

Oracle Cloud Infrastructure (OCI) GoldenGate

Real-world Examples

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Y V Ravi Kumar
Raghavendra S
Ankur Goel

Foreword by Jeffrey T. Pollock

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ABOUT THE AUTHORS

He has received the EB-1A Extraordinary Ability green card, colloquially known as the “Einstein visa,” from the United States. He is also a Senior Member of IEEE (Advancing Technology for Humanity), showcasing his commitment to advancing technology for the betterment of society.



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About the Technical Reviewers



Naresh Kumar Miryala, a distinguished engineering leader at Meta, possesses an extensive background in cloud and platform engineering honed over nearly two decades in the field. His deep understanding of both technical and business intricacies empowers him to pioneer innovative solutions spanning diverse domains such as database systems, large-scale back-end infrastructure, multicloud environments (AWS/GCP/OCI/Azure), automation, cloud infrastructure, DevOps, Kubernetes, and Elasticsearch.

Naresh is an adept engineering executive and technologist with extensive experience in working with cloud migrations, infrastructure implementation, database management, ERP solutions, and DevOps deployments.

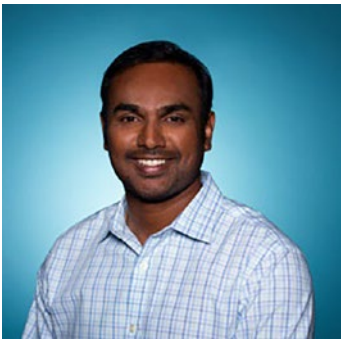
Having previously contributed to esteemed organizations like Oracle Corp and Computer Sciences Corporation, Naresh played a pivotal role in migrating or implementing Oracle technologies for over 60 organizations globally, many of which are Fortune 500 entities. His impact spans across various industries, including pharmaceuticals, retail, banking, and gold mining companies worldwide.

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ABOUT THE TECHNICAL REVIEWERS

comprehensive understanding of the multifaceted technical and business challenges intrinsic to such projects.

Naresh's affiliations include membership in IEEE, OATUG, AIM leadership council, and fellowship at RSA. He holds certifications as a professional in cloud and database platforms and actively engages as a blogger, tech reviewer, and frequent speaker in international conferences.



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Special thanks to Apress for giving me an opportunity to write this book. Last but not least, I thank all the readers. I hope this book provides you with valuable insights and ignites further exploration.

Raghavendra Sreenivas Murthy

Completing this book has been an incredible journey, exceeding my expectations. I would like to express my immense gratitude to Y. V. Ravi Kumar for the guidance, my wife Khushboo Goel for the steadfast support, and my manager Anirudhya Das Gupta for the motivation. Special thanks to Apress and the readers. May this book offer valuable insights and inspire further exploration.

Ankur Goel

Foreword

The emergence of cloud computing as the dominant paradigm for enterprise workloads has forever changed data architecture and design. Distributed data is the new normal. Real-time streaming data is no longer just a niche answer to high-end problems. Decentralized, heterogeneous data transactions are mandatory attributes of a modern multicloud data architecture. Fresh, up-to-the-minute data is crucial for accurate answers in enterprise generative AI solutions.

For more than 20 years, GoldenGate has been the world's most trusted software solution for distributed real-time data transactions. Now Oracle Cloud Infrastructure (OCI) GoldenGate is the most trusted solution for multicloud distributed data architecture.

I've been creating data-driven business software for more than 30 years, and there's never been a more exciting and dynamic time in the industry than right now. The emergence of data fabric and data mesh has redefined consumer expectations for data integration. Now more than ever, CIOs and CTOs recognize the value of real-time data events, data mesh, event mesh, and service mesh designs. OCI GoldenGate is on the cutting edge of these trends, providing a microservices-based solution for streaming data, changed data (DML, DDL), AsyncAPI, CloudEvents format, and integrations across all major public cloud infrastructure. What a time to be a data engineer!

This book is aimed at cloud developers, database administrators, and data engineers responsible to deliver a robust data fabric platform using OCI GoldenGate. Congratulations to Y. V. Ravi Kumar, Raghavendra Sreenivas Murthy, and Ankur Goel in putting together the industry's first book on cloud-native services for real-time data transactions. I'm certain

FOREWORD

this will be a useful guidepost for many engineers seeking to learn more and accelerate their productivity with the service.

Jeff Pollock
Vice President of Products for GoldenGate, Stream Analytics, and Data
Migrations
Oracle Development

CHAPTER 1

Introduction to Oracle GoldenGate Microservices Architecture

Before delving into GoldenGate for Microservices, let us first grasp the concept of microservices in the context of the software industry.

Oracle GoldenGate Microservices Architecture

Microservices constitute a software architecture that organizes an application into a set of small, independent, and loosely interconnected services. Each microservice corresponds to a distinct business feature and operates as an individual process or container. These services communicate via well-defined APIs (application programming interfaces), collaborating cohesively to provide the application's complete functionality.

Oracle GoldenGate Microservices Architecture (OGG MA) is a modern and flexible way to deploy and manage Oracle GoldenGate, a data replication and integration tool provided by Oracle Corporation. GoldenGate Microservices Architecture was introduced in Oracle

GoldenGate version 12.3 and is designed to meet the evolving needs of organizations dealing with real-time data integration, replication, and data streaming across various platforms.

In conventional/traditional/classic GoldenGate deployments, a monolithic architecture is employed, wherein a single process (manager process) oversees all data replication operations. Although this architecture is efficient, managing and scaling it becomes challenging with a growing number of replication processes and data sources.

What Is Oracle GoldenGate?

Oracle GoldenGate (OGG) is a software solution for real-time data integration and replication. It allows organizations to capture, transform, and move transactional data from one database to another, across different platforms and data environments, with minimal latency and impact on system performance. This ensures that databases remain synchronized, facilitating high availability, data migration, and real-time analytics.

Oracle GoldenGate Classic Architecture

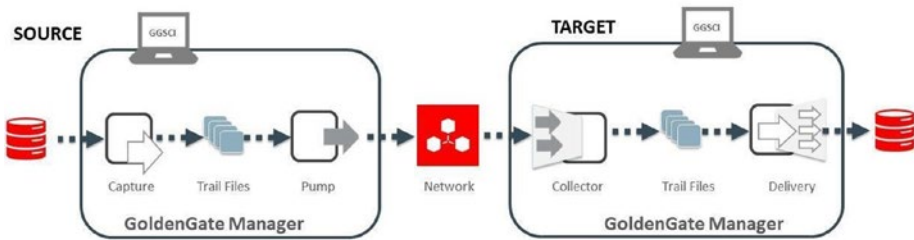


Figure 1-1. GoldenGate classic architecture

As shown in Figure 1-1, Oracle GoldenGate’s classic architecture, before the advent of the Microservices model, consists of several core components. Here’s a brief overview of the core components and their respective roles within the classic Oracle GoldenGate architecture:

1. Manager

- Role: This is the core component/controlling process for GoldenGate operations on a system. It starts other GoldenGate processes, manages resources, and oversees trail file management.

2. Extract

- Role: This is the capture process responsible for extracting transactional changes from the source database redo or transaction logs. Extract can operate in different modes, such as initial load, online change synchronization, or both.

3. Trail Files

- Role: These are intermediary files that store the captured data changes. They can reside on the source system, target system, or both, depending on the configuration.

4. Pumps

- Role: This is a secondary Extract process that reads from the local trail file and then routes that data to remote trail files, possibly transforming or filtering the data along the way. This component is particularly useful in multitier Oracle GoldenGate configurations.

5. Replicat

- Role: This is the apply process that takes the changes captured in the trail files and applies them to the target database.

6. Checkpoint Files

- Role: These files store the recovery checkpoints for the Extract and Replicat processes. In case of a failure or restart, the processes can pick up from the last known checkpoint, ensuring data consistency and no data loss.

7. Parameter Files

- Role: These configuration files store the settings for GoldenGate processes (like Extract, Replicat, and Manager). They define the behavior, mapping, filtering, and transformation rules for data replication.

Oracle GoldenGate Microservices Architecture Core Components

Oracle GoldenGate Microservices Architecture

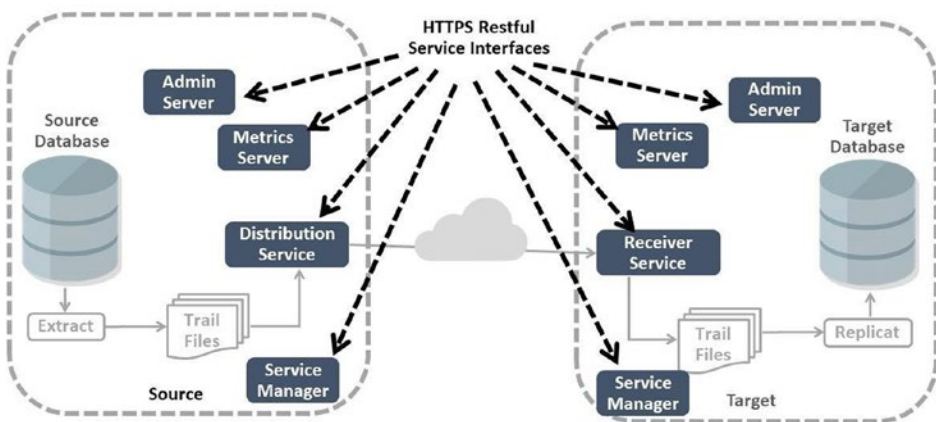


Figure 1-2. GoldenGate Microservices Architecture

As shown in Figure 1-2, GoldenGate Microservices Architecture offers a more modular and distributed approach to manage replication. It introduces several components or microservices, each responsible for a specific function, making the system more flexible, scalable, and easier to maintain. Key components of GoldenGate Microservices Architecture are

1. **Service Manager (SM):** This component manages the life cycle of other microservices. It starts, stops, and monitors microservices and provides a central point of control for managing the entire deployment.
2. **Administration Server:** It acts as the central control point for controlling and keeping track of different GoldenGate microservices. Administrators may set up, deploy, and manage GoldenGate instances using the Administration Server's web-based user interface and RESTful APIs.
3. **Distribution Server:** This evolved from the pump process of the classic architecture. It handles one or more tails to multiple destinations to the target systems.
4. **Receiver Server:** This is in charge of incoming trail files, one of the core components handling all the incoming trail files from the distribution server.
5. **Performance Metrics Server:** A vigilant observer, it continually amasses performance metrics, offering real-time insights.
6. **Replicat:** Retaining its role, Replicat remains instrumental in the transaction application to target databases. Process responsible for applying transactional data to target systems.