapter also touches on the basics of Mule RPA and explains the strength of automation concepts.

Chapter 11: CloudHub 2.0 – An Introduction – covers several aspects related to CloudHub 2.0, including the provision of IPass services, a comparison between CloudHub 1.0 and CloudHub 2.0, the creation and configuration of private Spaces, and an examination of the limitations of CloudHub 2.0.

Chapter 12: Universal API Management – An Introduction – covers Universal API Management, a set of MuleSoft product capabilities that together provide full life cycle management capabilities to APIs that are deployed anywhere in any architecture or environment. You will learn about the Flex Gateway and its features. The various configuration modes for the flex gateway. In order to enforce standards on APIs and reduce security and compliance risks, the chapter also covers API Governance.

Code Bundle and Coloured Images

Please follow the link to download the
Code Bundle and the ***Coloured Images*** of the book:

https://rebrand.ly/e0ucbvw

The code bundle for the book is also hosted on GitHub at **https://github.com/bpbpublications/Enterprise-Integration-with-Mulesoft**. In case there's an update to the code, it will be updated on the existing GitHub repository.

We have code bundles from our rich catalogue of books and videos available at **https://github.com/bpbpublications**. Check them out!

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Chapter 1
Introduction to the Integration World

Introduction

The world drastically changed in the last 10 years as we entered a digital era. And what a change it has been! Mankind rapidly moved from real to virtual-real, books to e-books and Kindles, working from the office to practicing working from anywhere! All due to connected systems and digital platforms. The most important component of a digital landscape is its "Middleware or Integration" layer. Be it streaming platforms like *Amazon Prime* and *Netflix* or E-commerce websites like *Shopify* and *Zoho*, integration of data from various partners, vendors, and payment gateways require a well-developed Integration Engine.

Structure

In this chapter, we will discuss the following topics:

- Definition
- Types of middleware
- MuleSoft-history and the idea
- Why MuleSoft for integration
- Introduction to other available integration tools

Objectives

The aim of this chapter is to highlight the current business and development trends of the industry. This chapter brings the history of MuleSoft, the idea behind the technology, and its core-basic insight.

Definition

Enterprise Integration is the task of uniting databases and workflows associated with disparate systems and business applications to ensure a consistent flow of information to provide better insight into organizational data. By merging and optimizing data and workflows between multiple software applications, organizations can achieve integration of disparate systems so as to support agile business operations.

Types of Middleware

Middleware connects applications, databases, and devices in order to provide unified services to end users. Middleware also connects applications and systems which are not designed to connect with each other by providing a gateway. Refer to the following figure:

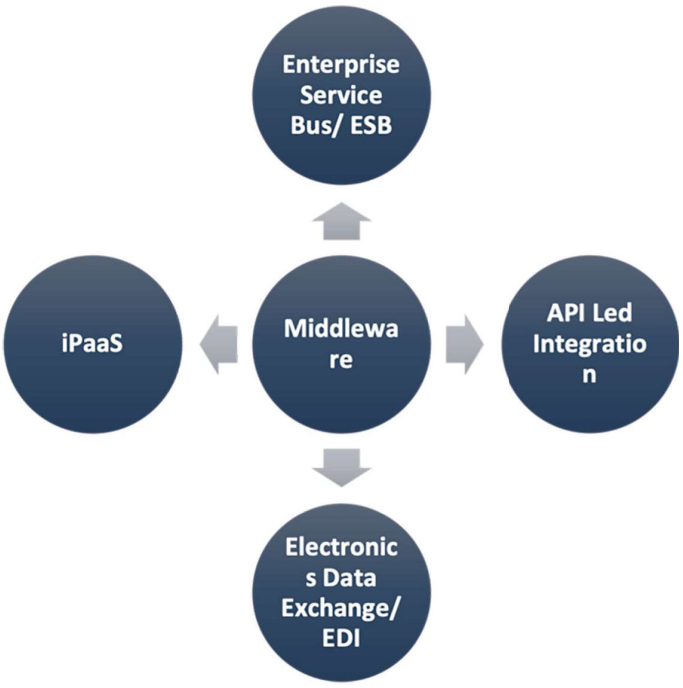

***Figure 1.1**: Types of Middleware:*

Enterprise Service Bus (ESB): ESB is a pattern where a central component or an Integration application talks to the surrounding applications/ systems. The various functions performed by an ESB are data transformation, message routing, conversion of communication protocols, and the management of multiple requests. ESB works on **Service Oriented Architecture (SOA)**. Refer to the following figure:

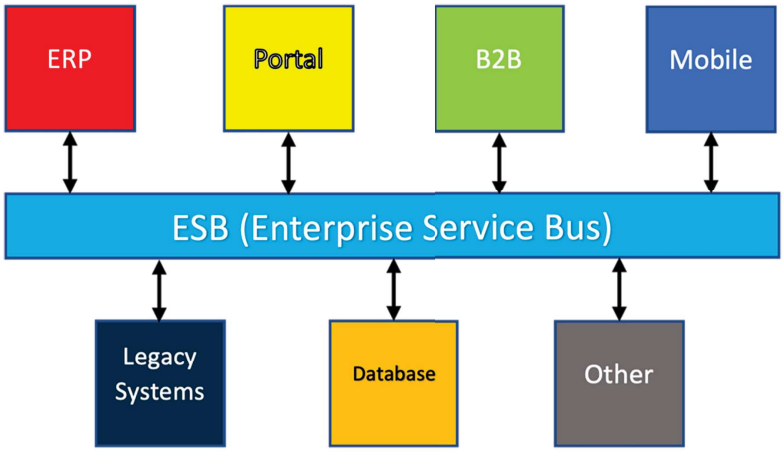

Figure 1.2: *Enterprise Service Bus*

Application interfaces connect with the ESB, and the next processes of transforming protocol, message routing, and data transformation are executed by the ESB application. It is a fully automated engine that enables developers to spend less time integrating. Most of the integration interfaces are reusable, enabling cost and effort savings.

While ESB still is a preferred Middleware in many organizations, it also is seen as a bottleneck in a few. Making changes in flows is cumbersome and can often lead to destabilizing surrounding systems. Significant efforts are spent on Testing post-updates in the integration workflows. ESB has proved to be a costlier Middleware to maintain in the long run where the volume of Integrations is high.

API-based integration: It is a messenger-based integration that processes incoming requests while ensuring the seamless functioning of Enterprise systems. API-based integration has replaced legacy integration systems due to the growing need for connectivity between disparate systems with uncommon Interfaces. Refer to the following figure: