



AWS Whitepaper

Migrating Oracle E-Business Suite on AWS



Migrating Oracle E-Business Suite on AWS: AWS Whitepaper

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Migrating Oracle E-Business Suite on AWS

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This whitepaper covers the migration of Oracle E-Business Suite to Amazon Web Services (AWS). It covers various tools, best practices, and considerations as customers migrate their Oracle E-Business Suite to AWS.

The intended audience includes Oracle E-Business Suite Database Administrators (Apps DBAs), Head of IT, Architects, and Oracle E-Business Suite Implementation Consultants.

Are you Well-Architected?

The [AWS Well-Architected Framework](#) helps you understand the pros and cons of the decisions you make when building systems in the cloud. The six pillars of the Framework allow you to learn architectural best practices for designing and operating reliable, secure, efficient, cost-effective, and sustainable systems. Using the [AWS Well-Architected Tool](#), available at no charge in the [AWS Management Console](#) (sign-in required), you can review your workloads against these best practices by answering a set of questions for each pillar.

For more expert guidance and best practices for your cloud architecture—reference architecture deployments, diagrams, and whitepapers—refer to the [AWS Architecture Center](#).

Overview of Oracle E-Business Suite migrations on AWS

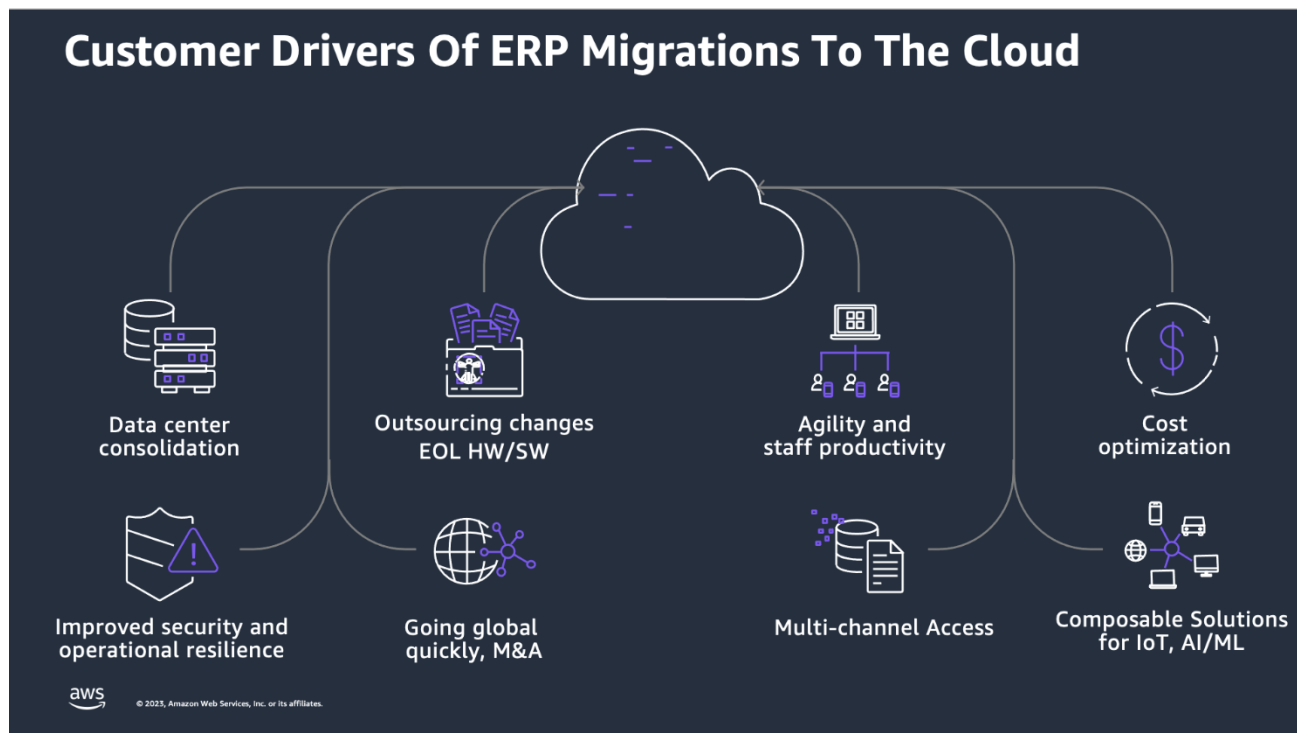
[Oracle E-Business Suite](#) is an Enterprise Resource Planning (ERP) solution used by customers to run their financial, human resources (HR), supply chain, manufacturing, and Customer Relationship Management (CRM) systems. It is one of the critical workloads in the enterprise.

On their journey to AWS Cloud, customers generally [lift-and-shift](#) their Oracle E- Business Suite workloads to AWS. This is because ERP applications are the backbone for any enterprise and customers do need to have experience and expertise to migrate these large applications on AWS. Some customers also look at re-platforming, such as migrating to [Amazon RDS Custom for Oracle](#), automating their cloning and or innovating by replacing their customizations with cloud native AWS services, or using emerging technologies such as artificial intelligence (AI) and machine learning (ML) to enable automation and unlock deeper insights from their data. AWS has over 200 services and a large set of AWS Partners.

In 2021, AWS published the [Overview of Oracle E-Business Suite on AWS whitepaper](#). Since then, many customers have migrated their workloads with the help of AWS Solutions Architects and [AWS Partners](#). Using insights gained from talking to customers about their Oracle E-Business Suite migrations, AWS has developed best practices for these migrations. It has also discovered tools to help the wider community benefit from customer experiences. This whitepaper shares those best practices for migrating Oracle E-Business Suite to run on AWS.

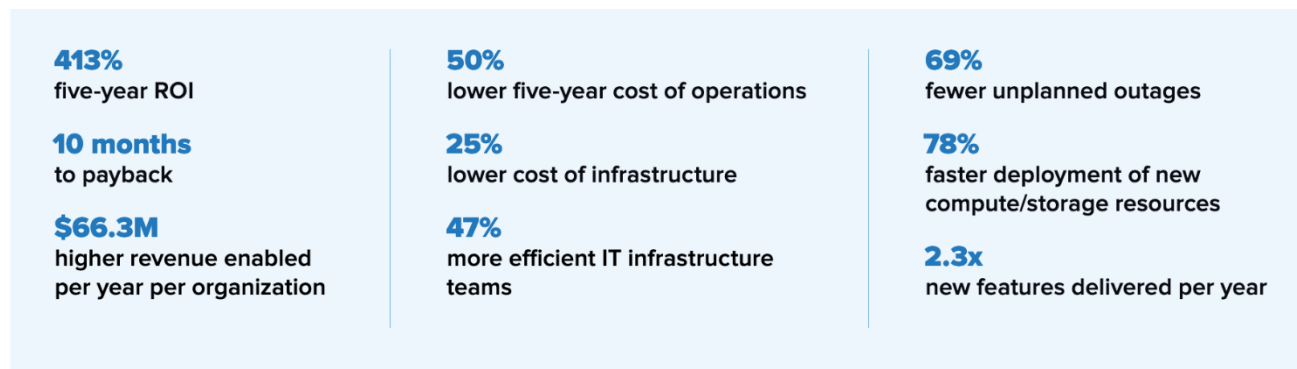
Why should customers migrate Oracle E-Business Suite on AWS?

Customers have been running Oracle applications workloads on AWS for over a decade. Migrating Oracle E-Business Suite to AWS allows customers to get all the benefits of a mature cloud platform (including cost reduction, performance improvements, and higher availability), without making big upfront investments. With more than 200 AWS Cloud services, Oracle customers gain choice, flexibility, and tighter cost control.



Business drivers for migrating to the cloud

For more details, refer to [Benefits of Oracle E-Business Suite on AWS](#) in the *Overview of Oracle E-Business Suite on AWS* whitepaper.



Migration business outcomes

Source, [IDC - The Business Value of Amazon Web Services, June 2022](#)

Migration methodology

AWS has published various blogs, prescriptive guidance, and whitepapers to help customers plan and complete their migrations using migration methodology. This includes vetted solutions and guidance for business and technical use cases. For more information on our technical solutions, see:

- [AWS Solutions Library](#)
- [AWS Prescriptive Guidance](#)
- [AWS Whitepapers & Guides](#)
- [Oracle Applications on AWS resources](#)

For details on the AWS three-phase migration process, see [How to migrate](#).



Three-phase migration process

Migration assessment and planning

Before Oracle E-Business Suite ERP can be migrated, customers need to consider the following:

- **Edge applications** – Application discovery tools, such as [AWS Application Discovery Service](#) or [Migration Evaluator](#) (formerly known as TSOLogic) can provide useful information on applications and systems interacting with Oracle E-Business Suite. Analyze the edge applications to determine whether they need to be migrated to the cloud first or later. This approach can also help you calculate the impact of Oracle E-Business Suite migration.
- **Current system utilization** – Check the current utilization of application servers, database servers, and concurrent processing servers for Oracle E-Business Suite. Utilization must be measured over a few weeks, observing the peak periods for I/O, and throughput capacity required on the database. You can get this information using various monitoring tools already available within your organization. As part of a migration exercise, discovery tools such as [AWS Application Discovery Service](#) or [Migration Evaluator](#) can also provide insight on current systems utilization, and appropriate instance sizing on AWS.
- **Target instance types** – Provision a database instance for the I/O and throughput that you observed on premises to serve the real-time and the batch workloads. For more information, refer to the [Right Sizing: Provisioning Instances to Match Workloads whitepaper](#).
- **Downtime** – You also need to plan for a downtime to cutover to the new production instance after migration and setup is done. To reduce the downtime, you can make use of various tools that are discussed throughout the following sections.
- **Recovery Point Objective (RPO) and Recovery Time Objective (RTO)** – Your current service level agreements (SLAs) can be improved as you migrate to the cloud. AWS recommends that you run the Oracle E-Business Suite production environment across multiple Availability Zones (AZs) within the AWS Region for high availability (HA). Each [Amazon Elastic Compute Cloud](#) (Amazon EC2) instance in an AZ offers 99.99% infrastructure availability. Based on your needs, you can also have a multi-Regional setup for disaster recovery (DR).
- **RAC versus non-RAC** – You might be running your current production databases underlying Oracle E-Business Suite on [Oracle Real Application Clusters](#) (Oracle RAC). While RAC improves availability and allows more throughput, by using appropriate AWS services and other Oracle HA tools such as Oracle Data Guard, you can achieve a similar level of performance and availability without implementing RAC on AWS. While sizing database nodes on AWS, consider the aggregate CPU, memory, and throughput numbers from all instances in RAC. Oracle RAC addresses a very specific use case, and can be prohibitively expensive compared to architecting

non-RAC, however in some cases Oracle RAC is the right solution depending on the business requirements and use case. We recommend customers work backwards from the workload's requirements to determine if Oracle RAC is a good fit, and we encourage customers to consider Well-Architected alternatives first, and work backwards from the business requirements.

- **Oracle RAC use cases:**

- **Scalability** – Oracle RAC was designed for scalability when single core x86 CPUs were standard. AWS offers instance types up to 224 vCPU cores and 24 TB of memory.
- **Availability** – When supported by the application, Oracle RAC provides local availability. Most RPO and RTO requirements can be achieved with a lower cost HA solution, within and across Availability Zones.
- **Performance** – Oracle RAC performance penalties due to cache fusion and other clustering overhead. In most scenarios, placing all resources on a single node will outperform the same amount of resources split between multiple nodes.
- **Maintenance** – When supported by the application, zero downtime, rolling maintenance can be performed on Oracle RAC clusters, reducing the required maintenance outages

- **AWS Oracle RAC solutions:**

- Oracle RAC on AWS
- [Oracle RAC on VMC](#)
- Third-party marketplace offerings, such as [FlashGrid](#)
- **Homogeneous versus heterogeneous migration** – Depending on the source operating system (OS) you are migrating from, Oracle E-Business Suite migration can be considered homogeneous or heterogeneous. Refer to the following table to determine your migration type. If the [endian formats](#) for source and target OS are different, they are considered to be the heterogeneous migrations of Oracle E-Business Suite.

Table 1 — Migration types

Source OS	Source Endian Format	Recommended Target OS on AWS	Target Endian Format
Windows	Little endian	Windows	Little endian
Linux	Little endian	Linux	Little endian
IBM AIX	Big endian	Linux	Little endian

Source OS	Source Endian Format	Recommended Target OS on AWS	Target Endian Format
HP-UX	Big endian	Linux	Little endian
Solaris SPARC	Big endian	Linux	Little endian
Solaris x86	Little endian	Linux	Little endian

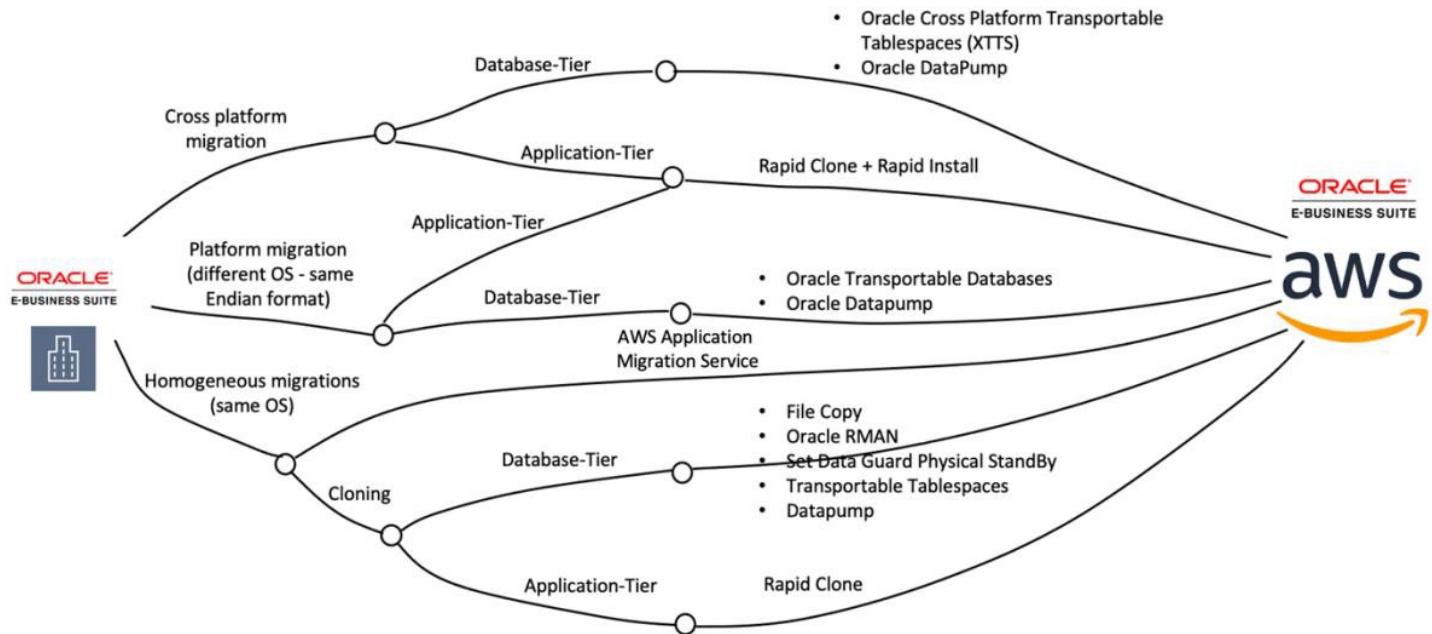
To query the endianness of platforms, connect to the database as [SYSDBA](#) using [SQL*Plus](#) and run the following command:

```
SQL> select platform_name, endian_format from v$transportable_platform;
```

Heterogeneous migrations are more complex, because only a subset of tools is available for migration, and you need to do thorough testing.

Migration approaches

The following diagram shows the migration paths that customers may take depending on the current platform, tooling, and experiences available to them.



Possible migration approaches

The current OS and endianness of the platform determines the appropriate tools you will need to migrate your Oracle E-Business Suite to AWS.

The following table identifies each tool and its support for homogeneous and heterogeneous migrations.

Table 2 — Migration tools and their support for homogenous and heterogenous migrations

Migration tool or utility	Application/ Database tier level	Homogeneous OS migration	Heterogeneous OS migration	Notes
AWS Application Migration Service (AWS MGN)	Application and database tier	Yes	No	Block replication

Migration tool or utility	Application/ Database tier level	Homogeneous OS migration	Heterogeneous OS migration	Notes
Oracle E-Business Suite Cloning	Application tier	Yes	No	File system copy
Oracle Data Guard	Database tier	Yes	No	Database replication using redo log shipping
Oracle Transportable Tablespaces	Database tier	Yes	Yes	Migration of data files and database tablespaces structure
Oracle RMAN backup and restore	Database tier	Yes	No	Oracle Native Backup tool
Oracle GoldenGate	Not supported for Oracle E-Business Suite Migration	N/A	N/A	Logical replication of a database
Oracle Data Pump	Database tier	Yes	Yes	Export/import utility

The preceding table should help you identify the tools for homogeneous or heterogeneous migrations. Further details on some of these tools are provided in the following sections.

Migration and assessment tools on AWS

Along with the Oracle E-Business Suite specific tools mentioned previously, you can also make use of various other AWS services to migrate files and objects from on premises to AWS.

- [Migration Evaluator](#) – Can be used for application discovery, building a business case, and right-sizing environments on AWS.
- [AWS Snowball Edge](#) – Can be used to move terabytes of data in about a week on AWS. You can use it to move digital assets such as databases, backups and media content. Example for a very large database would be to take an RMAN full backup a number of weeks in advance (to allow time for shipping to AWS) and then restore the standby and apply the redologs in AWS – keeping the database in sync with on premises.
- [AWS DataSync](#) – Can be used to move large amounts of data online between on-premises storage and Amazon S3, [Amazon Elastic File System](#) (Amazon EFS), [Amazon FSx for Windows File Server](#), [Amazon FSx for Lustre](#), [Amazon FSx for OpenZFS](#), or [Amazon FSx for NetApp ONTAP](#).
- [AWS Storage Gateway](#) – Can be used for implementing hybrid cloud storage use cases such as moving backups to the cloud, or using on-premises file shares backed by cloud storage.
- [AWS Direct Connect](#) – Can be used to establish a dedicated network connection from on premises to AWS.

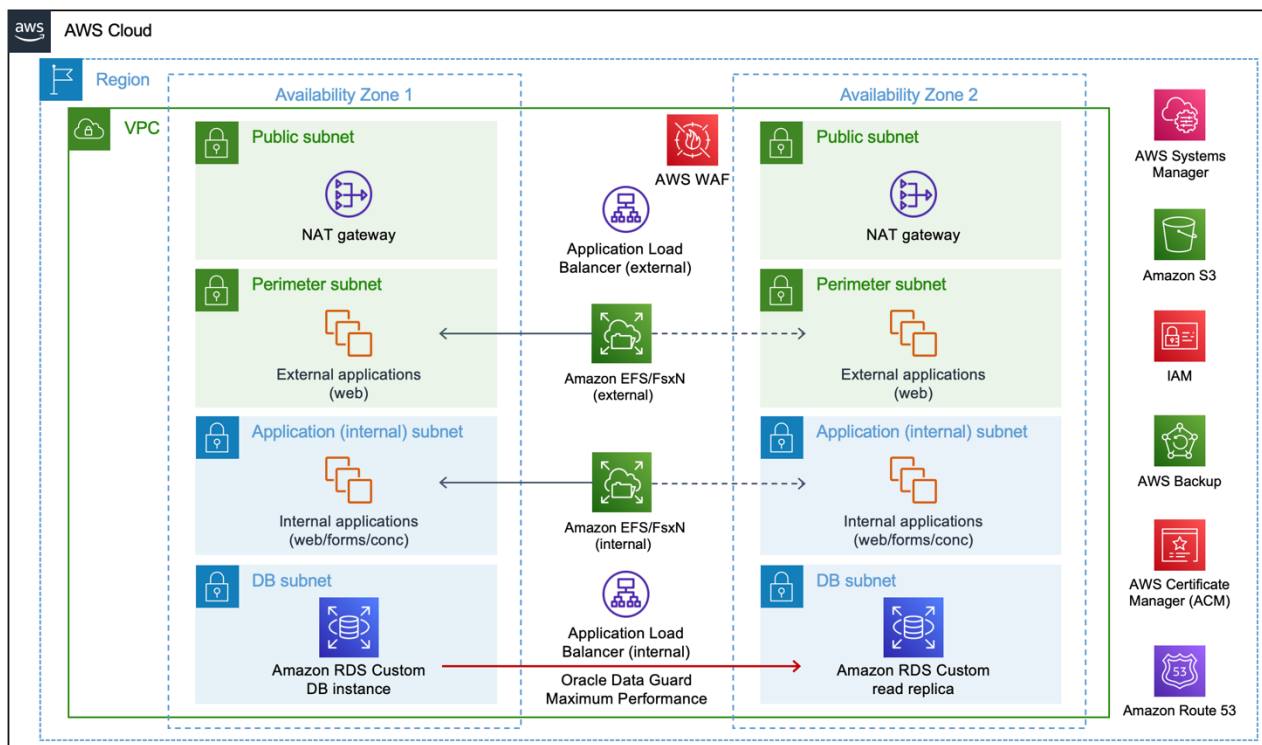
Architectures for running Oracle E-Business Suite on AWS

High level architecture for running Oracle E-Business Suite on AWS

The [Overview of Oracle E-Business Suite on AWS whitepaper](#) discusses various components of the Oracle E-Business Suite application tier, its interactions with AWS, and how the requests flow through those components. It also covers how to optimize HA for the Oracle database underlying the Oracle E-Business Suite.

In addition, it discusses how to scale the Oracle E-Business Suite application tier by adding multiple application tier nodes and database replication using Oracle Data Guard.

This whitepaper extends the same architecture and discusses a few other components that may require attention as part of your migration scenario.



Oracle E-Business Suite on Amazon RDS Custom for Oracle, HA

In the preceding architecture, we have shown multiple application servers deployed across Availability Zones for high availability. Some application tier nodes may reside in a subnet acting as a perimeter network (external applications) as part of customer-facing applications, such as Oracle Internet Expenses module within E-Business Suite.

You can enable [Application Load Balancer](#) (ALB) for both internal and external business users, and terminate SSL/TLS traffic at the ALB level. You can also incorporate an [AWS Web Application Firewall](#) (AWS WAF) for another layer of security to protect against common web exploits and bots that can effect availability, compromise security, or consume excessive resources.

You can use a [Amazon Elastic File System](#) (Amazon EFS), or [Amazon FSx NetApp ONTAP](#), which are highly redundant and fully managed filesystems for the application filesystem, shared across Availability Zones.

Lastly, to improve availability and achieve DR, you can provision a standby database instance in a different Region and use [AWS Backup](#) service to configure backup policies, and monitor backup or restore activity for AWS services like Amazon EC2, Amazon RDS Custom for Oracle, Amazon EBS, Amazon FSx and Amazon S3 all in one place. With a few clicks in the AWS Backup console, you can automate your data protection policies and schedules.

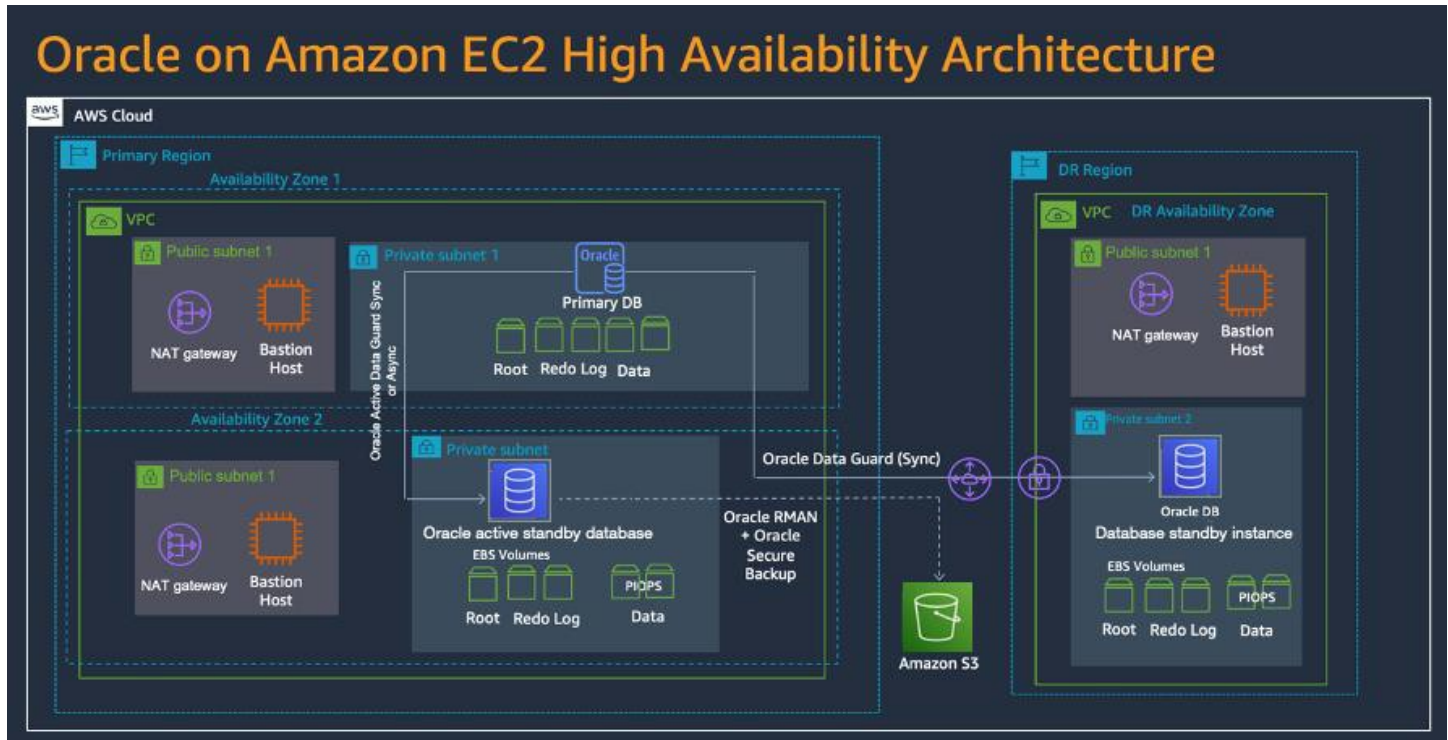
This paper now dives deeper into various database architectures for running Oracle E-Business Suite. You may choose different architectures for running Oracle Database, depending on the RTO, RPO, performance, and throughput requirements.

Oracle E-Business Suite database tier on Amazon RDS Custom for Oracle or Amazon EC2

Following is the deployment architecture for running Oracle database underlying Oracle E-Business Suite in an HA mode on [Amazon EC2](#), or [Amazon RDS Custom for Oracle](#) (RDS Custom). In this setup, there is a primary database instance running on Amazon EC2 or RDS Custom (Private subnet1/AZ1). You can select the compute or memory-optimized Amazon EC2/RDS Custom instance, depending on CPU and memory utilization metrics available as part of the migration assessment phase.

This instance may use [Amazon Elastic Block Store](#) (Amazon EBS) io1 volumes to provide the Provisioned IOPS (PIOPS). Amazon EBS volumes can be provisioned from 4GiB up to 16TiB. Each volume provides up to 64K I/O operations per second (IOPS). On the other side of the spectrum, AWS has io2 Block express volumes which can be from 4GiB to 64TiB per volume, with a maximum

of 256K IOPS per volume. You can optionally use Oracle Automatic Storage Management (ASM) for striping and mirroring to achieve more IOPS and throughput than supported by a single EBS volume and for the HA at the database storage layer. Amazon RDS Custom manages the striping automatically using Logical Volume Management (LVM) across four underlying Amazon EBS volumes.



Oracle on Amazon EC2/Amazon RDS Custom HA architecture

For additional availability and reporting offloading capability within the same Region, you can deploy another read-only standby database instance running on an Amazon EC2 instance in a different Availability Zone (private subnet2/Region1) using Oracle Active Data Guard. You can configure Parallel Concurrent Processing (PCP) for the Oracle E-Business Suite environment, and offload specific read-only reporting jobs to active standby database instances.

This can reduce the load on the primary instance, and make the resources available for transactions and other read/write jobs. Refer to [Oracle Support Note #2608030.1](#) (sign-in required) for more details. While improving HA architecture within an AWS Region, you can extend a read-only standby database to another Region for DR purposes.

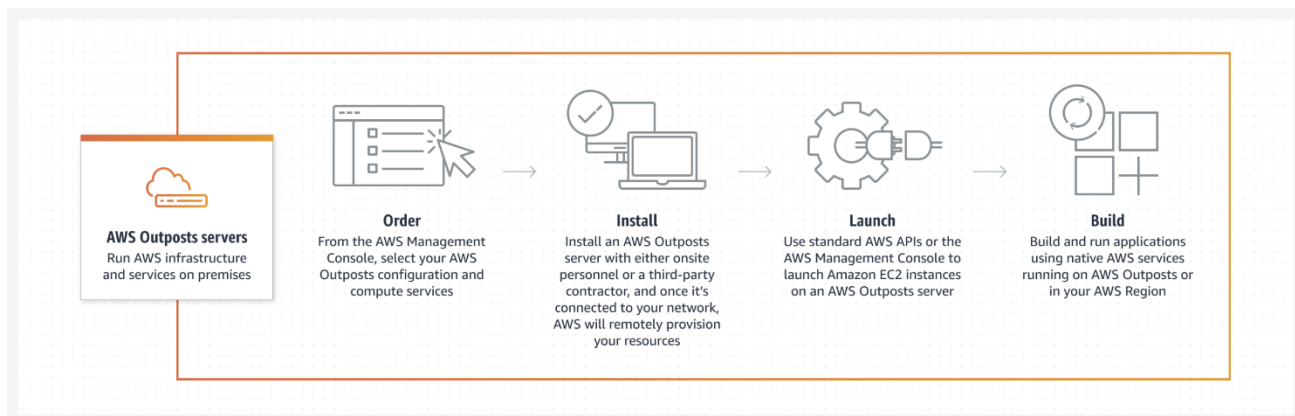
Cross-Region replication for database can be configured using Oracle Data Guard Physical Standby. Refer to [Oracle Support Note #1963472.1](#) - Business Continuity for Oracle E-Business Suite Release 12.2 Using Oracle 12c (12.1.0.2) Physical Standby Database for more details (sign-in required).

For 19c databases, refer to [Oracle Support Note #2617788.1](#) - Business Continuity for Oracle E-Business Suite Release 12.2 on Oracle Database 19c Using Logical Host Names

Migrating Oracle workloads to AWS Outposts

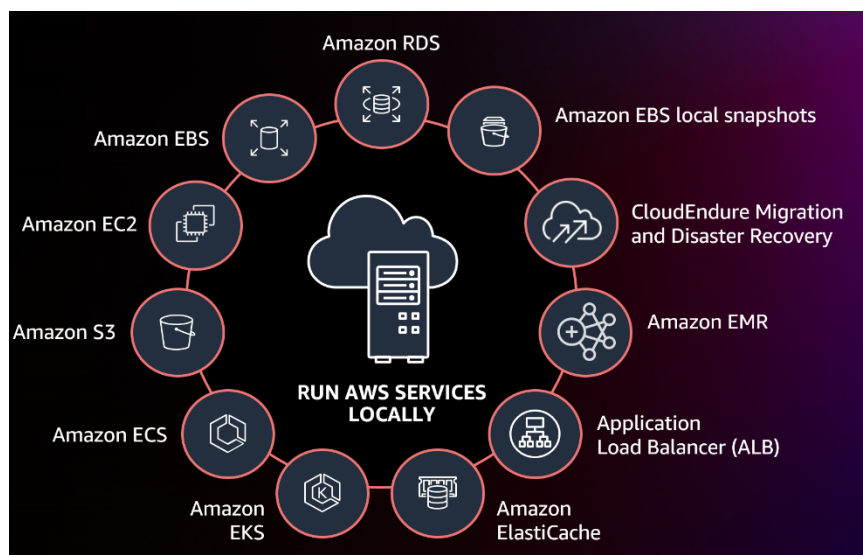
Customers with physical infrastructure investments like factories, manufacturing plants, warehouses and fulfillment centers often require ultra-low latency and high bandwidth between their local equipment and the ERP modules to ensure business continuity. Running Oracle E-Business Suite on [AWS Outposts](#) provides a viable hybrid cloud solution for ERP customers with ultra-low latency requirements, strict data residency requirements, or where there are no in-country regions. Using AWS Outposts, customers have the benefit of a fully-managed infrastructure with many core AWS services available in your data center, with seamless connection to a nearby AWS Region.

AWS Outposts are a family of fully managed solutions delivering AWS infrastructure and native services to on-premises or edge locations while providing a consistent hybrid cloud experience. AWS Outposts are available in a variety of form factors, from 1U and 2U Outposts servers to 42U Outposts racks, and multiple rack deployments.



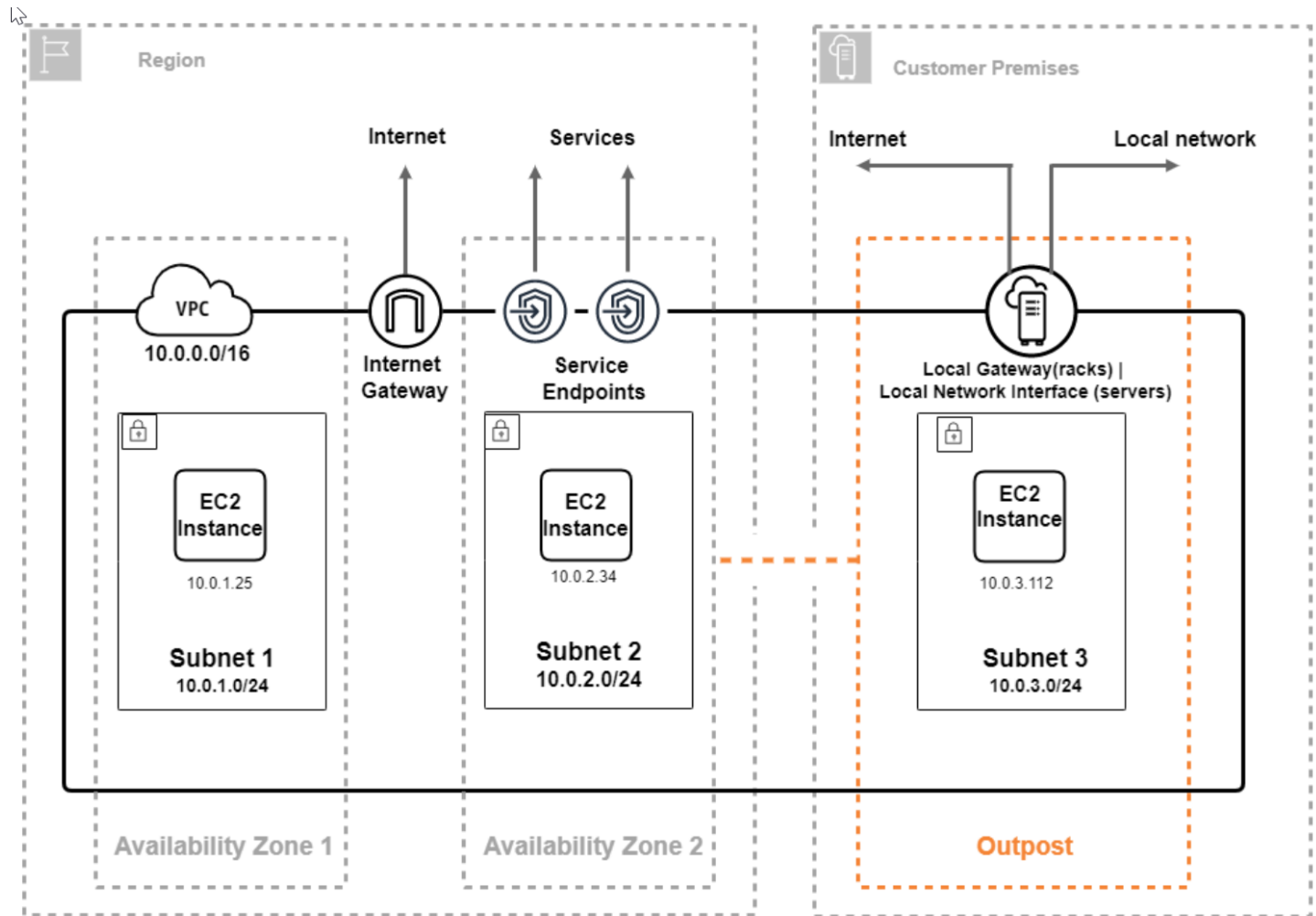
AWS Outposts

Many AWS services are locally available on Outposts, several of which (Amazon EC2, Amazon EBS, Application Load Balancer, and Amazon S3) are used in the following reference architecture for Oracle ERP on AWS Outposts. Outposts offers any-use EC2 instances for both database and application tier workloads.



Services on AWS Outposts

In addition to the locally offered services, because of the unique network model, EC2 instances on your Outpost can easily access in-region AWS services since the VPC spans both the region and Outpost. It may be convenient to visualize your Outpost as an additional AZ in your Region. Technically, the Outpost will be *attached* to one of the AZs and shares the VPC of the region. EC2 instances on your Outpost use AWS Nitro-based hardware virtualization that is consistent with in-region virtualization.



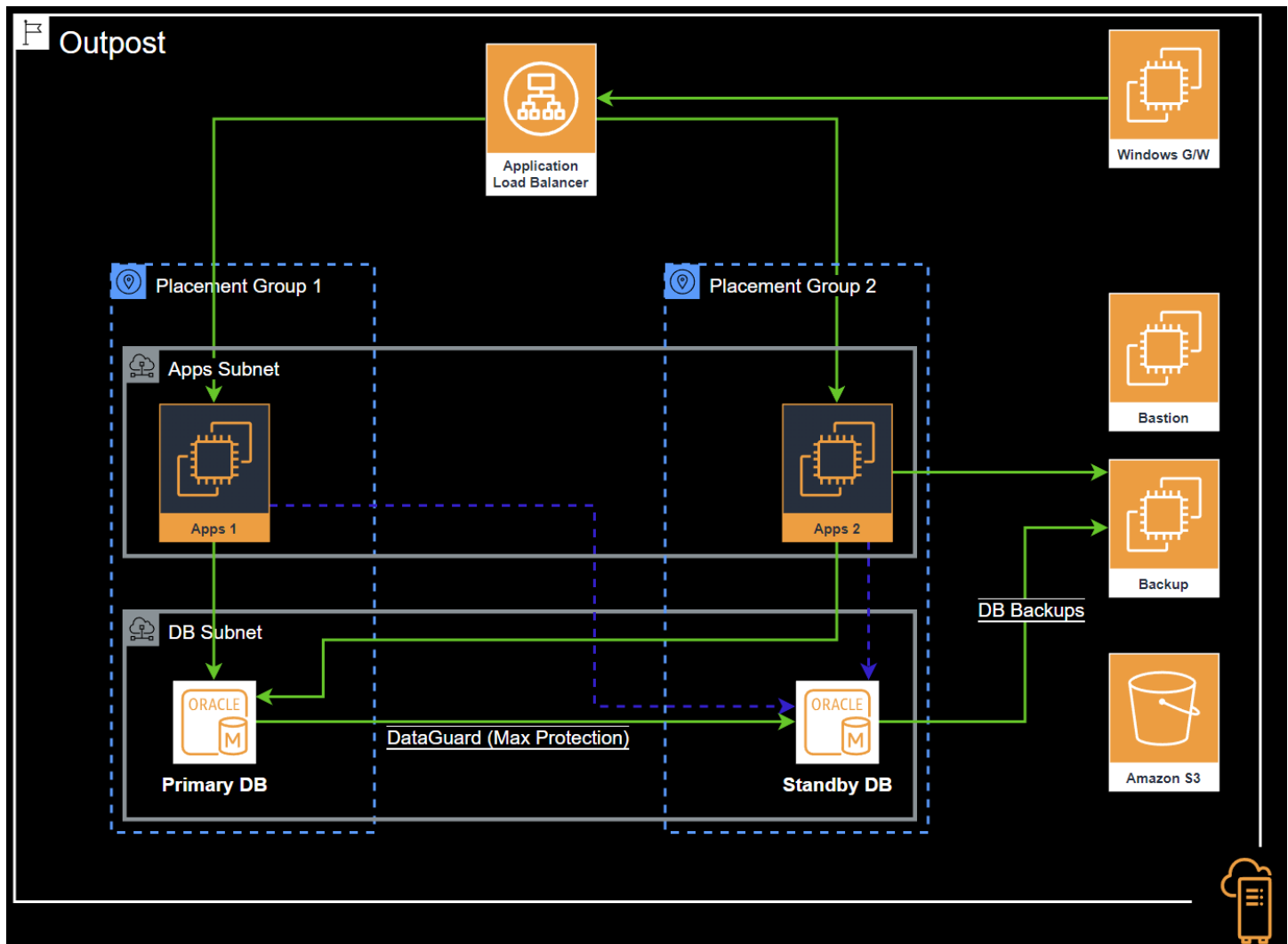
Deploying Oracle ERP on a single Outpost rack

The Oracle ERP on AWS Outposts reference architecture illustrates a deployment on a single Outpost rack. By using Placement Groups, EC2 instances for both the Application and Database tier reside on separate physical hardware hosts within the rack to protect against node failure.

The architecture can be enhanced to protect against rack failure by adding additional Outposts. These might be in the same on-premises DC or a nearby collocated facility. Uniquely, an HA or DR environment can be configured to run in-region on AWS.

An ALB (Application Load Balancer) fronts two application servers. An on-premises load-balancer might also be used to connect to the App tier through the local gateway. The database is protected with Data Guard (Max Protection mode). Synchronous replication to the standby database on the Outpost is viable due to ultra-low latencies ensuring zero data loss in the event of a node failure. Cascading standby databases to in-region EC2 instances are possible and indeed recommended.

Backups to Amazon EBS, local Amazon S3 or in-region Amazon S3 are recommended to augment the DR configuration.

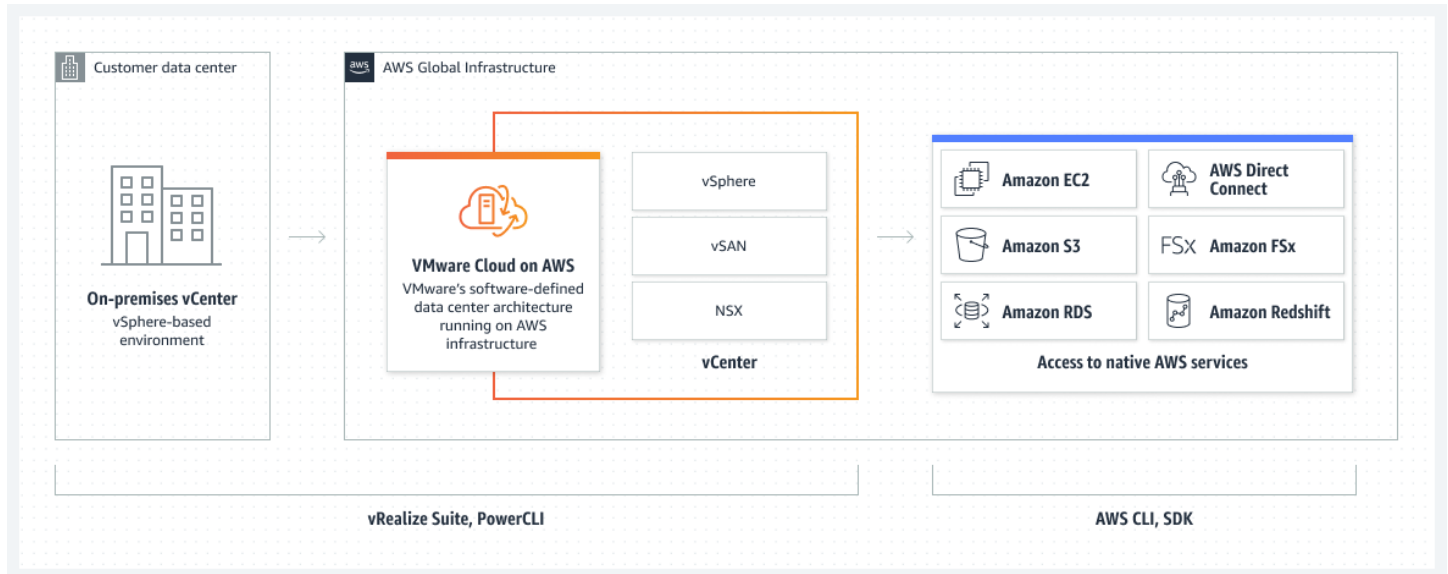


Using Application Load Balancers

The migration methodologies to EC2 instances discussed previously are applicable to AWS Outposts. Due to the likely physical proximity to the current on-premises Oracle E-Business Suite environments, the migration will likely be accelerated due to higher data transfer bandwidth available on the local network.

Migrating Oracle workloads to VMware Cloud on AWS

VMware Cloud on AWS is an integrated cloud offering jointly developed by AWS and VMware. You can deliver a highly scalable and secure service by migrating and extending your on-premises VMware vSphere-based environments to the AWS Cloud running on Amazon Elastic Compute Cloud (Amazon EC2)



Using VMware Cloud on AWS

VMware Cloud on AWS supports several ways to migrate your workload VMs from your on-premises hosts to the ones in your Software Defined Data Centre (SDDC) and back again, as well as across hosts in your SDDC. The method you choose should be based on your tolerance for workload VM downtime, the number of VMs you need to move, and your on-premises networking configuration.

Hybrid Migration

Hybrid migration refers to migrating virtual machines between two different vSphere installations: one that's in your on-premises data center and another that's in your VMware Cloud on AWS SDDC. Because these two vSphere installations might have different versions, configurations, or both, hybrid migration use cases typically carry additional prerequisites and configuration that ensure both compatibility of the virtual machines and appropriate network bandwidth and latency. VMware Cloud on AWS supports a variety of tools and methods for hybrid migration.

- [Hybrid Migration With VMware HCX](#) VMware HCX, a multi-cloud app mobility solution, is provided free to all SDDCs and facilitates migration of workload VMs from your on-premises data center to your SDDC.
- [Hybrid Migration with vMotion](#) Migration with vMotion, also known as hot migration or live migration, moves a powered-on VM from one host or datastore to another. Migration with vMotion is the best option for migrating small numbers of VMs without incurring any downtime.
- [Hybrid Cold Migration](#) Cold migration moves powered-off VMs from one host or datastore to another. Cold migration is a good option when you can tolerate some VM downtime during the migration process.

Migrate using VMware HCX

This pattern describes the use of VMware Hybrid Cloud Extension (HCX) to migrate your on-premises virtual machines (VMs) and applications to VMware Cloud on Amazon Web Services (AWS). The migration uses VMware enterprise-class software-defined data center (SDDC) software on the AWS Cloud to provide optimized access to AWS services.

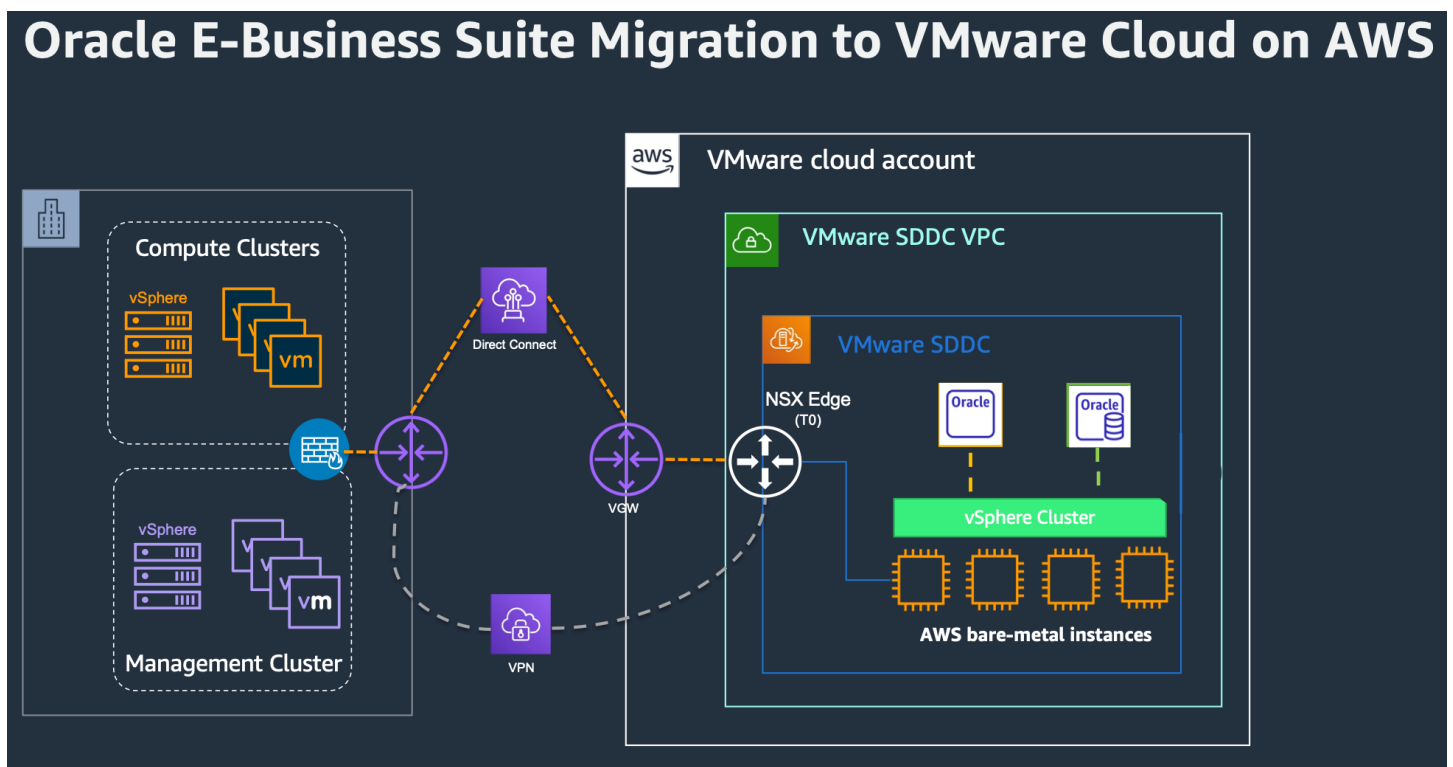
VMware Cloud on AWS integrates compute, storage, and network virtualization products (vSphere, vSAN, and VMware NSX) with VMware vCenter server management, which is optimized to run on dedicated, elastic, bare-metal AWS infrastructure. The resulting infrastructure is low-maintenance, simplified, and hyper-converged. With this service, IT teams can manage their cloud-based resources with familiar VMware tools. For more information, see [VMware Cloud on AWS](#) on the VMware website.

VMware HCX supports three types of cloud migrations:

- **Hybridity (data center extension):** Extending an existing, on-premises VMware SDDC to AWS to provide footprint expansion, on-demand capacity, a testing/development environment, and virtual desktops.
- **Cloud evacuation (data center-wide infrastructure refresh):** Consolidating data centers and moving completely to the AWS Cloud (including handling data center co-location or end of lease).
- **Application-specific:** Moving individual applications to the AWS Cloud to meet specific business needs.

Following is the deployment architecture for migrating Oracle VMs from on-premises data centers to VMware Cloud on AWS. This migration is done without making any changes to the operating system, Oracle applications, or the databases.

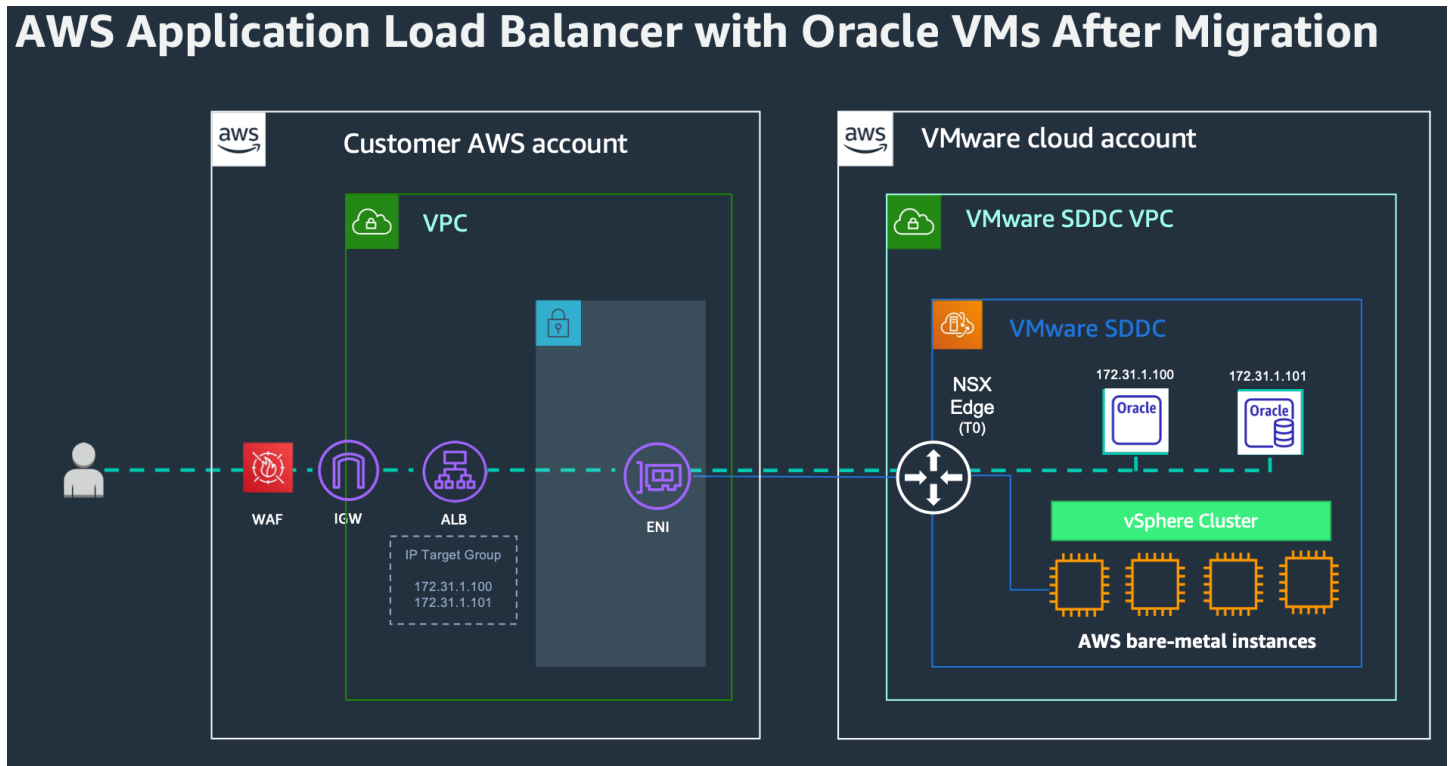
In this setup, the on-premises data center can be connected to the VMware Cloud on AWS environment using DX or IPsec VPN and the actual migrations are performed using VMware HCX



Oracle E-Business Suite Migration on VMWare Cloud on AWS

Connect to workloads on VMware Cloud using Application Load Balancers

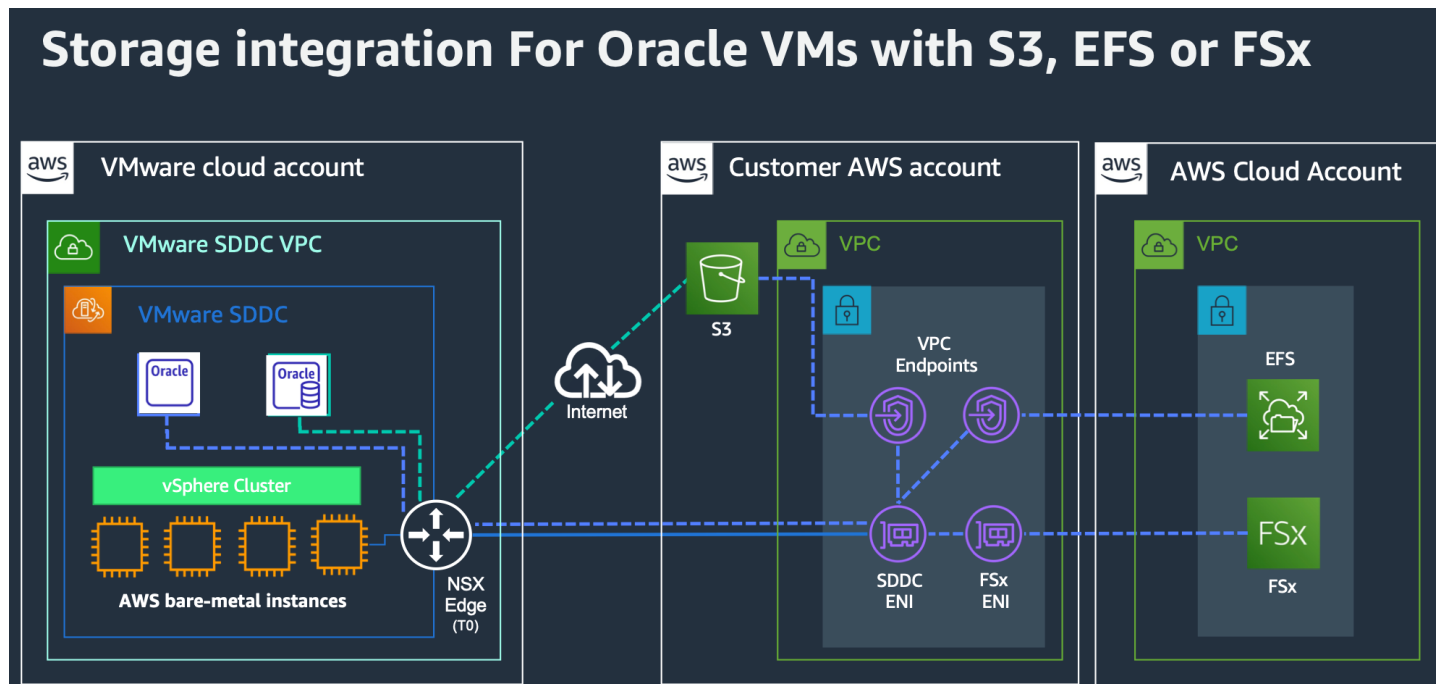
Once the migration is completed, the Oracle E-Business Suite can be accessed using Application Load Balancers and protected using AWS WAF. The VMware Cloud on AWS environment is connected to the Application Load Balancer and AWS WAF using a private ENI.



AWS Application Load Balancer with Oracle VMs after migration

Expand storage using AWS Storage Services

If more storage is needed for the Oracle E-Business Suite application and databases, it can be obtained from the different AWS storage services.



Storage integration for Oracle VMs with Amazon S3, Amazon EFS. and Amazon FSx

Migrating Oracle E-Business Suite to the same operating system

This section describes migrating Oracle E-Business Suite to the same operating system.

Topics

- [Oracle E-Business Suite migration using Rapid Clone and Smart Clone \(homogeneous - same OS\)](#)
- [Database migration tools](#)
- [Migrating Oracle E-Business Suite using AWS Transform MGN](#)

Oracle E-Business Suite migration using Rapid Clone and Smart Clone (homogeneous - same OS)

Migration using Rapid Clone

If the source and target OS for Oracle E-Business Suite migration are the same platform, you can make use of the Oracle Rapid Clone tool to migrate their database to AWS.

Note

Cloning from a later version of an OS to an earlier one is not supported.

Rapid Clone does not modify the source system. The `adpreclone.pl` script prepares the source system to be cloned by collecting information about the app-tier, database- tier, and by creating generic templates from existing files that contain source-specific hardcoded values.

After running `adpreclone.pl`, you copy the relevant files and directories from the source system files to the target system, and then run the `adcfgclone.pl` configuration script. The values for various parameters are required to create the context file that will be used to configure the target system. A few of these values are calculated from the current target system, and `adcfgclone.pl` will prompt for the others.

For migrating Oracle E-Business Suite using Rapid Clone, refer to [Oracle Support Note #1383621.1](#) - Cloning Oracle E-Business Suite Release 12.2 with Rapid Clone (sign-in required).

Migration using Smart Clone

Oracle Application Management Pack for Oracle E-Business Suite also provides the ability to clone an Oracle E-Business Suite system automatically using the Oracle Smart Clone procedure. Smart Clone expects, as a prerequisite, the target Oracle E-Business Suite database to be cloned and discovered in the Enterprise Manager. Smart Clone starts with taking the discovered target database as an input to configure a database target and then clones the applications tier of the source instance. It then applies that to the target Oracle E-Business Suite system.

For more information on the Smart Clone procedure for migrating Oracle E-Business Suite, refer to [Cloning an Oracle E-Business Suite System](#).

Whether using Rapid Clone or Smart Clone, you can migrate the data from source to target using either Oracle RMAN, Data Guard, Data Pump, Transportable Tablespaces, or by directly copying the data files from the target database depending on the downtime available.

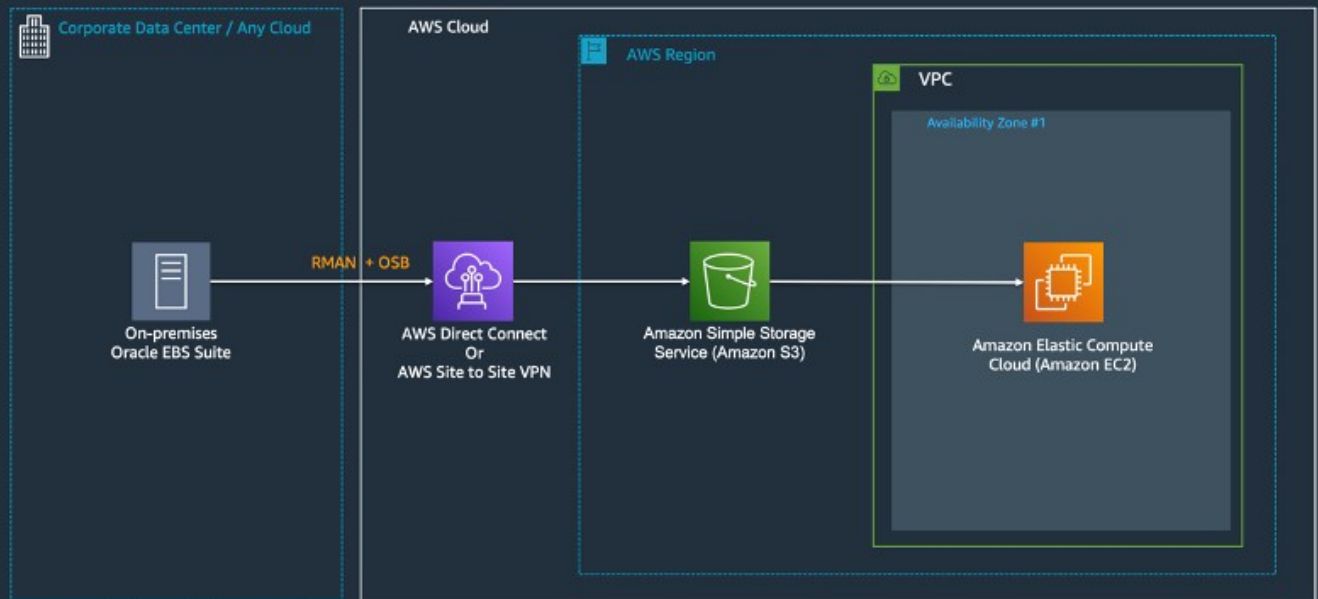
Database migration tools

Various database migration techniques previously mentioned are briefly discussed here.

Oracle RMAN backup and restore

RMAN is a backup/restore tool for Oracle database. The Oracle Secure Backup (OSB) plugin allows you to copy your backup directly to Amazon S3 and restore it to an Amazon EC2, or RDS Custom instance. Refer the following figure.

Oracle RMAN Backup and Restore



Oracle RMAN backup and restore

Oracle Data Guard

Oracle Data Guard is a feature used for HA and DR of Oracle databases. This is achieved by setting up a standby database instance in the same or different location, and mirroring the changes from the primary database instance to a standby instance in synchronous or asynchronous mode. Oracle Data Guard can also be used for database migrations. You can set up an Oracle Data Guard standby database for your on-premises or co-location Oracle instance on Amazon EC2 or Amazon RDS Custom.

Data Guard standby is synchronized, effectively mirroring the live database on the new instance running on Amazon EC2, or RDS Custom. Lastly, a switchover to the new database instance can be performed during a suitable maintenance window. It is recommended to have a dedicated bandwidth between on-premises or co-location to the AWS Cloud through [AWS Direct Connect](#).

Oracle Data Pump

The Data Pump utilities allow you to move existing data in Oracle format to and from Oracle databases. For example, Data Pump export files can move data among different Oracle databases

that run on the same or different OSs. This is a logical replication (data is extracted and imported into target), so it can be used for homogeneous as well as heterogeneous database migrations.

For migrating Oracle E-Business Suite using Oracle Data Pump, refer to the [Oracle Support Note #1926203.1](#) - Export/Import Process for Oracle E-Business Suite 12.2 Using Oracle Database 12c (sign-in required). Similar notes exist for other database versions.

Logical Hostnames

To reduce the number of migration steps, it's recommended to use logical hostnames to reduce the complexity of the migration process. This is also useful for DR purposes. For information about the advantages of using logical hostnames, see the following support notes (sign-in required):

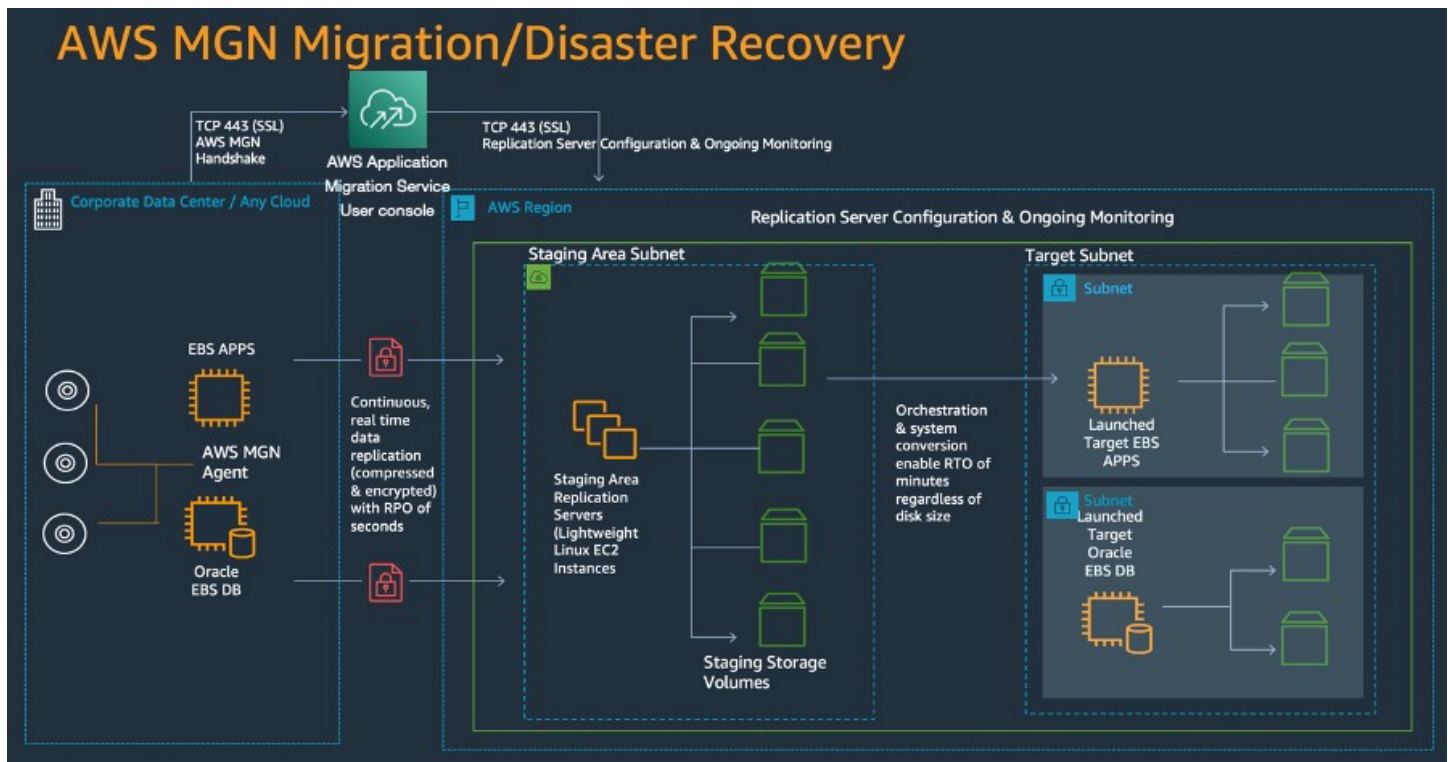
- For 12c, Oracle Support Note [2246690.1](#)
- For 19c, Oracle Support Note [2617788.1](#)

Oracle transportable tablespaces

The Oracle transportable tablespace feature enables you to move a set of tablespaces from one Oracle database to another. To move or copy a set of tablespaces, you must make the tablespaces read-only, copy the data files of these tablespaces, and use Export and Import to move the database information (metadata) stored in the data dictionary. After copying the data files and exporting the metadata, you can optionally put the tablespaces in read/write mode.

Migrating Oracle E-Business Suite using AWS Transform MGN

[AWS Transform MGN](#) (AWS MGN) is a migration and replication tool available from AWS which can be used for migrating the applications as well as for setting up DR environments on AWS. It works by migrating or replicating the blocks of storage devices from source to target. Because it operates at the block level, it can migrate various workloads, including enterprise resource planning (ERP) applications from virtual machines (VMs), cloud, or physical data center. AWS MGN supports migration from any OS to AWS. Following is an architecture showing various components of AWS MGN and how they work together to migrate workloads on AWS.



AWS MGN migration or disaster recovery

The AWS MGN orchestration engine automatically launches a fully operational Oracle E-Business Suite environment in the target AWS Region, enabling a recovery time objective (RTO) of minutes. The AWS MGN automated machine conversion process takes approximately 30 seconds, and ensures that OS machines replicated from physical, virtual, and cloud-based infrastructure will natively boot and run transparently in AWS, by automatically handling all hypervisor and OS configuration changes, boot process changes, and OS activation and installation of target infrastructure guest agents.

Major steps involved in migrating Oracle E-Business Suite environment using AWS MGN are as follows:

1. Identify the list of servers to be migrated by name, and break down the list to migration waves.
2. Install the AWS MGN software agents on the selected servers to initiate replication and confirm replication progress within the AWS MGN console.
3. Assess source Oracle E-Business Suite network to plan the network creation in the target infrastructure.
4. Create the target network within the target infrastructure of choice.

5. Once server replication is complete, create test target machines using the AWS MGN dashboard and confirm that they are functioning and accessible.
6. Upon confirmation of the successful target machines launch, engage with the business/application owners for Oracle E-Business Suite acceptance tests. If corrections are required, modify the target blueprints accordingly and repeat this step. If the acceptance tests are completed successfully, proceed to cutover.
7. Cutover procedure:
 - a. Schedule a migration cutover window.
 - b. Prevent user connectivity to the source Oracle E-Business Suite environment.
 - c. Create a final version of the target machines.
 - d. Confirm Oracle E-Business Suite application readiness.
 - e. Redirect user traffic to the new target machines.
 - f. Stop the AWS MGN replication on the source servers that were cutover, and decommission them.

Notes:

- For the database tier, use of Oracle native tools outlined in this document is recommended rather than AWS MGN.
- If you're using Oracle ASM or Oracle ASM Filter Driver, refer to [Can Application Migration Service replicate Oracle ASM?](#) in the [Application Migration Service whitepaper](#).
- If you are using Oracle ASM, note the EC2 volume limits by EC2 instance family at [Linux-specific volume limits](#).

Migrating for Oracle E-Business Suite across operating systems (same endian format)

For some customers, it may be the case that source and target platforms are [little endian](#), but OSs might be different. For example, RedHat Linux to SUSE Linux. In such cases, cloning utilities such as Rapid Clone and Smart Clone can't be used. Rather, this would be considered as a "platform" migration. In such scenarios, you can still use the Oracle database tools such as Oracle RMAN, Oracle Data Guard, Oracle Transportable Tablespaces, and so on for migration, but you will need to install a new application tier using the Rapid Install utility and configure it as a target.

This approach is mentioned in the following Oracle Support Notes (sign-in required):

- [2048954.1](#) - Application Tier Platform Migration with Oracle E-Business Suite Release 12.2
- [2011169.1](#) - Transportable Databases for Oracle E-Business Suite Release 12.2

Transportable Database is the fastest way to migrate data between two platforms, because the process is fundamentally one of copying database files and then using Recovery Manager (RMAN) to convert data files (using the RMAN `convert database` command). The E-Business Suite Transportable Databases process for migration does, however, require that the source and target database be of the same release and patchset version.

Migrating Oracle E-Business Suite across platforms (different Endian format)

For some customers, it might be the case that the source and target platforms have a different endian format.

Oracle E-Business Suite cross-platform migration using Oracle Transportable Tablespaces

Application tier migration

Cross-platform migration of Oracle E-Business Suite application tier is detailed in the Oracle Support Notes that follow.

Cross-platform migration of Oracle E-Business Suite application tier process (high level):

1. Prepare source and target systems for migration.
2. Run `adpreclone.pl` on the source system.
3. Generate a customer-specific manifest file and upload to the [MyOracleSupport](#) website.
4. Copy `APPL_TOP`, `COMMON_TOP/java`, `COMMON_TOP/webapps`, and so on to the target.
5. Copy the source context file to the target.
6. Generate the target context file using the pairs file and source context file on the target.
7. Run Rapid Install Wizard with `-techstack` option to install technology components.
8. Run AutoConfig on the target.
9. Apply customer-specific patches (obtained from the manifest upload procedure).
10. Review components and technology stack patchset level.
11. Regenerate file system objects.
12. Clean nodes.
13. Run AutoConfig.
14. Update printer and workflow settings.
15. Start all services on the target.

For details, refer to [Oracle Support Note #2048954.1](#) (sign-in required).

Database migration

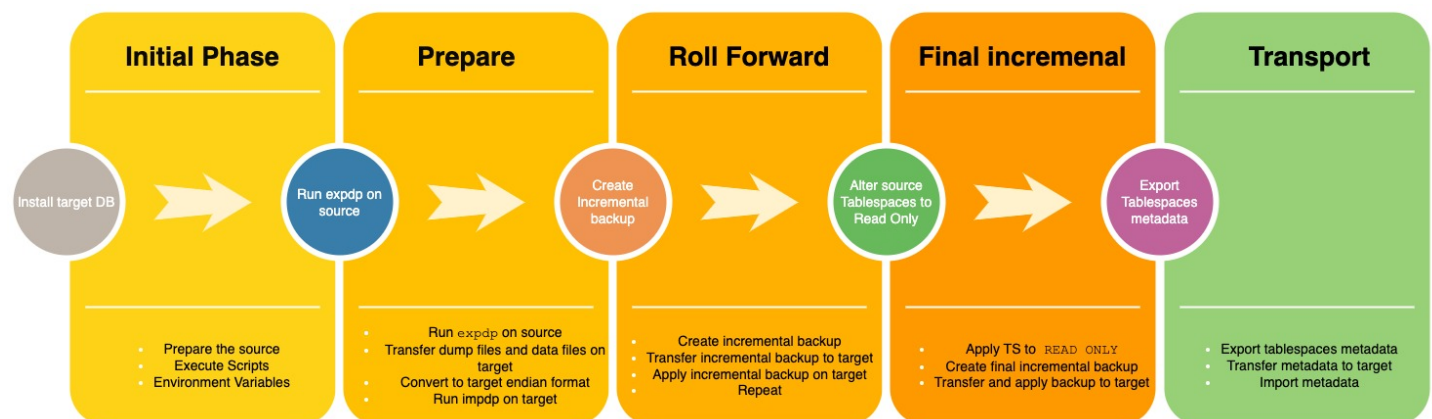
Transportable Tablespaces is an Oracle database feature that provides a faster way to move bulk data from one database to another, independent of the OS of the source and target. The Cross-Platform Transportable Tablespaces (XTTS) provides functionality in distributing data and database migration specifically across platforms of different endian (byte-ordering) formats.

This migration method is particularly suited for very large databases where the relative size of metadata is small compared to the data.

Refer to [Oracle Support Note #2674405.1](#) - Using Transportable Tablespaces to Migrate Oracle E-Business Suite Release 12.2 Using Oracle Database 19c Enterprise Edition. (sign-in required) This note also contains the procedure to migrate the Application tier.

You can also perform incremental data transfer using Oracle Transportable Tablespace. For details, refer to [Oracle Support Note #2471245.1](#) - Reduce Transportable Tablespace Downtime using Cross-Platform Incremental Backup (sign-in required).

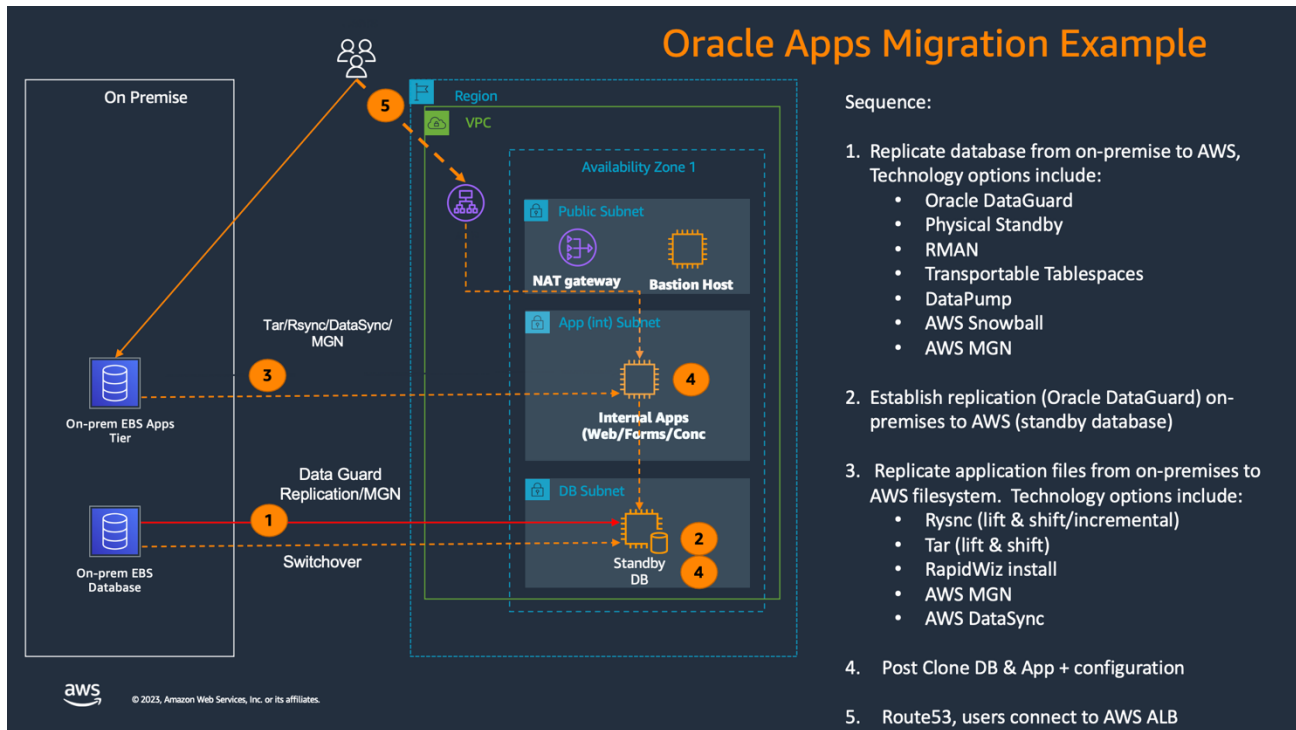
Incremental backup is supported only for the same platforms, and from big endian platforms to Linux OS only. Following is the typical flow for migration using incremental backups when using XTTS.



Typical flow for migration using incremental backups using XTTS

Migration patterns and architectures

This section describes, at a high level, how corporate on-premises customers can migrate Oracle E-Business Suite to the AWS Cloud.



Representative Oracle E-Business Suite migration approach

Sequence:

1. Replicate database from on-premises to Clone database. Technology options include:
 - Oracle Data Guard
 - Physical Standby
 - RMAN
 - Transportable Tablespaces
 - DataPump
 - [AWS Snowball Edge](#)
 - [AWS Transform MGN](#)
2. Establish replication from on premises to AWS
3. Replicate application files from on-premises to AWS filesystem. For shared filesystem, options include Amazon EFS, or FSx NetApp ONTAP.

Technology options include:

- rsync (lift and shift / incremental)
 - tar (lift and shift)
 - Fresh Rapidwiz install
 - AWS Transform MGN
 - AWS DataSync
4. Configure target database and application with PostClone and Autoconfig
 5. DNS Configuration (Amazon Route 53) switching users to Application Load Balancer

Considerations for running Oracle E-Business Suite on AWS

There are a number of considerations for running Oracle E-Business Suite on AWS.

Sizing

It is important to right size the Oracle E-Business Suite environment while migrating to AWS, because it can save on infrastructure costs and licensing. Right sizing also gives your business users adequate performance from Oracle E-Business Suite on the cloud.

Migration to the cloud is also an opportunity to fix long-term outstanding issues that you might be having in your current Oracle E-Business Suite environment. Following are a few questions that you should ask your IT team when sizing Oracle E-Business Suite on AWS.

- When are the peak periods of usage? (such as period close, batch data load, and so on.)
- What is the pattern of load and spikes on the system? Is it due to transactional or batch load?
- What is the number of named and concurrent users in the source system and their usage profile?
- How much business data has to be retained in the system online?
- What is the percentage of storage growth year-over-year?
- How many reporting jobs are there? Can those be offloaded to a read-only standby database created using Oracle Active Data Guard?
- What is the response time requirement from the system?
- What are the workload requirements from a storage perspective, in terms of peak and average IOPS and throughput?
- Are there any outliers in terms of jobs/concurrent programs – especially customizations that are causing unnecessary high peaks, and are candidates for tuning?

Getting answers to these questions will help you right size your Oracle E-Business Suite instance, and allow selection of the right deployment topology.

Throughput requirements

Throughput is another important factor when selecting the compute for the database-tier instance. Throughput determines how much data can be read or written to the disk per second by the compute OS. Consider measuring throughput during events such as period end close while multiple concurrent batch jobs are performing intensive read and write operations.

For Oracle RAC workloads, you will have to combine the throughput from all RAC instances when moving to non-RAC based deployment on AWS. Customers can select from a variety of compute instance and storage types that provide highly optimized levels of IOPS and throughput.

Integrations with on-premises services

When migrating Oracle E-Business Suite on AWS, you may have the following integration services:

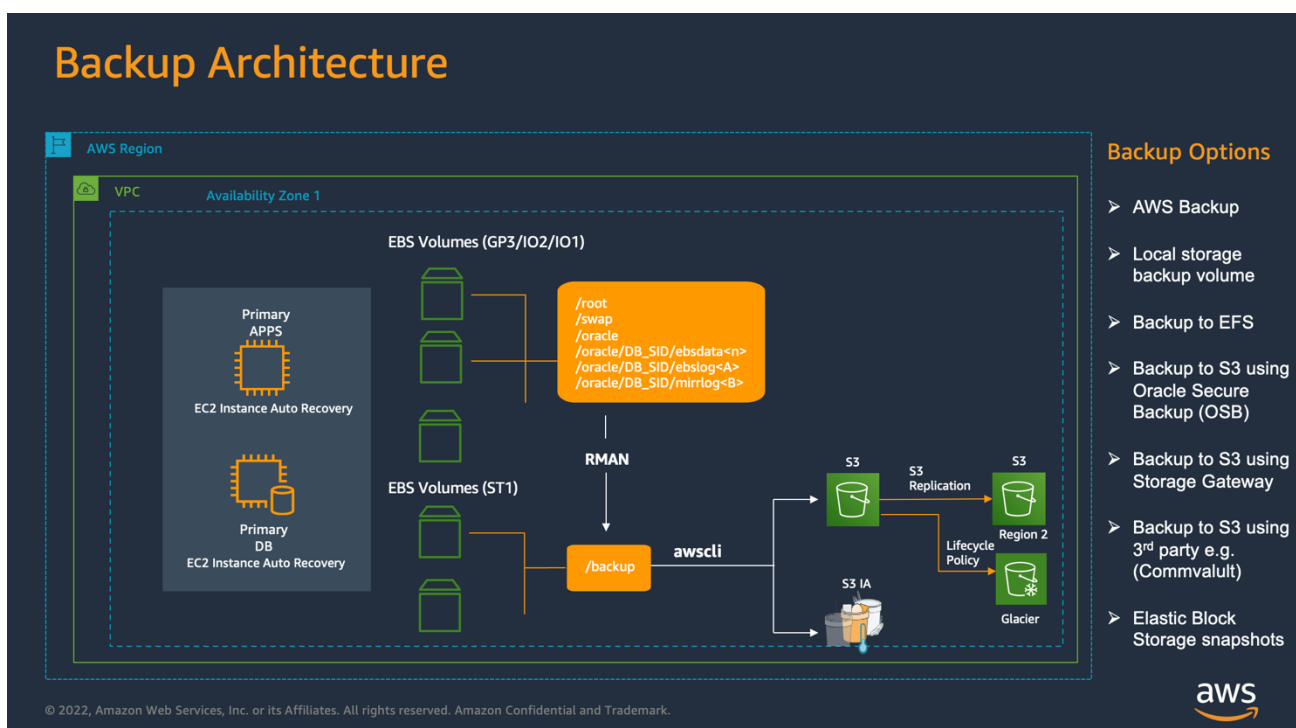
- Single sign-on
 - Enterprise-wide single sign-on with Microsoft Active Directory
 - Integration with [Okta](#)
- Microsoft SharePoint
- Oracle E-Business Suite B2B integration using file-based transfers, such as FTP and HTTP.
- Integrating with CRM/ERP systems such as Salesforce and SAP.
- Message queue-based integration using [Apache Kafka](#), [IBM MQ](#), and so on with Oracle E-Business Suite.

Consider the effort involved in services integration, and follow relevant support articles from [MyOracleSupport](#) to integrate with these applications and third-party services.

Backups and disaster recovery (DR) - Oracle E-Business Suite application and database on AWS

Backup and recovery

AWS recommends implementing a robust and reliable backup and recovery procedure as part of customers build on AWS. Backup and restore policies differ between organizations, which is typically dictated based on the RPO and RTO requirements. The following are some of the options available to customers:



Backup architecture options

AWS Backup, a fully managed backup and recovery service that integrates with AWS services such as Amazon EC2, Amazon FSx, Amazon EFS, Amazon EBS, and Amazon S3

- RMAN backup weekly full (level 0)
- RMAN daily incremental, with block change tracking enabled
- RMAN + OSB > Amazon S3 + intelligent tiering > Amazon Glacier
- Frequent restore testing using "RMAN restore database check logical"

- AWS managed file and object services (Amazon S3, Amazon EFS, Amazon FSx family, Storage Gateway)
- Tiering capabilities built into AWS storage services, object, file, and block
- Backup capabilities, AWS and third-party agent-based tools, such as Commvault, and Veritas.

[AWS Backup](#), fully managed backup and recovery service which integrates with AWS services such as Amazon EC2, Amazon FSx Amazon EFS, Amazon EBS, Amazon S3, and many more

AWS recommends a *belts and braces* approach to backing up Oracle E-Business Suite, as there is benefit in having more than one restore point in the event of a disaster. AWS recommend documenting and testing backups regularly to ensure they are working as expected.

Disaster recovery (DR)

There are a number of options for implementing DR for Oracle E-Business Suite on AWS.

[AWS Elastic Disaster Recovery](#) is an alternative to using Oracle native tools for DR, which works at the block level and can achieve a relatively low-cost DR alternative, which can meet extremely low RPO and RTO requirements. This solution simplifies the DR solution for our customers by removing the complexity of configuring, managing and invoking a DR for these highly complexity Oracle E-Business Suite systems.

[Amazon EFS replication](#), You can use Amazon EFS replication to create a replica of your application file system in the AWS Region of your preference. When you enable replication on an EFS file system, Amazon EFS automatically and transparently replicates the data and metadata on the source file system to a new destination EFS file system. To manage the process of creating the destination file system and keeping it synced with the source file system, Amazon EFS uses a *replication configuration*.

Amazon EFS automatically keeps the source and destination file systems synchronized. Amazon EFS replication is continual and designed to provide a recovery point objective (RPO) and a recovery time objective (RTO) of minutes. These features should assist you in meeting your compliance and business continuity goals.

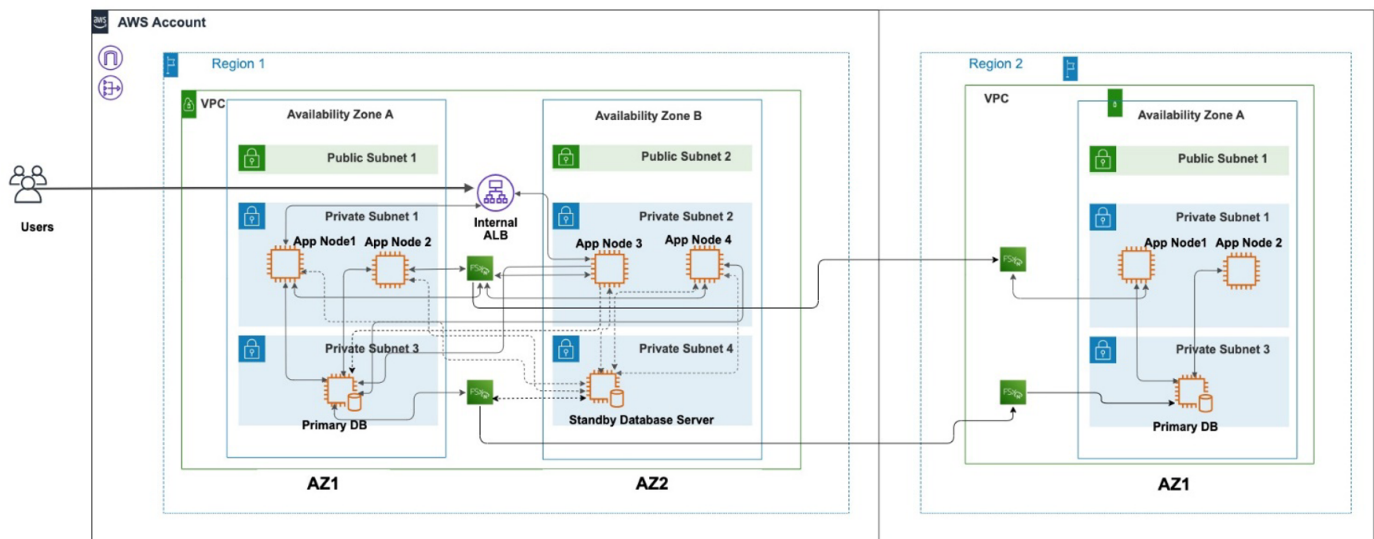
[Amazon FSx for NetApp ONTAP supports NetApp SnapMirror](#), a replication technology that you can use to replicate data between two ONTAP file systems. You can configure automatic NetApp SnapMirror replication of your application file system to another Amazon FSx for NetApp ONTAP file system in another AWS Region. With SnapMirror, you can configure replication with a recovery

point objective (RPO) of as low as five minutes, and a recovery time objective (RTO) in single-digit minutes.

The following architecture represents an Oracle E-Business Suite implementation using Amazon FSx for NetApp ONTAP as the database and application storage layer. The database layer, Region 1, Availability Zone B and Region 2, Availability Zone A are passive, which means the FSx storage (containing the Oracle binaries and data files) is mounted during a failover or switchover operation. This is a potentially efficient way of providing low RPO and RTO with a reduction on licenses. Cloning to lower environments is also fast using SnapClone, which is particularly useful for large multi-terabyte databases, where AWS Snapshot or RMAN restores could take longer.

AWS does not provide licensing advice. We highly recommend that you consult with an Oracle licensing specialist to provide recommendations based on your environment.

EBS Architecture - Storage replication - FSxN



Oracle E-Business Suite Architecture – Storage replication with Amazon FSx for NetApp ONTAP

This architecture could provide the following benefits:

- Binaries and data files stored on Amazon FSx, potentially saving on licenses
- Ability to clone environments quickly using [FlexClone](#)
- Ability to sync to another availability zone using [SnapMirror](#)
- Low RPO, RTO, or both

Best practices for migrating Oracle E-Business Suite on AWS

Proof of concept

After you perform the migration assessment, identify the migration path, and design the target architecture for running Oracle E-Business Suite on AWS, it is important to perform a proof of concept (PoC). Note all the required input and output parameters.

Migrate versus upgrade

For homogeneous migrations, you can either upgrade your Oracle E-Business Suite on-premises first and then perform the migration as a separate step, or perform the migration and the upgrade at the same time in AWS. This decision differs per customer dependent on their use case, both are viable options.

If you are only doing homogeneous migration and do not want to upgrade, you can directly migrate your Oracle E-Business Suite environment to AWS.

For heterogeneous/cross-platform migrations, you can perform re-platforming and migrations at once. Do however expect a longer cutover window since this requires a [Oracle Rapid Install](#) application tech stack install and database platform conversion. Once migrated to the cloud, you can later upgrade to the latest Oracle E-Business Suite version.

DB tier and app-tier

Due to latency considerations and integration issues, AWS recommends that you perform database tier and application tier migration at the same time.

Identification of read-only workloads

If you haven't done this for your on-premises environment, AWS recommends that you identify the read-only workloads such as reports, batch jobs, and ETL jobs, and use Oracle Active Data Guard read-only standby for offloading the read-only workload. This allows you to scale the environment and serve transactional workloads with optimal performance.

AWS native services for customizations

Customers often develop custom user interfaces and APIs on top of Oracle E-Business Suite functionality for their business-specific requirements. Although Oracle E-Business Suite has all the underlying technical infrastructure available for building and hosting custom UI, AWS recommends that customers make use of AWS services such as [AWS Elastic Beanstalk](#), [AWS Lambda](#), [Amazon AppFlow](#), [AWS Glue](#), and so on for UI development and data integration. This approach helps customers reduce the load on Oracle E-Business Suite environment, and helps achieve agility and CI/CD adoption.

You can also build solutions such as serverless data lakes and machine learning (ML) solutions on AWS surrounding your ERP systems such as Oracle E-Business Suite to analyze data, generate insights, and for predictions.

Right stakeholders in the discussion

It is important to engage the right stakeholders throughout the process. In AWS discussions with customers, AWS engaged personas such as Head of IT, database administrators (DBAs), and Chief Information Officers (CIOs). When working with AWS teams, it is also helpful to set up deep dive technical discussions in the form of workshops. Also bring everyone on the same page in terms of current skills in the team, implementation timelines, and post-migration activities.

Conclusion

This whitepaper covered various approaches for migrating Oracle E-Business Suite on AWS. The approach varies depending on the current OS platform and OS on AWS. It also covered advanced architectures for running Oracle E-Business Suite on AWS. However, this is not the only way. You can have variations depending on the volume, performance SLAs, and integrations with other systems. Finally, it covered the considerations and best practices that you should follow for smooth experience while migrating to AWS.

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Change	Description	Date
Whitepaper updated	Updated to include AWS Outposts, Amazon FSx filesystems, Oracle RDS Custom for Oracle, and VMware to VMC migration patterns.	July 27, 2023
Whitepaper updated	Updated architectural patterns, added migration utility AWS Transform MGN (AWS MGN), described integration with on-premises services requirements.	May 11, 2022
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AWS Glossary

For the latest AWS terminology, see the [AWS glossary](#) in the *AWS Glossary Reference*.