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E-Business Suite on Oracle Cloud Infrastructure

Validated Solution Guide

October 24, 2019

Purpose statement

This validated solution guide provides an overview of procedures, supporting services, reference architectures, and the business benefits you can gain when you move EBS to Oracle Cloud Infrastructure. It is intended solely to help you assess the business benefits of migrating EBS to Oracle Cloud Infrastructure and to plan your IT projects.

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Solution Overview

Audience and Business Problem Being Solved

As companies began to adopt cloud solutions, some workloads moved quickly and easily, demonstrating the elasticity and agility of the cloud. But that wasn't true for all workloads. Many companies found it difficult to move core business applications which presented additional challenges, and tight requirements around predictable performance, security, and control.

This validated solution guide will explain the approach we recommend for moving Oracle E-Business Suite from your current on- premises deployment to Oracle Cloud Infrastructure. The guide was created based on prior experience successfully migrating customer environments. It addresses the key implementation concerns, technical requirements and existing business challenges that need to be addressed as part of the migration.

In addition, it summarizes the supporting cloud services, third-party integrations, and best deployment practices that can best align with your application environment and requirements. It provides reference architectures across several use cases that have been validated by prior successful deployments

If you're reading this, your organization is probably already using Oracle E-Business Suite for order management, procurement, manufacturing, logistics and / or financials. Your solution may have been customized to fit your exact needs and be deeply integrated with other applications to help drive daily operations. Therefore, it may not make sense to start from scratch, re-architect, and retrain employees with a new software-as-a-service (SaaS) solution. The flexibility to accommodate everything you already do with E-Business Suite is the strength of using an infrastructure as a service (IaaS) solution. With IaaS you have control over the performance, security and business continuity plans.

Top-Level Value Proposition

Most on-premises E-Business Suite deployments can be migrated to run on Oracle Cloud Infrastructure without requiring significant configuration, integration, or business process changes, and will result in an implementation that is more flexible, more reliable, higher performance, and lower cost than either on-premises or other cloud approaches.

Oracle has a validated solution to accomplish these goals, quickly and reliably, that includes procedures, supporting OCI platform services, reference architectures. These consider real production needs, like security, network configuration, HA / DR, identity integration, and cost management.

- 38% lower TCO than on-premises deployments, 44% less than AWS

- Managing and reducing CAPEX, ensuring the datacenters you maintain are efficient, while eliminating server hardware and taking advantage of cloud flexibility where possible.

- 30% increased performance, 2-10x faster reporting

- High availability with RTO < 4 hours and RPO < 4 hours

- Maximize your solution availability with Oracle, with Oracle RAC or Exadata in the cloud

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- Rapid in-place technology refresh and patching

- Proactive monitoring of usage and costs

- Near instant scaling up or down – e.g., to handle business growth or workload bursts at month end

- Federated identity with your existing systems

- Security and compliance overhead for IaaS is Oracle's responsibility, helping reduce audit length and cost

Transform large, irregular CAPEX expenditures to predictable OPEX, pay as you go based on usage, and bring your own Oracle licenses to Oracle Cloud Infrastructure to leverage your existing investments, including monitoring, operational runbooks, skills, and workflow. Oracle Advanced Customer Services (ACS) and partners can help you design, deploy, and even manage your environment.

TCO Analysis

Beyond the benefits of being straight-forward to migrate, easier to manage, and more flexible to scale, a E-Business Suite implementation on Oracle Cloud Infrastructure is actually cheaper than running it on premises or in another cloud.
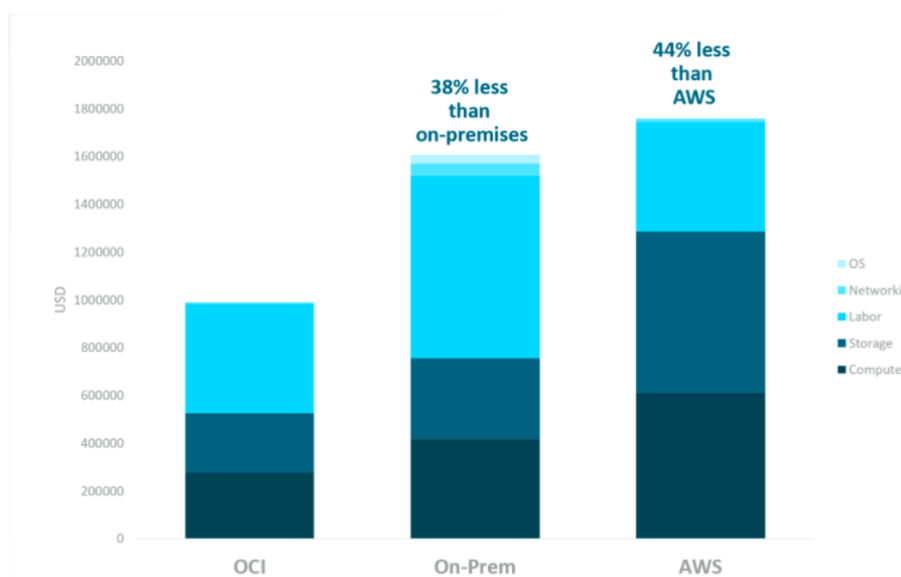
ASSUMPTIONS

- 2,500 concurrent users

- 6 environments (2 production, 1 development, 1 testing, 1 staging, and 1 QA)

- OCI: 80 vCPUs per environment, 5TB database storage, 50 GB/vCPU storage, 1 Gbps FastConnect, Backups, 4TB d single node database, 25% cloud discount

- On-Premises: 12 physical servers, each with 28 cores, 128 GB RAM, and 13.5 TB storage

- AWS: Same details as OCI, reserved instances for prod environments, 7% EA discount

Image 1 E-Business Suite on Oracle Cloud Infrastructure can be 38% less than on-premises and 44% cheaper than running on another cloud.

Unique Infrastructure and Tools

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These advantages exist because Oracle Cloud Infrastructure was designed specifically to support workloads like E-Business Suite. Oracle Cloud Infrastructure delivers higher performance compute, storage, networking, and managed database instances that result in a high-performance experience for your users at a lower cost of operation. Oracle Cloud is the only place you can run Oracle Database with RAC or Exadata. Other clouds are limited to less robust configurations.

In addition, Oracle provides specific tooling and automation to streamline deployment, migration, upgrading, and maintaining your implementation, reducing the time, expertise, risk, and cost of migration and day-to-day operations.

- [E-Business Suite Marketplace Trial](#)

- [E-Business Suite Cloud Manager](#)

- Enterprise Manager and Oracle Management Cloud for Hybrid Application Management

Proven Customer Success

These are not idle claims. Many E-Business Suite customers have achieved these results for themselves, for example:

• **Darling Ingredients,** the world's largest producer of sustainable ingredients, was facing aging hardware in a colocation facility hosting key infrastructure. As the contract came up for renewal, Darling's goal was to modernize their solution without increasing costs. They tried several cloud providers, but found the reliability and performance lacking. Oracle Cloud Infrastructure (OCI) provided the predictable high-performance infrastructure for Oracle Database and the applications that depend on it. They doubled the performance of their previous solution and consolidated from 19 database systems down to three.

• **Maritz** is a privately held holdings company that has been in business for over 100 years. They operate three major business units as well as several smaller ones, all specializing in providing sales and marketing services to Fortune 100 companies. Maritz's business units used more than two-dozen applications on-premises, including Oracle E-Business Suite, Vertex, Kofax MarkView for AP and custom applications, running on Oracle WebLogic Middleware and Oracle Database to manage enterprise resource planning functions such as finance, accounting, inventory, procurement and HR. They retired old Sun Microsystems hardware, seeing a ten-fold performance increase and reducing infrastructure costs while reducing disaster recovery times and meeting their compliance needs.

• **Murad** is a prestige skincare brand, specializing in acne and anti-aging treatments operating under Unilever since 2015. Unilever had launched a corporate-wide initiative to enhance consumer experience, facilitated by faster and more efficient back-office operations. Historically, Murad maintained their own hardware in a co-located data center, leveraging Cisco UCS hardware and refreshing them every 3-5 years. They were on the cusp of another hardware refresh cycle, when they decided to explore cloud infrastructure based on their key business and operational needs. They achieved 30% increased performance, reduced reporting time by 75%, and saved 30%.

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Validated Solutions That Address Your All Business Requirements

Because OCI was built for the usage patterns of enterprise production applications like E-Business Suite, existing deployments can be easily moved to – and even improved on – Oracle Cloud Infrastructure with little or no modification of the environment or business processes. Oracle can provide architectural patterns that meet all your networking, connectivity, performance, HA, DR, and multi-region requirements.

Key Requirements for Running EBS in the Cloud

Many E-Business Suite customers have similar questions when exploring a migration to the cloud:

- How can we implement a full HA / DR capability in the cloud?

- How do we deploy a secure architecture and integrate with our identity management system?

- How do we match our high-performance, highly isolated network model in the cloud?

- How do we deploy to, or migrate to, the cloud?

- How do we maintain control over and visibility into operating costs, especially with multiple departments?

- What about ecosystem apps / customizations / integrations migrate alongside EBS?

Oracle E-Business Suite on Oracle Cloud Infrastructure

Oracle E-Business Suite runs on Oracle Cloud for Infrastructure just like the Oracle E-Business Suite that you run on premises in your data center today — the same applications you may have customized, bought, and trained your staff on, but on a combination of Oracle's Infrastructure as a Service (IaaS) and Database as a Service (DBaaS).

Oracle E-Business Suite deployment on Oracle Cloud Infrastructure choices include the following:

Infrastructure-as-a-Service: Oracle Cloud Infrastructure is a complete set of cloud services that enterprise apps run on. Oracle Cloud Infrastructure offers high-performance compute capabilities and storage capacity in a flexible overlay virtual network that is securely accessible from your on-premises network. OCI provides highly scalable, competitively priced compute capacity that you can use to host your Oracle E-Business Suite application tier and, optionally, your database tier.

Infrastructure-as-a-Service + Database-as-a-Service: Oracle Cloud Platform is a comprehensive, standards-based, fully integrated combination of Oracle and open source technologies you can use to build, deploy, migrate, and manage a variety of different application workloads in the cloud at a significantly lower operational cost. The OCI DB System or OCI Exadata DB System can be used to run your database tier, enabling you to provision your chosen database configuration quickly and easily.

Later in this paper, we provide some guidelines you can use to navigate these choices

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Deployment Options for Oracle E-Business Suite on Oracle Cloud Infrastructure

When you subscribe to Oracle's Infrastructure as a Service (IaaS), you have access to all the compute, storage, and network services associated with it. If you find that DBaaS is required for your deployment, you can also subscribe to Oracle DB System or Oracle Exadata DB System and take advantage of the specific features and capabilities of these offerings. There are several methods of deploying Oracle E-Business Suite on OCI.

1. **Deploy the Application and the Database Tiers to Compute VMs**. With this deployment, the application and database tiers are deployed on distinct sets of Compute VMs. You may optionally deploy multiple application tiers on distinct compute VMs that are load balanced using Load Balancer as a Service (LBaaS).

2. **Deploy the Application Tier to Compute VMs and the Database Tier to DBaaS.** Just like in the previous scenario, the application tier is deployed on a Compute VM, or you can deploy multiple application tiers on distinct Compute VMs that are load balanced using LBaaS. The database may be deployed to a Database Cloud Service (DBCS) Single Instance VM, to a DB System Single Instance on Bare Metal, or to an Exadata DB System. When you choose Exadata DB Systems, RAC is deployed by default. Oracle offers automated provisioning capabilities that can be used to deploy a Demo (Vision) Oracle E-Business Suite instance.

3. **Deploy the Application Tier to Compute VMs and the Database Tier to Oracle RAC.** Optionally, use Data Guard for disaster recovery.

Oracle also offers automation to perform a migration of your on-premises Oracle E-Business Suite instance to OCI. The migration from on-premises to Oracle Cloud is commonly referred to as Lift and Shift. With the Lift and Shift automation you have the ability to define your deployment architecture. You will also define your Virtual Cloud Network including subnets, routing tables, security lists and load balancers. The Oracle E-Business Suite instance running on OCI can be used for non-production (test or development) and—when you are ready—for production.

For the latest information and requirements regarding supported deployments and automations refer to Getting Started with Oracle E- Business Suite on Oracle Cloud (Doc ID 2066260.1).

EBS Cloud Management Tool

An added new feature for E-Business Suite on OCI is the release of the E-Business Suite Cloud Manager tool. This is a new native- cloud GUI based tool that was introduced with Release 18.3.1 of the Oracle E-Business Suite Cloud Tools, as described in September 2018 EBS Cloud Automation Updates for Oracle Cloud Infrastructure (Including New Cloud Manager UI).

This new tool is a web-based application that drives all the principal automation flows, including provisioning new environments, performing lifecycle activities on those environments, and restoring environments from on-premises. It was designed to simplify the diverse tasks Oracle E-Business Suite DBAs perform on a daily basis.
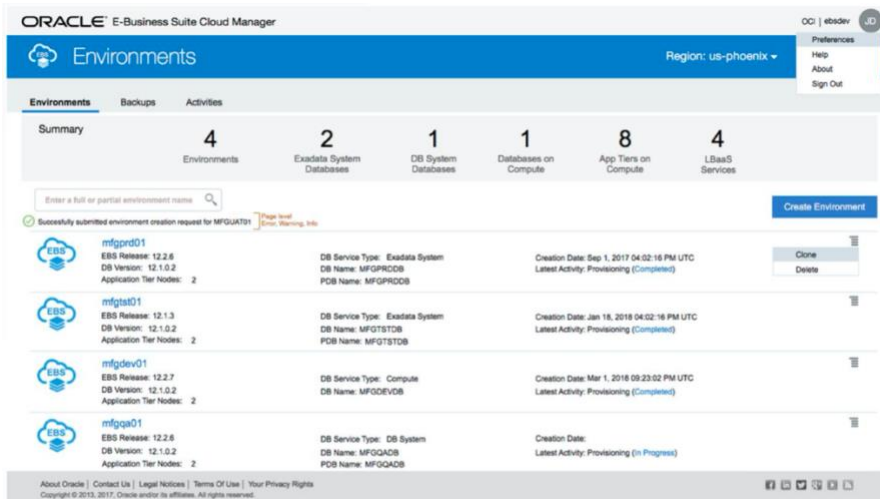
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Image 2 EBS Cloud Management Tool

This web application provides the foundation for building further automation capabilities, with the user experience being a fundamental consideration at all stages of this process from inception to delivery. For the latest information on E-Business Suite Cloud Manager start with the EBS Cloud Manager blog.

Oracle E-Business Suite Cloud Manager is often deployed from the image available in our Marketplace. It can also deployed via an image that can be downloaded from the Oracle Software Delivery Cloud and uploaded to the Object Storage for your Oracle Cloud Infrastructure account. After importing this image, you create a VM that contains all the software libraries required to run the tool as a web application. For step-by-step instructions on all as of the deployment procedure, refer to Deploying Oracle E-Business Suite Cloud Manager on Oracle Cloud Infrastructure (Doc ID 2434500.1).

Migration Methods

Customers face multiple reasons to move to a cloud computing environment, business agility, high efficiency, scalability, and availability that the pooling of elastic computing resources provides, along with significant cost reductions and support for business growth. The question remains; "What is the correct solution for my environment?" Customers that take advantage of deploying their solutions on Oracle Cloud Infrastructure gain a huge benefit from the fact that they have now have access to Oracle's entire technology stack in the cloud, just as they did in on-premises deployments and more. Understanding "How do I move data, metadata, and configuration with minimum risk?" is a key question for Oracle to answer for its customers.

Selecting the correct migration method is dependent on several factors; source platform, DB vendor and version and OS along with current version of EBS. An understanding of the current or source hardware performance characteristics as compared to the new OCI platform architecture for sizing. Additionally, with selected EBS version, there can be multi-step upgrades process required prior to the actual migration. For a complete listing of requirements and procedures the place to start is with this MOS Note link Getting Started with Oracle E-Business Suite on Oracle Cloud (Doc ID 2066260.1) .

Once an understanding of the full environment is made, there are several methods available for migration; One-Click Provisioning, Lift and Shift, Move

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and Improve, Cloning and even a new install. Fortunately, EBS has a variety of tools available to use including EBS Cloud Manager. Recently announced EBS R12 Cross Platform migration supports a documented process combines both an application tier platform migration from on-premises to OCI Compute VM and database tier migration to OCI running a multi-tenant database. The database migration process uses Transportable Tablespaces (TTS) with the full transportable export / import option in 12cR1 to speed up the migration. For complete details and how and what database and EBS version requires are follow this link EBS R12 Cross Platform Migration to Oracle Cloud. There is a series of Oracle by Example (OBE) that take you step-by-step through 4 scenarios on EBS migrations. This is an excellent first step source in understanding the process, here is the link Oracle EBS on OCI - OBE Tutorials.

Security

OBJECTIVES

The objective of the security architecture is to enable you to maintain your security posture when running E-Business Suite and associated applications in the Oracle Cloud. Even though you may be reducing the overhead of building and maintaining data center infrastructure, you still need unparalleled control and transparency over what you're running in the cloud

Outcomes this architecture can provide:

- Ensure the deployment and data assets are completely isolated from other tenants' workloads and Oracle's staff so to limit the effect of noisy neighbors and prevent lateral movement of attacks

- Protect your internet-facing applications from cyberattacks

- Encrypt your data at rest and in transit in a way that allows you to meet your security and compliance requirements

- Segregate operational responsibilities and restrict access to cloud services in order to reduce risk associated with malicious and accidental user actions

- Be able to leverage existing security assets, identity provider and other third-party security solutions to access and secure your application and data

- Audit and monitor actions taken on your cloud resources so that you can meet audit requirements

- Demonstrate compliance readiness to internal security and compliance teams, end-customers, auditors and regulators

SOLUTION ARCHITECTURE

As a cloud provider, it is our job to provide and operate our secure infrastructure. We've designed security into every aspect of our infrastructure to help our customers achieve better protection, isolation and control. We started with taking a unique design approach, separating the network and server environments. This way, if an attack occurs on a VM, we can contain that threat and prevent it from moving to other servers, resulting in better protection and lower risk for customers. We also hyper- segment our physical network and backend infrastructure for secure isolation between customer instances and backend hosts. Additionally, we've implemented hardware-

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based root of trust, making sure each server is pristine each and every time it is provisioned.

However, security is a shared responsibility between Oracle and our customers. Therefore, we provide security tools and controls covering core IAM, networking, compute, data management and more so you can run your critical workloads and supporting databases, securely on our cloud without having to rebuild your security posture.

Secure Network Isolation: We discussed VCNs, subnets and security lists earlier in the section on Network and Connectivity. For each customer's VCN there is a range of defense in depth protections available spanning layers 3-7.
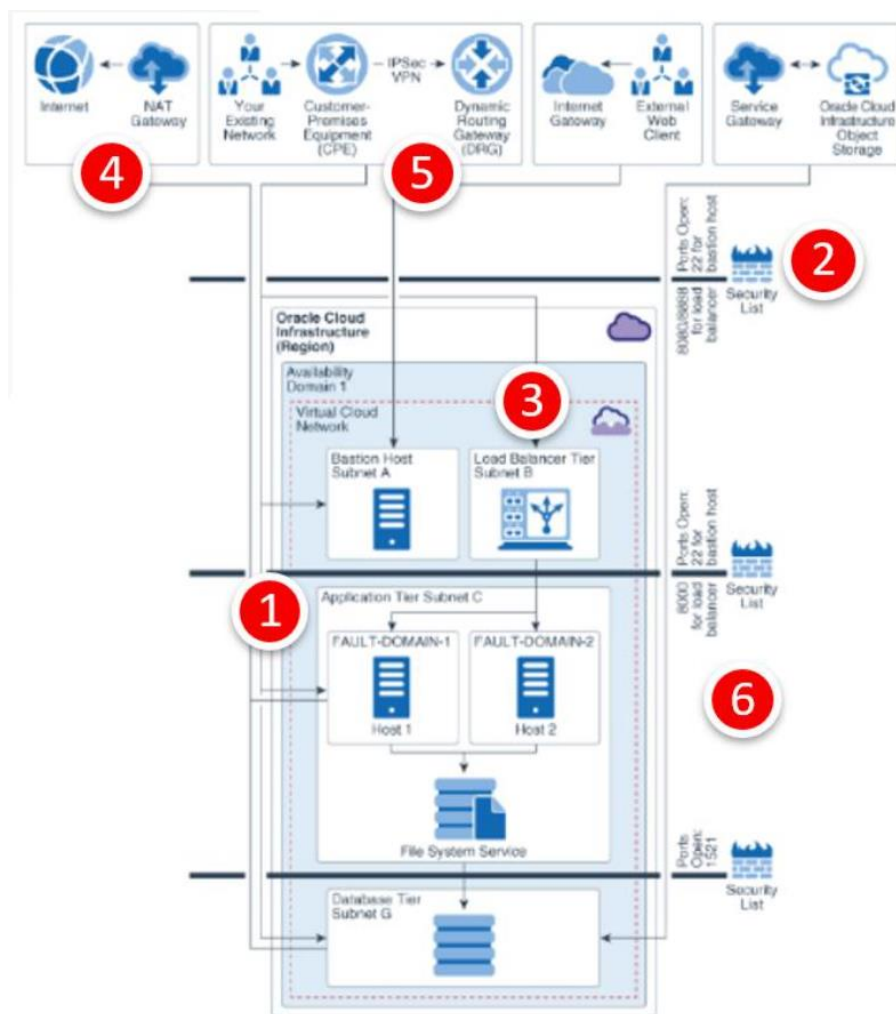

Image 3 Secure Network Isolation options

> **VCN (1):** A VCN provides isolation for your workload from any other workload on Oracle Cloud Infrastructure, including your other workloads in a different VCN.
>
> **Internal Firewalls (2):** Implement virtual firewalls at the subnet level using VCN security lists.
>
> **Load Balancing Traffic Securely (3**): TLS 1.2 is supported by default to securely balance traffic within the implementation and from external connections

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Secure Traffic Between ADs and Regions: Communications between ADs are encrypted with Media Access Control security (MACsec) to prevent layer 2 security threats such as wiretapping, DDoS, intrusion, man-in-the-middle and playback attacks. VCN traffic that travel between regions are either sent over private links or are encrypted.

Secure Connectivity to Public Internet (4): For security, a VCN has no internet connectivity by default. Therefore, internet bound traffic to / from a VCN must pass through an IGW. Virtual routing tables can be implemented with private IP addresses for use with NAT and 3rd party firewall devices for additional security.

Secure Connectivity Between Your VCN and Data Center (5): Traffic can be routed through a DRG for private traffic. It is used with an IPSec VPN or FastConnect connection to establish private connectivity between a VCN and an on-premises or other cloud network.

Protect Internet-Facing Applications (6): Oracle provides a Web Application Firewall (WAF) service with 250 pre-defined OWASP and compliance rules. Oracle Cloud Infrastructure WAF acts as a reverse proxy that inspects all traffic flows or requests before they arrive at the origin web application. It also inspects any request going from the web application server to the end user. Additionally, Oracle's optional global anycast DNS service also takes advantage of DNS-based DDoS protections providing resiliency at the DNS layers.

Server Isolation: If you require complete workload and data isolation at the server level for security and / or performance requirements, you can leverage bare metal compute shapes. These shapes are single tenant so they offer consistently high performance and are immune to noisy-neighbor issues. There is also no Oracle managed hypervisor and Oracle staff have no access to memory nor local NVMe storage while the instance is running.

If you have more flexible requirements, our multi-tenant VM shapes leverage a security-hardened hypervisor that provides strong isolation between customers. And regardless of shape type, bare metal or VM, all servers are wiped clean and installed with gold state firmware when newly provisioned.

Data Encryption: By default, all data that customers store with any of Oracle Cloud Infrastructure's storage or data management services, including Block Volumes, boot volumes, Object Storage, File Storage, and Database, is encrypted at rest using strong AES keys or TDE in the case of database encryption.

Key Management: For customers that require the ability to control their own cryptographic keys for security or compliance purposes, we offer Oracle Cloud Infrastructure Key Management. With Key Management, you can centralize key lifecycle management in FIPS 140-2 Level 3 hardware security modules (HSMs).

Identity and Access Management (IAM): Identity management including authentication, authorization, tools to help you organize and control access to resources according to organizational hierarchy, and the ability to leverage

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existing identity providers is such a rich topic that we devoted a separate section to IAM below.

Audit and Logging: Oracle automatically records calls to all supported Oracle Cloud Infrastructure public application programming interface (API) endpoints as log events. Currently, all services support logging by our Audit service. You can leverage this data to perform diagnostics, track resource usage, monitor compliance, and collect security-related events. Learn more about Oracle Cloud Infrastructure Audit.

Compliance: Depending on where you do business and industry-specific practices, you may need to demonstrate compliance readiness to internal teams and to external auditors. Oracle continually engages with external assessment entities and independent auditors to meet a broad set of international and industry-specific compliance standards for service deployments on our cloud. Learn more about Compliance.

Separation of Duties: E-Business Suite Cloud Manager implements separations between personnel roles, aligned with policy on the infrastructure resources. Control profiles can also be used across multiple deployments. Built-in roles exist for Network Administrators, Cloud Manager Administrators, and Application Administrators. Network Administrators can design the network, manage network security and monitor the network. Cloud Manager Administrators can deploy and configure cloud manager, define mappings between network profiles, and user groups with network profiles. Application Administrators can provision environments, clone them, and maintain all layers of the app. Taken together these establish a governance model that comports with production, development, test and shared resources, without having a single administrative role with full control over everything.

Learn more about Security Best Practices when running applications like E-Business Suite in Oracle Cloud Infrastructure.

Identity and Access Management

OBJECTIVES

You can group and isolate resources according to your organizational structure and hierarchy, control who has access to cloud resources, what type of access a group of users has, and to which specific resources.

Outcomes this architecture can provide:

- Securely isolate cloud resources based on organizational structure

- Authenticate users to access cloud services via browser interface, REST API, SDK or CLI

- Authorize groups of users to perform actions on appropriate cloud resources

- Enable managed service provider (MSP) or systems integrator (SI) to manage infrastructure assets while still allowing your operators the ability to access resources

- Authorize application instances to make API calls against cloud services

- Federate identities using your existing identity provider (IDP)

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Oracle Identity and Access Management (IAM) service lets you control who has access to your cloud resources, what type of access they have, and to which specific resources. This allows large enterprise organizations to manage complex structures with rules enforcing logical groups of users and resources with simple to define policies. You control what type of access a group of users has and to which specific resources. With the IAM service, you can leverage a single model for authentication and authorization across all of the Oracle Cloud Infrastructure services. Resources for in-depth explanations can be found with the following links:

- Best Practices for Identity and Access Management Service on Oracle Cloud Infrastructure

- Oracle Cloud Infrastructure Identity and Access Management Guide

Oracle E-Business Suite may be integrated with Oracle Access Manager using Oracle E-Business Suite AccessGate for single sign-on integration. The integration of Oracle E-Business Suite with Oracle Access Manager has a mandatory requirement to use Oracle Internet Directory or Oracle Unified Directory. Oracle Unified Directory is certified with Oracle E-Business Suite Release 12.2.5.

Oracle Unified Directory is certified with the integration of Oracle Access Manager and Oracle E-Business Suite Release 12.2.5. When integrating Oracle Access Manager with Oracle E-Business Suite Release 12.2.5, either Oracle Unified Directory or Oracle Internet Directory is required.

Refer to Document 2003483.1, **Integrating Oracle E-Business Suite Release 12.2 with Oracle Unified Directory 11gR2,** for more details.

Oracle E-Business Suite is not certified directly with third-party authentication systems. Oracle E-Business Suite inherits its certification with third-party authentication and directory services through its certification with Oracle Access Manager and Oracle Internet Directory or Oracle Unified Directory.

Third-party single sign-on solutions can be integrated with Oracle Access Manager, and third-party LDAP directories can be integrated with Oracle Internet Directory or Oracle Unified Directory. Oracle Access Manager and Oracle Internet Directory or Oracle Unified Directory are integrated, in turn, with Oracle E-Business Suite.

For more information, refer to Document 1388152.1, **Overview of Single Sign-On Integration Options for Oracle E-Business Suite**.

SUPPORTING SERVICES

Oracle Cloud Infrastructure offers a single model for authentication and authorization, and we also integrate with your existing identity provider. We have architected identity and access management (IAM) to be secure by default, leveraging the security principle of least privilege. This means that new users cannot access nor take any action on cloud resources unless an administrator grants them appropriate permissions to do so. To begin, we recommend organizing and isolating your cloud resources appropriately so that you can apply policies to grant the right groups of users access to the right resources.

Compartments: Compartments are a fundamental component of Oracle Cloud Infrastructure for organizing and isolating your cloud resources. A

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common approach is to create a compartment for each major part of your organization. For example, you can place all database resources in a database compartment and only grant database administrators access. You also use them to ensure isolation between business units and to logically group resources for the purposes of measuring usage and billing. Learn more about Compartments.

Authentication and Credential Management: By default, Oracle Cloud Infrastructure enforces a strong password policy for access to the console user interface and to the Swift client for database backups to Object Storage. Administrators can also modify password policies for all local or non-federated users using Oracle IAM service. Each user can automatically reset their own console passwords and manage their own API keys. However, you must have administrator permissions to manage credentials for users other than yourself. Learn more about Managing User Credentials.

Policies: Leverage policies to authorize a group of users to take action on cloud resources in a specified compartment or across the tenancy. Oracle Cloud Infrastructure policies are written in human-readable language so they are simple to define and easy to understand.

IAM for MSP / SIs: A common use case is to have an MSP or SI manage your cloud infrastructure assets while still retaining the entitlement to operate your cloud resources. Compartments and policies can be used in conjunction to ensure clear separation of duties.

Instance Principals: Allow users to call IAM-protected APIs from an Oracle Cloud Infrastructure compute instance without the need to create users or manage credentials for that instance. You may have an application running on a compute instance that requires access to object storage. By grouping the appropriate compute instances as "principal" actors, you can simply attach policies to enable them to make API calls against other cloud services such as object storage.

Federation: Oracle IAM supports federation with Oracle Identity Cloud Service (IDCS), and any other SAML 2.0 compliant identity provider. Learn more about Federation.

When you sign up for Oracle Cloud Infrastructure, your tenant administrator account is automatically federated with Oracle Identity Cloud Service. Federating with Oracle Identity Cloud Service automatically allows you to have a seamless connection between services without having to create a separate username and password for each one.

Cost Management and Governance

OBJECTIVES

When transitioning from a CapEx model, where many costs are fixed at the implementation of a project, to an OpEx model, where costs scale up and down with the usage of the system, customers often require cost management tools to understand, control, and communicate these cloud costs within their organization. Oracle provides tools to meet these needs

Outcomes these tools can enable:

- Set and manage cloud budgets

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- Prevent overspending

- Ensure accurate cost tracking across departments and projects

- Analyze which departments, services and projects are contributing to cloud usage over time

- Get granular usage details for invoice reconciliation

- Identify areas to optimize costs

SUPPORTING SERVICES

Compartments: As discussed earlier in the Identity and Access Management section, compartments can be used to ensure isolation of cloud resources between business units. In addition, they are also used to logically group resources for the purposes of measuring usage and billing. We typically recommend creating a compartment for each major part of your organization, i.e. business unit or department. Compartments can also be nested to support sub-departments as well. Learn more about Compartments.

Tagging: Leverage tags to track cost and usage of resources that are associated with a particular project that span multiple departments. In addition, you can streamline resource management by tagging and then scripting bulk actions on exactly the Oracle Cloud Infrastructure resources you want. Tags leverage policies and controls to ensure tagging integrity and to prevent users from creating excessive tags, duplicate tags, and manipulating existing tags. Learn more about Tagging.

Budgets: Once resources are assigned to compartments, e.g. matching specific use-cases or departments, or regions, budgets and alerts can be configured, so that unexpected usage is flagged before a budget is actually exceeded. Learn more about Budgets.

Cost Analysis: The billing cost analysis dashboard can help visualize the big buckets that are contributing to cloud usage and cost, namely cloud service, compartments and tags. With proper tagging, an analyst or administrator can use this tool to identify the difference between increased production or dev / test usage, as well as the difference between increased usage of storage versus networking. Learn more about Cost Analysis.

Detailed Usage Reports: CSV files containing detailed resource-level and hour-by-hour data, including all associated metadata, i.e. tags and compartments. Export detailed usage reports as CSV files and import into existing business intelligence tools for invoice reconciliation use cases, to get more granularity into your bill and to identify areas for cost optimization. For example, you can leverage the detailed usage data and combine with CPU utilization data from Oracle Cloud Infrastructure Monitoring service to identify instances with low CPU utilization to shut down. Learn more about Usage Reports.

Monitoring

OBJECTIVES

You need to be able to monitor the health and capacity of cloud infrastructure resources in order to optimize performance at all times and in real time. Objectives include ensuring availability and performance in the cloud and detecting and fixing anomalies before they can impact your business.

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Additionally, you may require the visibility to identify bottlenecks and under-utilized resources to optimize accordingly.

SUPPORTING SERVICES

Infrastructure Monitoring: Chances are, you are already leveraging monitoring tools like Oracle Enterprise Manager and Oracle Management Cloud for your existing deployment. Oracle Cloud Infrastructure offers infrastructure monitoring natively within the console, but it can also support your existing monitoring tools. Oracle recommends the following monitoring tools.

> **Multi-Tier Monitoring of Hybrid / Multi-Cloud Environments:** For most multi-tier migration scenarios, we recommend leveraging Oracle Management Cloud. Oracle Management Cloud provides integrated monitoring across hybrid and multi- cloud environments. It performs monitoring through use of agents across various tiers from infrastructure to application performance, security, and even end-user activity. And it integrates with Oracle Enterprise Manager for Oracle Database performance and capacity analytics. Learn more about Oracle Management Cloud and Oracle Enterprise Manager.

> **Oracle Cloud Infrastructure Monitoring:** Cost-effective and out-of-the-box metrics and dashboards are provided for IT to monitor cloud resources such as compute instances, block volumes, virtual NICs, load balancers, and object storage buckets natively within the Oracle Cloud Infrastructure console. For example, you can leverage Monitoring to track CPU utilization, memory utilization and integrate with compute autoscaling. You can also integrate with open-source visualization tools, run your own metrics queries, and have your applications emit their own custom metrics, enabling you to visualize, monitor and alarm on all critical time-series data from one place in the console. Learn more about Metrics and Alarms.
> Oracle Cloud Infrastructure performs agentless monitoring. Currently this native infrastructure monitoring service does not monitor database services. For that, we recommend either Oracle Management Cloud or Oracle Enterprise Manager, depending on if Oracle Database is deployed on-premises or as a cloud service.

OCI Network Architecture Overview

OBJECTIVES

The primary objectives for the networking and connectivity architecture is to provide secure, high-speed connectivity between your cloud resources and any users and / or systems that would need to access those resources. Additionally, it illustrates mechanisms by which you can design a network topology that best meets your needs, with the ability to isolate resources between bastion host, application tiers, database tiers and load balancing for security and management purposes.

Outcomes this architecture can provide:

- Isolation from other customers and your other workloads

- Network-level isolation between web / application tiers and database tiers

- Monitoring and management access to all application and database tiers

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- Private / dedicated access from corporate campus(es) to the application via private network links

- Ensuring low latency between cloud environment and your data center

- Secure network access to the application via encrypted links over the public internet

- Private network connectivity to other systems or services hosted on Oracle Cloud Infrastructure

- Load-balancing across multiple application nodes for performance and availability

REFERENCE ARCHITECTURE

Provisioning Oracle E-Business Suite on Oracle Cloud Infrastructure or migrate Oracle E-Business Suite environments from your data center to Oracle Cloud Infrastructure, you can plan a multi-host, secure, high-availability topology. Each of the following network architectures have their own benefits but with added complexity and cost. The network topology used will be based on your customer requirements, Availability, Reliability, Performance and Cost. As a general practice, Oracle recommends creating separate subnets for your instances, such as bastion host, database, application, and load balancer instances to ensure that appropriate security requirements can be implemented across the different subnets. You can create instances in a private or a public subnet based on whether you want to permit access to the instances from the internet. Instances that you create in a public subnet are assigned a public IP address, and a Private IP Address, and you can access these instances from the Internet. You can't assign a public IP address to instances created in a private subnet. Therefore, you will not be able to access these instances via the internet but only with direct connections like VPN IPSec or FastConnect. However, a NAT gateway can be used to provide outbound Internet access, if needed.

An understanding of networking architecture terms and best practices are used for are describe with the following components:

> **Application Tier:** This tier contains more than one instance of an Oracle E-Business Suite application to provide high availability. Set up multiple instances of an application in separate fault domain to ensure that you can continue accessing the application even if an application instance goes down.

> **Database Tier:** This tier contains Oracle Cloud Infrastructure Database instances. For high availability requirements, Oracle recommends using Oracle Real Application Clusters database on a two-node virtual machine database system or Oracle Database Exadata Cloud Service.

> **Bastion Host:** The bastion host is an optional component that can be used as a jump server to access instances in the private subnet. A bastion host is an Oracle Cloud Infrastructure Compute instance that uses Linux as its operating system. Place the bastion host in a public subnet and assign it a public IP address to access it from the Internet.

> **Load Balancer Tier:** This tier contains Oracle Cloud Infrastructure Load Balancing. It receives requests from application users, and then

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load balances traffic to Oracle E-Business Suite application servers. Use Oracle Cloud Infrastructure Load Balancer to distribute traffic to your application instances within a VCN.

This service provides a primary and standby instance of the load balancer to ensure that if the primary load balancer goes down, the standby load balancer forwards the requests.
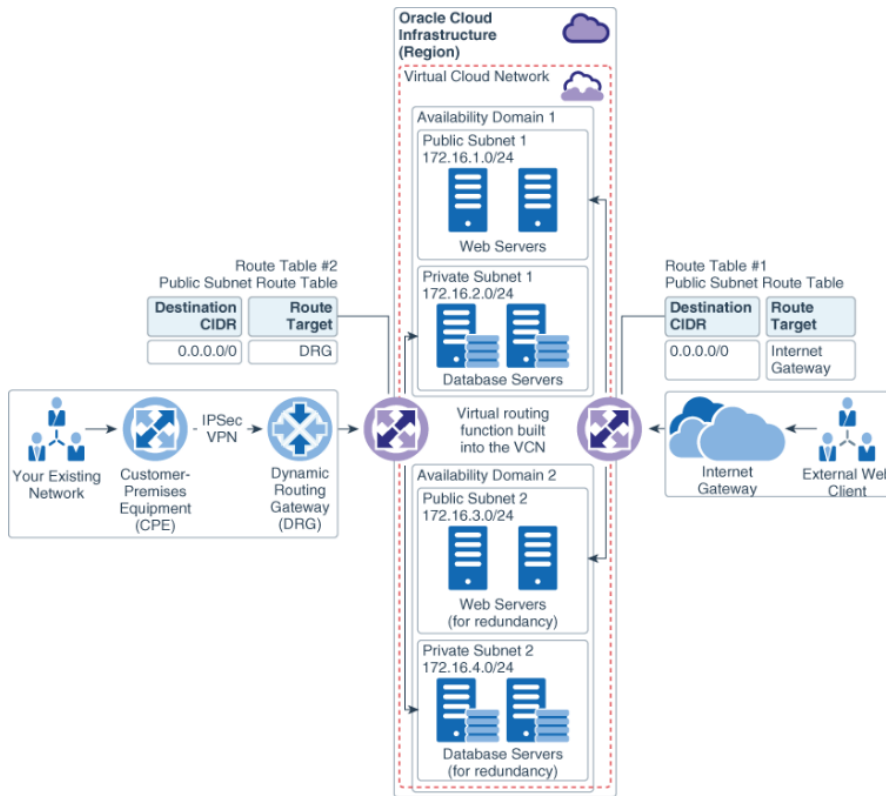

Image 4 OCI Network Architecture overview

On-Premises Network Connectivity to OCI Methods

E-Business Suite customers are demanding secure and

performant connectivity in the cloud when connecting to the

Oracle Virtual Cloud Network (VCN) when designing and implementing their networks. Like in a traditional datacenter, customers assign their own private IP address space, create subnets, define route tables, and configure firewalls. Customers may create isolated VCNs for standalone applications such as a corporate web site, or provision VCN resources as an extension of their corporate network. Regardless of the purpose for which a customer deploys resources into a VCN, customers have three options to reliably connect to their resources.

FASTCONNECT

The FastConnect Service is a network connectivity alternative to using the public internet for connecting a customer's network with the Oracle Cloud. Using FastConnect, customers can establish a private connection between their existing physical network and their Virtual Cloud Network (VCN), and access their VCN using private IP addresses (RFC 1918).

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Connections are established in two ways, a.) by co-locating with Oracle in a FastConnect location or b.) by connecting via a FastConnect provider. For the listing of current network providers and exchange services available, please follow the link FastConnect Network Providers and Exchange Services. Too understand the detailed steps that are required for setting a FastConnect service within OCI, please refer to the following documentation Setting Up FastConnect on OCI.

For both service types Oracle provides the building blocks so customers can establish redundant connections using both VPN and FastConnect.

INTERNET-BASED VPN

IPSec VPNs provide encryption over the public Internet. The VPN service provides multiple, redundant data center VPN tunnel endpoints using standards-based IPSec encryption. To understand the detailed steps that are required for setting a IPSec VPN service within OCI, please refer to the following documentation Setting Up an IPSec VPN on OCI. For a list of VPN devices we have tested and that are known to work with the VPN service and generic customer premises equipment (CPE) configuration information please view the CPE Configuration Information

INTERNET

The public internet reliably connects resources anywhere in the world. Oracle provides redundant data centers, multiple Internet Service Providers (ISP), and ISP circuits that connect every Oracle Cloud Infrastructure region to the Internet. Internet based resource can be accessed directly from Oracle Cloud, or if you require greater control over how hosts in your tenancy access external resources you can also route through your site, for example if you need to use existing proxies or content inspection systems.

The connectivity architecture is based on the customer's requirements for reliability, security, performance and user access that is defined by their E-Business Suite environment. For a detailed explanation with architecture examples for your connectivity options with OCI refer to the following link VCN Connectivity: Flexible Options for Your Most Demanding Applications and Workloads.

Resiliency, High Availability, and Disaster Recovery

OBJECTIVES

- Server redundancy via multiple active-active nodes at each application tier

- Redundancy strategy for database tier

- Backup strategy for non-database tiers

- Backup requirements for database tier

- DR within a single region

  - Active-Active components across ADs – Active-Passive components across ADs – Regional subnets across ADs

  - Load-balancing across ADs

  - Storage synchronization across ADs

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- Database DR across ADs
- DR across multiple regions
  - Application replication between regions
  - Storage replication between regions
  - Cross-region copy lets you asynchronously copy object storage datasets – Cross-regionbackupcopyforblockvolumes
  - Database protection between regions

Reference architectures follow.

Oracle E-Business Suite Deployment Examples

Oracle E-Business Suite has a flexible logical architecture, and Oracle cloud infrastructure provides several capabilities that complement the EBS's deployment options, including options for high availability and for very high performance. You may also optionally configure your environment for disaster recovery. Selecting your deployment architecture is based on a number of factors including but not limited to: performance, user concurrency, and operational requirements. Business requirements, such as availability and disaster recovery have to be taken into consideration. Each has a consideration into the design and application of the cloud architecture.

You can design your Oracle E-Business Suite deployment on Oracle Cloud Infrastructure in a single availability domain, across multiple availability domains, or in multiple regions.

- **Single Availability Domain:** You can deploy Oracle E-Business Suite in a single availability domain and still ensure high availability by setting up multiple application instances. Use this architecture when you want to ensure that your application is available even when an application instance goes down. The other available application instances in the availability domain continue to process the requests.

- **Multiple Availability Domains:** Use this architecture when you want to ensure that E-Business Suite is available even when one availability domain goes down. You can still access the application instances in another availability domain.

- **Multiple Regions:** Use this architecture when you want to set up a disaster recovery site for E-Business Suite in a different region. This architecture is essentially the same as the multiple availability domain architecture, but instead of creating resources in a second availability domain in the same region, you create resources in another region.

Deploying Oracle E-Business Suite in a Single Availability Domain

This architecture shows the deployment of an Oracle E-Business Suite application in a single availability domain while ensuring high availability.

The architecture consists of a virtual cloud network (VCN) with the bastion, load balancer, application, and database hosts placed in separate subnets of VCN in a single availability domain. In the following architecture diagram, the bastion host is deployed in a public subnet, and all the other instances are deployed in private subnets. You can place the different instances in public or private subnets based on your business requirements.

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In this architecture, multiple application instances are deployed in an availability domain to ensure high availability. This ensures that your application is available even when an application instance goes down. The other available application instances in the availability domain continue to process the requests. This high availability of an application within an availability domain can be achieved by placing application instances in separate fault domains. Fault domains enable you to distribute your instances so that they are not on the same physical hardware within a single availability domain. As a result, a hardware failure or hardware maintenance that affects one fault domain does not affect instances in other fault domains.

Instances in the private subnet require outbound connection to the Internet to download patches as well as to apply operating system and application updates. All application instances in the availability domain are active. The load balancer instances receive requests and send it to the application servers. The application servers process these requests and forward it to the database instances. You can access the instances in private subnets over port 22 through the bastion host or the Dynamic Routing gateway (DRG) if you have set up an IPSec VPN tunnel between your data center and Oracle Cloud Infrastructure DRG.

This architecture supports the following components:
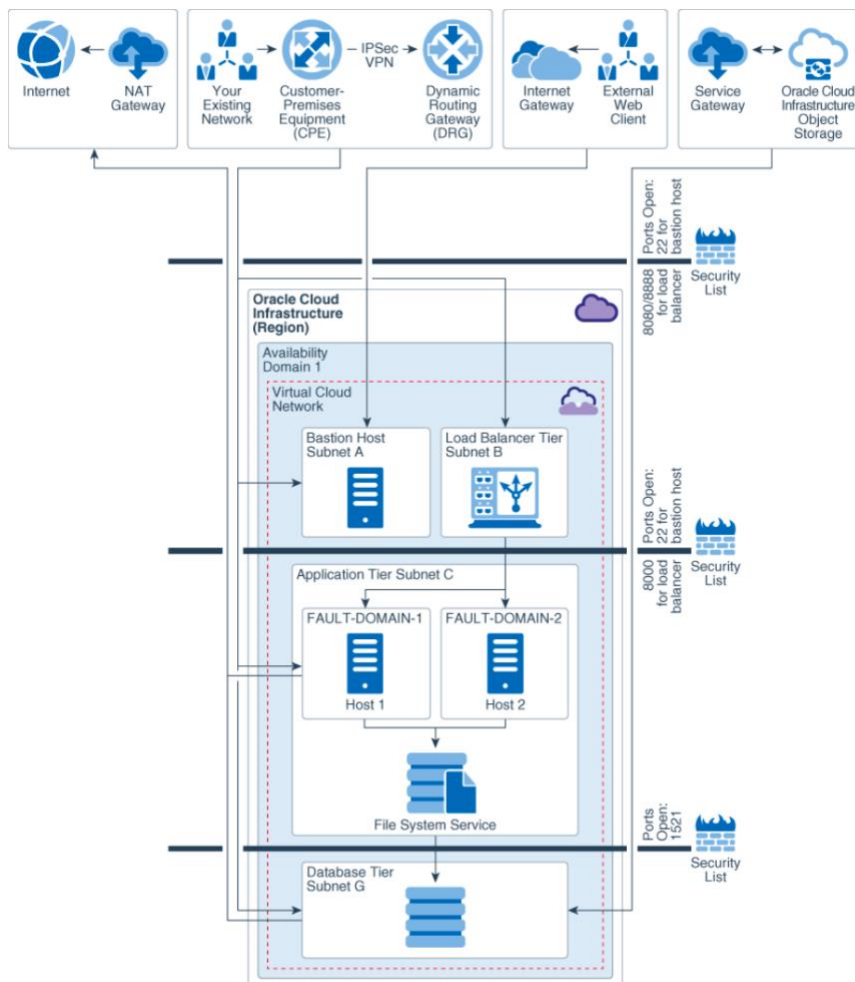
Image 5 Architecture for deployment of an Oracle E-Business Suite application in a single availability domain

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Bastion Host: The bastion host is an optional component that can be used as a jump server to access instances in the private subnet. A bastion host is an Oracle Cloud Infrastructure Compute instance that uses Linux as its operating system. Place the bastion host in a public address to access it from the Internet. To provide an additional level of security, you can set up security lists to access the bastion host only from the public IP address of your on-premises network.

Load Balancer Tier: This tier contains Oracle Cloud Infrastructure Load Balancing. It receives requests from application users, and then load balances traffic to Oracle E-Business Suite application servers.

Application Tier: This tier contains more than one instance of an Oracle E-Business Suite application to provide high availability. Set up multiple instances of an application in separate fault domain to ensure that you can continue accessing the application even if an application instance goes down.

Database Tier: This tier contains Oracle Cloud Infrastructure Database instances. For high availability requirements, Oracle recommends using Oracle Real Application Clusters database on a two-node virtual machine database system or Oracle Database Exadata Cloud Service.

Deploying Oracle E-Business Suite in Multiple Availability Domains

This architecture shows the deployment of an Oracle E-Business Suite application across multiple availability domains. It shows a virtual cloud network (VCN) with the bastion, load balancer, application, and database instances placed in separate subnets across two availability domains.

Multiple application servers are deployed in each availability domain to ensure high availability within an availability domain. All application servers within an availability domain are deployed across different fault domains. By using different fault domains, application instances are protected against unexpected hardware failures and planned outages due to hardware maintenance. In addition, to ensure availability in case the primary availability domain is not available, redundant instances are created in another availability domain. In the architecture diagram, the instances in Availability Domain 1 are active and the instances in Availability Domain 2 are on standby.

When the instances in Availability Domain 1 are active, the load balancer in Availability Domain 1 will direct traffic only to these instances. It won't direct traffic to application server instances in Availability Domain 2. If Availability Domain 1 is not available, then you'll have to manually switch over to the other availability domain. In this scenario, the load balancer, application, and database server instances in Availability Domain 2 become active. The load balancer in Availability Domain 2 accepts requests and forwards them to application servers in Availability Domain 2.

For a seamless failover across availability domains, use logical host names for the Oracle E-Business Suite database and application instances. Use the same logical host names on the primary and standby sites to reduce the effort for reconfiguring instances during switchover or failover.

This architecture supports the following components:

Application Tier: Multiple application servers are set up in each availability domain to ensure high availability. The application servers in Availability Domain 1 are in the active state, and the application servers in the Availability

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Domain 2 are in the passive state. To synchronize application servers across availability domains, use rsync. Oracle recommends deploying the Oracle E-Business Suite multitier setup with shared application binaries. Use Oracle Cloud Infrastructure File Storage to create a shared file system to share Oracle E- Business Suite application binaries.

Database Tier: Set up highly-available database instances in both availability domains. The architecture diagram shows that the database servers in Availability Domain 1 are active and the database servers in Availability Domain 2 are on standby. To replicate the database across availability domains, use either Oracle Active Data Guard or Oracle Data Guard.

Load Balancer Tier: Oracle Cloud Infrastructure Load Balancing distributes traffic across the application servers in an availability domain. Set up private load balancers in both of the availability domains. The load balancer in Availability Domain 1 is in the active state, and the load balancer in Availability Domain 2 is in the passive state. The active load balancer distributes traffic only to the active application servers in Availability Domain 1 and not to the passive application servers in Availability Domain 2.

Bastion Host: The bastion host is an optional component that you can use as a jump server to access the application and database instances. For high availability, deploy a bastion host in both availability domains.
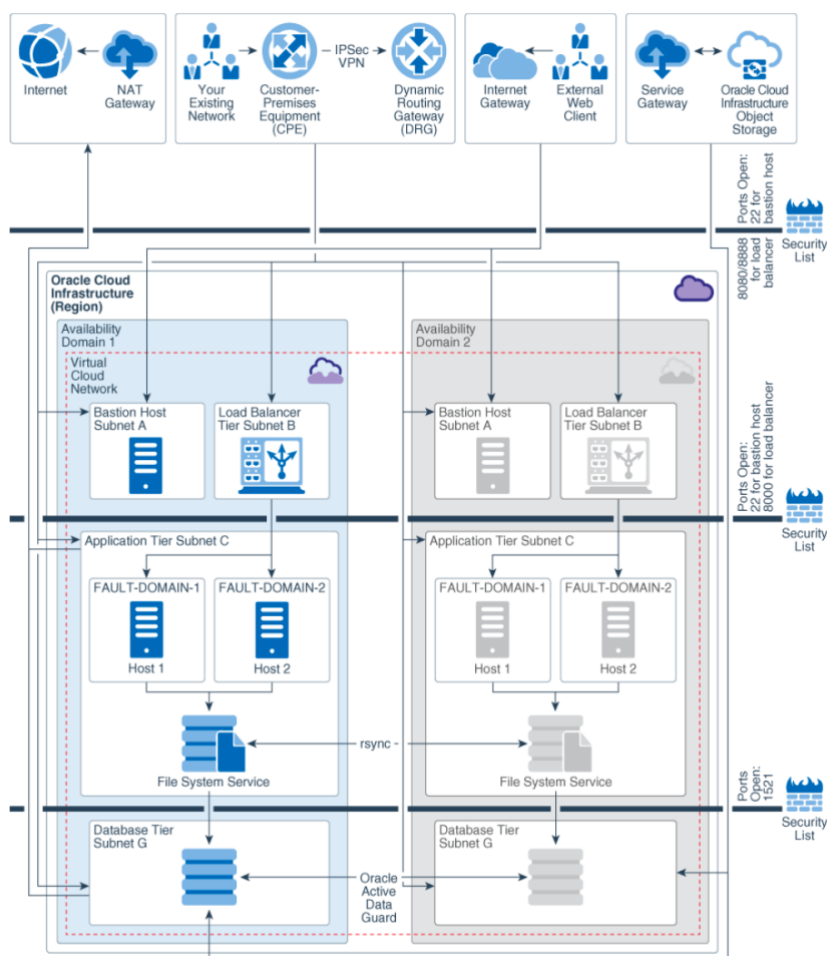
Image 6 Architecture for the deployment of an Oracle E-Business Suite application across multiple availability domains

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Oracle E-Business Suite on OCI with Disaster Recovery Architecture

This option is a variant of the multiple node architecture. It is comprised of the same components, however, the database is deployed to Oracle's Platform-as-a-Service (PaaS). You may subscribe to DBCS (Single Instance), DB Systems (Single Instance) or Exadata DB System for the Oracle E-Business Suite database. You may provision a multi–node Oracle E-Business Suite environment or perform a Lift and Shift of an existing on-premises Oracle E-Business Suite Release 12.2 or 12.1.3 Environment. The use of the

Lift and Shift automation provides an expedited capacity for migration with reduced risk and shorter a time period for project completion.

Just as you may use Oracle Real Application Clusters (RAC) or Data Guard for disaster recovery, you can use them in Oracle Cloud.

The following diagram is an example of a multi-node Oracle E-Business Suite installation on OCI for the application tier with PaaS services for the database tier.
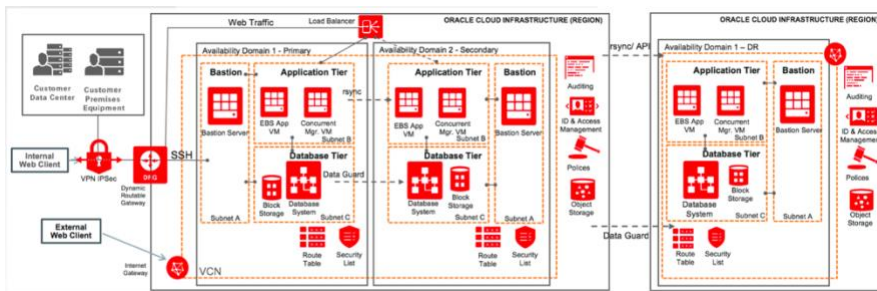
Image 7 Example of a multi-node Oracle E-Business Suite installation on OCI for the application tier with PaaS services for the database tier

The primary environment is deployed to Availability Domain 1 in Region 1, a secondary site for high availability is deployed to Availability Domain 2 in Region 1 and a disaster recovery environment is deployed in Availability Domain 1 in Region 2. Note that the primary environment and secondary environment as well as the disaster recovery environment are all active-passive – meaning only the primary site is active for online users and transactions.

Conclusion

Many enterprises rely on Oracle Database and software like Oracle E-Business Suite to power their business. Automations provided by Oracle make it easier to move these workloads to Oracle cloud.

Oracle has a public cloud Infrastructure-as-a-Service offering – Oracle Cloud Infrastructure – and decades of experience provisioning and running Oracle products. Our hardware choices, staff expertise, and long-honed IT processes are all best-of-breed for managing Oracle workloads, and make Oracle Cloud Infrastructure the best place to host applications like E-Business Suite.

Migrating your existing Oracle applications such as Oracle E-Business Suite to Oracle Cloud Infrastructure helps you:

* Manage solutions and applications – not infrastructure.

* Focus on your core business, not on IT

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- Improve performance and availability

- Reduce costs

Several architecture configurations are available to match your current on-premises design. With the Oracle E-Business Suite Lift and Shift capability, moving from on-premises, operational risk has been reduced with improved success on all migrations. OCI is also very cost-effective for rapid deployment and removal of test and QA environments.

A good place to continue to learn about the most up-to-date information on EBS is with the EBS blog E-Business Suite and Oracle Cloud. Documentation for EBS on OCI can be found at Oracle E-Business Suite on Oracle Cloud. Oracle Support provide MOS Notes with the most up-to-date information, as the primary starting point for EBS on OCI refer to Getting Started with Oracle E-Business Suite on Oracle Cloud Infrastructure (Doc ID 2517025.1). Oracle also provides a "Solutions" page where content is created by multitude of Oracle sources and provides examples of architectures, migrations, networking and overall general information on EBS running on the OCI platform. This solutions page can be found at E-Business Suite Solutions on OCI.

Additional Resources

- Oracle E-Business Suite on Oracle Cloud – Quick References

- Oracle Applications on Oracle Cloud Learning Library

- Oracle E-Business on Oracle Cloud Blog

- Getting Started with Oracle E-Business Suite on Oracle Cloud (My Oracle Support Knowledge Document 2066260.1)

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