BOSS (Business Operations Support System)

UHGWM110-002777

Application Migration Assessment Discovery and Design

Table of Contents

[1 Overview 2](#_Toc194521757)

[2 Application Profile 3](#_Toc194521758)

[3 Methodology 4](#_Toc194521759)

[4 Architecture and Platform (Current & Future) 5](#_Toc194521760)

[4.1 Current Architecture 5](#_Toc194521761)

[4.2 Findings and Risks 7](#_Toc194521762)

[4.3 Recommendations 8](#_Toc194521763)

[5 Infrastructure 9](#_Toc194521764)

[5.1 Findings and Risks 9](#_Toc194521765)

[5.2 Recommendations 10](#_Toc194521766)

[6 Security and Compliance 10](#_Toc194521767)

[6.1 Findings and Risks 10](#_Toc194521768)

[6.2 Recommendations 11](#_Toc194521769)

[7 Data Management 11](#_Toc194521770)

[7.1 Data classification and tagging 11](#_Toc194521771)

[7.2 Findings and Risks 11](#_Toc194521772)

[8 TCO Assessment & Management 12](#_Toc194521773)

[8.1 Findings and Risks 12](#_Toc194521774)

[8.2 Recommendations 12](#_Toc194521775)

[9 Business Continuity & Disaster Recovery 13](#_Toc194521776)

[9.1 Findings and Risks 13](#_Toc194521777)

[9.2 Recommendations 13](#_Toc194521778)

[10 Annexure 1: Server List 14](#_Toc194521779)

# Overview

The purpose of the Application Migration Assessment is to evaluate the readiness and completeness of the migration assessment and design phase documentation in preparation for migration planning.

BOSS application is a business initiative aimed at creating a central repository that serves as the single "source of truth" for Customers (those we serve), Products (those we develop), and Service Agreements (contracts sold to customers). This initiative will streamline end-to-end business processes, enhance communication, ensure operational consistency, and improve tracking of customer commitments. The BOSS application acts as the definitive source for products, customers, and service agreements, providing a unified view of what products customers have purchased.

**Key Elements:**

* The application is currently hosted in both ELR & CTC datacenters for production and nonproduction.
* The application tech stack is .net and Oracle
* There are several downstream applications that consumes business data via Kafka topics that recieves data via CDC from BOSS Oracle database.

# Application Profile

The BOSS application consists of five key components, each playing a crucial role in ensuring seamless functionality:

1. **User Interface (UI):** The frontend of the application, designed for Optum's internal users. It provides an intuitive and interactive experience, enabling users to access and manage data efficiently. The UI communicates with the backend through APIs to display business information and perform business operations.
2. **API Layer:** A set of RESTful APIs that serve as the bridge between the frontend and backend systems. These APIs handle data requests, authentication, and business logic execution, ensuring smooth and secure communication between the UI and the underlying services.
3. **Service Layer:** Responsible for executing core business operations and logic. It interacts with the database to process transactions, enforce business rules, and maintain data integrity. This layer ensures that all business workflows and computations are performed efficiently.
4. **Batch Jobs:** A set of scheduled background processes that automate recurring tasks. These jobs ensure the processing of critical tasks at defined intervals.
5. **BOSS Database:** An Oracle Database that holds business information on the customers, products, service agreements, and their relations.

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**LOB**: OH & Enterprise Clinical Tech

**App R Disposition:** Re-Platform

# Methodology

The following methods were used as part of this assessment.

**Discovery sessions:**

Discovery sessions were held using Microsoft Teams Meeting and Chat to review existing documentation for the Complex Medical Conditions Application.  Items reviewed during Discovery are as follows:

1. Current State Architecture
2. Sizing of Servers
3. Backup Requirement
4. Disaster recovery and BCP requirements
5. Application requirements
6. Database Migration Requirements
7. ETL & Batch Processing requirements
8. Security & compliance requirement
9. Monitoring and Observability
10. Cost Management

# Architecture and Platform (Current & Future)

## Current Architecture

A diagram of a network

AI-generated content may be incorrect.

The applications are monolithic, built using the .Net framework. The application components are containerized and deployed to Optum Azure Stack as Application Service. The application’s Batch Jobs are deployed to a Windows Server scheduled as Windows service. The application database is Managed Oracle hosted in on-perm. The application is deployed to both CTC and ELR datacenters with Oracle Database replication in place.

**Application & Deployment:**

* BOSS application's core components—UI, API, and Service—are containerized and deployed on Application Service instances within the Optum Azure Stack.
* The application's database runs on Oracle 19c, managed by the DBA team.
* The source code is maintained in GitHub repositories.
* The CI/CD pipeline is hosted in Azure DevOps Pipelines, automating build and deployment processes. There is a plan to migrate the pipelines to GitHub Action Workflows.
* The DMLs and DDLs for database changes are maintained in source control repository and tested in lower environment before rolling out to production environment.
* The application is deployed to both CTC and ELR datacenters and load balanced by f5 load balancer.
* The Change Data Capture (CDC) mechanism tracks changes in the Oracle database and publishes them to Kafka topics hosted in Google Cloud Platform (GCP). These topics are then consumed by various downstream applications, which may be deployed either on-premises or in cloud environments.

**Infrastructure & Configuration:**

* The BOSS application's core components—UI, API, and Services—are hosted on Application Service within the Azure Stack in an on-premises environment. The Application Service provides scalability in the range of 2 - 10 instances.
* The application's Batch Jobs run on Virtual Machines (VMs) with the following configurations:
  + Windows Server 2022 in the ELR datacenter
  + No Server in CTC datacenter
* The application's database is Oracle 19c, hosted on Exadata DB Server Nodes running Oracle Linux, ensuring high performance and scalability.
* The system operates in two distinct environments:
  + Production – for live, customer-facing operations
  + Staging – for testing and validation before deployment to production

**Application Characteristics:**

* The application depends on Entra ID (AD) for the login

**Technology Stack:**

* The application components UI, API, Service, and Batch Jobs are all developed using .net framework
* The backend APIs are RESTful. The front-end code makes HTTP calls to the backend APIs.
* The Batch Jobs are configured as Windows Services in the Windows Server

**Security Operations:**

* The application source code are subjected to static security scans (SCA and SAST) as part of the build pipeline.

**Monitoring & Orchestration:**

* The application monitoring is fulfilled by Azure Stack Console
* The database monitoring is fulfilled by the DBA team where automated email notifications are sent for DB alerts

**Data Growth & Retention:**

* Data is expected to grow 30% YoY.
* No data purge, archival, or retention policy is currently in place. All data is required for the business.

## Findings and Risks

* The BOSS application's components are hosted in an on-premises Azure Stack and on-premises Windows Server environments. While there are plans for cloud migration, the scope is currently focused only on the database.
* There is no Batch Job installation in the CTC datacenter.

## Recommendations

A diagram of a computer network

AI-generated content may be incorrect.

**Containerization & Deployment:**

* The application components – UI, API, and Services are already containerized. It is recommended to be deployed to Managed Kubernetes (Namespace as a Service) in Azure Cloud.
* Batch Jobs migrated to Windows Server VMs in Azure Cloud.

**Oracle Database Migration:**

* The on-prem Oracle database should be migrated to a self-managed Oracle instance in the cloud.
* Active-passive replication should be implemented to maintain high availability, eliminating the need to connect from the cloud to an on-premises database.

# Infrastructure

Refer to the Annexure Section for the list of servers / virtual servers in the infrastructure.

## Findings and Risks

**Infrastructure Overview:**

* The infrastructure spans across CTC and ELR datacenters, ensuring resiliency and high availability.
* It includes a mix of Windows Server for Batch Jobs and Linux servers for Oracle Database.
* The application components are deployed to manage on-perm Azure Stack.
* The applications between CTC and ELR are load balanced by Enterprise f5 load balancer.

**Monitoring & Logging:**

* Grafana are used for server infrastructure monitoring.
* The database is monitored by the DBA team and notification alerts are delivered via email.
* The application monitoring and log analysis is performed via Azure Stack console.

**Load Balancing:**

* The application endpoint is managed by a dedicated F5 load balancer instance, ensuring efficient traffic distribution and high availability.

**CI/CD Infrastructure:**

* The CI/CD is hosted in Azure DevOps pipelines.

## Recommendations

**Migration Scope:**

* The application components deployed to Azure Stack should be migrated to Cloud to ensure 100% cloud adoption and mitigate risk of on-perm to cloud connectivity risks.

**Environment Segregation:**

* There is no clear indication that production and non-production environments are segregated into separate networks.
* It is recommended to establish dedicated VNets for production and non-production environments to enhance security and isolation.

**Infrastructure Monitoring:**

* The infrastructure should be monitored using Optum recommended monitoring tools for Cloud Infrastructure. or a solution recommended by ARB (Architecture Review Board) for better visibility and compliance.

**Traffic Management & Security:**

* It is recommended to integrate Azure Load Balancer.
* Azure Front Door and Web Application Firewall (WAF) can be considered for additional layer of performance and security. However, it is not mandatory, as the application is Optum Internal.

# Security and Compliance

The security and compliance portion evaluation.

## Findings and Risks

* BOSS applications handle PHI and PII data and must adhere to HIPAA compliance standards to ensure data security and privacy.
* The system undergoes enterprise-level vulnerability scanning and code-level security scans.
* There is no available information on network-level or application-level penetration testing, posing potential security risks.

## Recommendations

* When migrating CI/CD to GitHub Actions Workflow, it is essential to use self-hosted runners with a dedicated pool for production jobs to maintain strict separation.
* Network level and application-level penetration testing should be performed periodically.
* Runtime vulnerability scanning must be implemented to detect zero-day vulnerabilities and enhance overall security posture.

# Data Management

## Data classification and tagging

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| PHI | PCI | PII | Company Confidential | Information Classification |
| YES | NO | YES | NO | PROTECTED |

## Findings and Risks

**Data Management Gaps:**

* There are no defined data backup policies, posing a risk to data availability and recovery.
* There are no data retention policies in place, leading to uncontrolled data accumulation.

**Data Growth & Volume:**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Database | Environment | Number of Tables (Approx Range) | | | Volume (GB) | Expected Growth YoY (%) |
| **BOSS Schema** | **BOSS\_ETL Schema** | **CDCORADL Schema** |
| HWTDV02 | Development | 800 | 10 | 10 | 1057 | 30 |
| HWTTS04 | Test | 800 | 10 | 10 | 847 | 30 |
| HWTTS05 | Test | 800 | 10 | 10 | 342 | 30 |
| HWTTS06 | Test | 800 | 10 | 10 | 1007 | 30 |
| HWTTS07 | Test | 800 | 10 | 10 | 1357 | 30 |
| HWTTS08 | Test | 800 | 10 | 10 | 1207 | 30 |
| HWTST02 | Stage | 800 | 10 | 10 | 1337 | 30 |
| HWTPR02 | Production | 800 | 10 | 10 | 1097 | 30 |
| HWTPR02\_1 | DR/Standby | 800 | 10 | 10 | 1097 | 30 |

* Average data volume per database is 1TB. The total volume is 10TB.
* The data is expected to grow at a rate of 30% year over year (YoY), increasing storage demands and potential performance risks.

# TCO Assessment & Management

## Findings and Risks

**Infrastructure Utilization:**

* Grafana metrics indicate that the provisioned servers of Batch Jobs are right sized.
* Utilization of Oracle servers are assumed to be right sized as well, as the metrics are not available.

## Recommendations

**Application Migration:**

* Migration of the applications to managed Kubernetes in Azure Cloud will reduce the TCO compared to the existing Azure Stack.
* Migration of the applications will also help eliminating overheads and cost due networking and data transfer between On-Perm and Cloud

# Business Continuity & Disaster Recovery

Business Continuity (BC) and Disaster Recovery (DR) in private cloud environments are focused on ensuring minimal downtime and maintaining continuous operations through robust infrastructure design, including redundant systems and data replication across multiple locations. These strategies involve detailed planning and testing to handle potential disruptions smoothly, including automated failover to backup systems and regular recovery drills to ensure all systems and processes are effective and ready to deploy in an emergency. By leveraging the inherent scalability and control of private clouds, organizations can tailor their BC/DR plans to meet specific needs, ensuring both swift recovery from incidents and resilience in ongoing operations.

|  |  |  |
| --- | --- | --- |
| **Aspect** | **Business Continuity (BC)** | **Disaster Recovery (DR)** |
| **Primary Goal** | Ensure that business operations continue without significant disruption. | Restore critical IT functions and data access quickly after a disruption. |
| **Focus Area** | Holistic approach that includes all aspects of the organization’s operations. | Specifically focuses on IT and data systems recovery. |
| **Implementation** | Requires strategies that cover the entire organization, often involving multiple sites. | Typically involves technical solutions such as data backup and failover systems. |

## Findings and Risks

* The BOSS application components are deployed in both CTC and ELR environments.
* Batch Jobs are not provisioned in ELR, leading to a gap in Disaster Recovery (DR) capabilities.

## Recommendations

* A Pilot-Light DR strategy can be implemented
* The BOSS application components (UI, API, and Services) are deployed to both the primary and DR sites with every release with 0 replicas.
* Batch Jobs are deployed to the DR server, but the server remains stopped during normal operations to optimize resource usage.
* Data replication from the primary to DR environment follows the existing Recovery Point Objective (RPO), ensuring data consistency and availability in case of a failover.

# Annexure 1: Server List

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Environment | Server Desc | FQDN | OS | CPU Count | Location | Memory |
| Production | Database | ep24db01.uhc.com | Exadata DB Server Node (Oracle Linux 4/5/6) | 64 | ELR | 2048 |
| Production | Database | ep24db02.uhc.com | Exadata DB Server Node (Oracle Linux 4/5/6) | 64 | ELR | 2048 |
| Production | Database | ep72db01.uhc.com | Exadata DB Server Node (Oracle Linux 4/5/6) | 64 | CTC | 2048 |
| Production | Database | ep72db02.uhc.com | Exadata DB Server Node (Oracle Linux 4/5/6) | 64 | CTC | 2048 |
| Production | Batch Job | wp000165966.ms.ds.uhc.com | Microsoft windows 2022 | 6 | ELR | 12 |
| Stage | Batch Job | wn000165965.ms.ds.uhc.com | Microsoft windows 2022 | 8 | CTC | 16 |