The Cloud DBA-Oracle

Managing Oracle Database in the Cloud

—

First Edition

—

Abhinivesh Jain
Niraj Mahajan

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To my parents, my wife Bhumika, and my son Aarjav,
for their unconditional love, support, and encouragement in writing this book.

—Abhinivesh Jain

To my parents, my wife Aboli, and my daughters Swarali and Sarisha,
for their continuous support and love.
My father is my inspiration for writing this book.

—Niraj Mahajan

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Introduction

Cloud adoption in the database world is growing very rapidly. Various research and studies forecast the DBaaS and cloud database service market to grow at a compound annual growth rate (CAGR) of more than 65% by 2019.

Currently available books cover either cloud computing or database administration, but not both. This book bridges the gap. The book is divided into two parts. Part I covers the cloud computing concepts and database as a service overview, whereas Part II covers everything that is required for you to become a cloud DBA.

Part II starts from your first database provisioning in the cloud and then moves to setting up Oracle RAC and DataGuard in the cloud. The chapter on database migration to the cloud gives you in-depth details around how to plan and execute DB migration. The chapter on DB security touches on the key security aspects that you should take care for your cloud-based database. The backup and recovery chapter covers various backup and recovery options in Oracle cloud and AWS. The manage and monitor chapter covers details on all the tools that are useful for performing day-to-day monitoring and administration. Part II covers DB administration aspects from the two most prominent cloud providers—Oracle Cloud and Amazon Web Services (AWS).

This book has the right balance of theory and practical examples, along with the best practices in each given area.

Database administrators, DB architects, and DB operations managers can use this book to learn and understand the process of running Oracle database in the cloud.

Thanks for purchasing this book; we are confident that the knowledge you acquire by reading this book will be worth your time and money. For any comments, suggestions, or feedback, write to us at `feedback@thecloudDBA-oracle.com`.

PART I

Cloud Computing Fundamentals

To become Cloud DBA, you need to first understand the cloud concepts. Cloud computing is very vast area and there are numerous books available in market. Objective of Part I of this book is to give you "just enough" details of cloud computing so that you can get started towards your journey to become The Cloud DBA.

In Part I, there are 2 chapters.

Chapter 1 covers the overview of cloud computing. This is explained using cloud computing definition, benefits, challenges, service models, deployment models etc.

Chapter 2 covers overview of Database as a service (DBaaS) and how DBaaS is provided in IaaS, PaaS, Public cloud and Private cloud. It also makes you aware of key terminologies related to DBaaS.

CHAPTER 1

Introduction to Cloud Computing

This chapter explains the definition and benefits of cloud computing. It also covers cloud computing deployment models and service models. Finally, it covers the metering and chargeback concepts. Tons of resources are available on cloud computing, hence the objective here is to give you a high-level overview.

Overview

The origin of cloud computing is not known, and it has nothing to do with real "cloud". So why is it called *cloud computing*? The word "cloud" is a metaphor to indicate the abstraction between the end user and the resources. Cloud computing is more of a pay-as-you-go model, compared to a do-it-yourself (DIY) model. This can easily be understood from an electricity example. You consume electricity and pay on the basis of the number of units consumed. While using it, you are not concerned about how the electricity is produced, distributed, or managed. Similarly, in cloud computing, you just pay for computing resources for the duration of your use. You are not concerned with how these computing resources are hosted or managed.

In database terms, you will get your database up and running very quickly. You don't need to worry about procurement of server, configuration, and installation of various software, or with, maintaining the datacenter, infrastructure, hardware, or operating system.

In this book, you will first learn about the cloud computing concepts, followed by "database as a service" details, and then you will learn about the major aspects of database administration, including provisioning, HA and DR setup, monitoring, day-to-day administration activities, and backup and recovery, all from the cloud perspective.

What Is Cloud Computing

Defining cloud computing is complex and many definitions exist. The official definition is given by the National Institute of Standards and Technology (NIST).

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It's essentially a web-based service for computing resources, including server, network, storage, and applications. This service is ubiquitous and provided as on-demand basis.

Benefits of Cloud Computing

Companies have traditionally believed in owning the assets and managing them on their own, but this model meant large capital expenditure (CAPEX) and operating expenditure (OPEX) costs. Another challenge with this traditional approach is related to meeting the higher computing requirements due to a single business event. Buying extra hardware and resources for handling spikes means waste of resources during the non-peak times.

The biggest benefit of cloud computing is saving on CAPEX related to infrastructure costs. The various benefits are listed in Table 1-1.

Table 1-1. *Cloud Computing Benefits*

Category	Benefits
Provisioning	Faster provisioning makes cloud computing an ideal platform for test and dev environments
Scalability	Scale up and scale out on-demand
Resource release	Faster resource release/scale down
CAPEX	No investment required for setting up the infrastructure
OPEX	Lower OPEX due to pay-as-you-go model
Availability	Highly available
Skill requirements	Lower skill required due to built-in automation
Accessibility	Accessible using web-based portal, hence it is ubiquitous

Challenges of Cloud Computing

There are many challenges related to cloud computing, some of the key ones are listed here:

- *Cost of service*: While cloud computing is good for ad hoc usage, it becomes more costly if you try to adopt it as the only solution for all your hosting requirements.
- *Laws of the land*: Local laws in various countries don't allow you to keep data on servers that aren't in direct control of the data owner. In a few cases, keeping data outside of a given country is also not allowed.
- *Cloud interoperability*: Moving things between different cloud service providers is a very difficult task.

- *Geographical presence*: Cloud vendors do not have a presence in all geographies, which means cloud computing becomes infeasible for some customers.
- *Application certification*: Not all applications are certified to run in a cloud; this is one of the key challenges in cloud computing adoption.
- *Lack of an integrated solution provider*: Currently no single vendor provides all the cloud services that any given organization needs. For example, converged infrastructure as a service is provided by Oracle, whereas physical hardware as IaaS is provided by IBM SoftLayer.
- *Security*: Security used to be the biggest challenge for cloud computing, but this is less the case nowadays. Cloud service providers get all security certifications and have a proven track record. For example, AWS hosts the American Security agency's cloud computing infrastructure. Many organizations still perceive cloud security as a major challenge.

Cloud Computing Service Models

There are three commonly used service models (see Figure 1-1):

- Infrastructure as a Service (IaaS)
- Platform as a Service (PaaS)
- Software as a Service (SaaS)

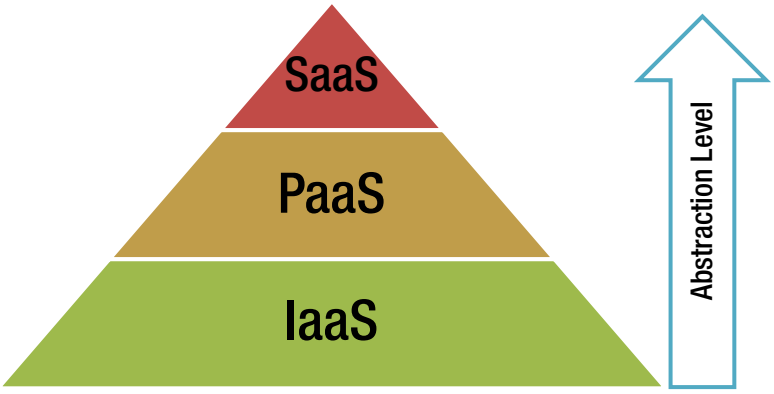

Figure 1-1. *Cloud computing service models*

Infrastructure as a Service (IaaS)

IaaS providers supply physical/virtual machines, storage, firewall, load balances, VLANs, etc. These are provided from a vast pool of resources. In IaaS, the consumer is responsible for patching and maintaining the operating system and the application software. In Oracle database context, IaaS means that the cloud service provider gives you the server, network, storage, OS, and other software that is required to run Oracle. Sometimes, Oracle software is preinstalled or the server comes with Oracle binaries. You are allowed to bring your own software image.

Platform as a Service (PaaS)

PaaS providers give the dev environment like Dev toolkit (for example, Microsoft Azure and Google App engine). In PaaS, the consumer is not responsible for managing the underlying infrastructure and doesn't administer the underlying cloud components such as the operating system, database, etc. In Oracle database context, PaaS means Oracle database as a service. Here, you don't need to worry about installing Oracle or managing the database server.

Software as a Service (SaaS)

In the SaaS model, the application is placed in the cloud by the SaaS provider. The consumer is not responsible for managing the infrastructure and platform. In Oracle context, SaaS means getting the entire database service from the cloud provider; you just pay for usage. The schema as a service offering from Oracle Cloud is one example of SaaS.

Cloud Deployment Models

Cloud computing can be deployed in many ways and it all depends on the placement of computing resources at the consumer's location (on-premise), at cloud service provider's location, or at both locations. The current cloud deployment models are as follows:

- Public cloud
- Private cloud
- Hybrid cloud
- Community cloud

Public Cloud

This is most common deployment model. In this model, computing resources are present in the cloud service provider's datacenter and are shared with various consumers in a multi-tenant architecture (Figure 1-2). The major advantage of this deployment model is

that you don't need to invest in H/W and effort in setting up the cloud. The disadvantage is that you don't have full control of your computing resources. You can't use this model when there are local laws that prevent you from keeping your data outside your premises.

The public cloud model is good option for startups and any organization that wants to avoid CAPEX costs related to DB servers.

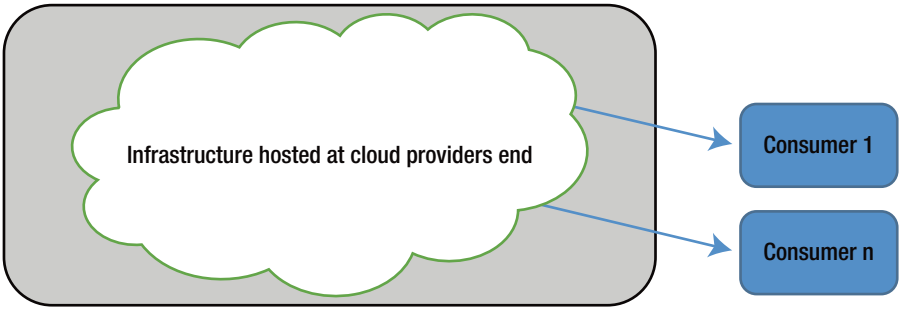

Figure 1-2. *Public cloud example*

Oracle database can be run on many public cloud providers; however the prominent players are as follows:

- Oracle Cloud
- Microsoft Azure
- Amazon Web Services (AWS)

In the public cloud model, database related services are provided in all three service models (IaaS, PaaS, and SaaS). Oracle provides the following services in Oracle cloud:

- *Oracle Database Cloud Service, Virtual Image*: IaaS offering to run Oracle database
- *Oracle Database Cloud Service*: IaaS/PaaS offering to run Oracle database
- *Oracle Database Exadata Cloud Service*: IaaS offering for running Oracle on Exadata machines
- *Schema as a Service*: SaaS offering to run Oracle database

Microsoft Azure provides IaaS service where you can run Oracle database on virtual machines hosted in their cloud.

AWS provides the following services for Oracle database:

- *EC2 Instance*: IaaS offering
- *Relational Database Services (RDS)*: SaaS offering to run Oracle database

Cloud service providers continuously add enhancements, hence it is recommended that you check the cloud service provider's portal to get the latest offerings.

Private Cloud

In this deployment model, computing resources are placed on-premise. There is one more option here in which computing resources are placed at the cloud provider's premises, but all of these are dedicated for consumers (Figure 1-3). The major advantage of this model is that you have full control of your resources and you can meet any local laws requiring data be kept in your datacenter. The disadvantage is related to the effort needed for private cloud setup.

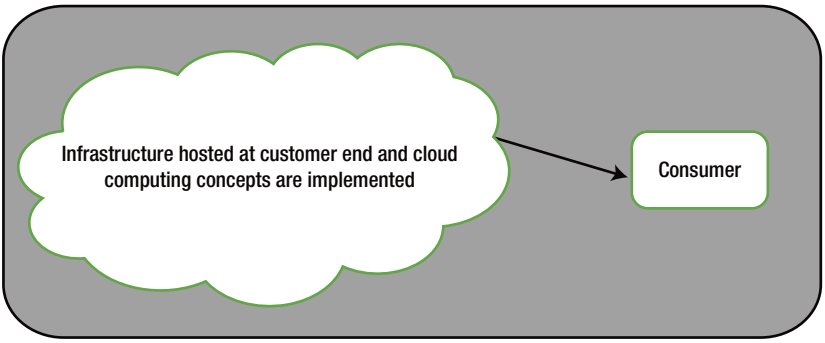

Figure 1-3. *Private cloud example*

Database private cloud setup is done mostly in house, where companies use commodity server or converged infrastructures like Oracle Exadata, VCE Vblock, and IBM Pure app to host DB servers in a consolidated fashion. Oracle OEM 12c/13c cloud control is used to mimic a cloud-like setup where a self-service portal is created for quick provisioning and a chargeback module is used for metering and billing. In this model, planning, implementation, and on-going maintenance is handled by the company itself.

Private cloud is good option for organizations that want to get ROI from their CAPEX investments done and where hosting in a public cloud is not an option due to compliance requirements.

Hybrid Cloud

This deployment model provides the best of the public and private cloud options. In this model, consumers use both a public cloud and private cloud to cater to different requirements (Figure 1-4). For example, some applications can't move to a public cloud since they are running on end-of-life software, so they remain in a private cloud.