2019

BizConnect Phase 2 – Solution Blueprint

SOLUTION BLUEPRINT
FOR BUSINESS BANKING

UOB | Singapore

Project Code :	Date Created : 10-Jan-2019	File Name : BRM Regional BizConnect P2 – Solution Blueprint
Object ID :	Date Printed : 24-May-2019	Version : 1.0

Document Sign-Off

Revision History

Revision Date	Version	Updated By	Reviewed By	Summary of Changes
02-Oct-2018	0.1	Naveen Ichapurapu		Initial Draft
20-Mar-2019	0.2	Naveen Ichapurapu		Updated Solution architecture & DevOps sections. Merged Integration architecture into 1 consolidated doc.
25-Mar-2019	0.3	Naveen Ichapurapu	Arvind Singh. Prasad M.	Updated as per the comments. Removed DevOps section as it will be documented separately.
04-May-2019	0.4	Naveen Ichapurapu	Arvind Singh. Prasad M.	Updated as per the UOB comments.
07-May-2019	0.5	Naveen Ichapurapu	ChengKwang Heng, Arvind Singh. Prasad M. Nishant Kumar.	Updated as per the Accenture team review comments.
17-May-2019	0.6	Naveen Ichapurapu	UOB Team	Updated as per the UOB comments.
24-May-2019	1.0	Naveen Ichapurapu	UOB Team	Updated NFR as per the UOB recommendations.

Review List

Name	Department / Role / Company	Remarks	Date
Arvind Singh	Integration Lead/Accenture	Reviewed and updated Integration architecture	04/30/2019
Prasad M.	CRM & Data Migration lead/Accenture	Reviewed and updated BRM Entities and BRM Modules sections	04/30/2019
Nishant A. Kumar	CRM Lead/Accenture	Reviewed	04/29/2019
ChengKwang	Lead Enterprise Architect	Reviewed	07/05/2019

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1 OVERVIEW

1.1 Background

UOB Business Banking (BB) is aiming to improve the experience of its customers, particularly in the areas of acquisition, leads management, lending and liabilities, across three countries – Singapore, Malaysia and Thailand.

The objective is to transform the current sales model by forming a mobile sales force geared towards a most digitized sales process by enabling self-service acquisition, optimizing the leads management process, digitizing the application journey for both new and existing customers, as well as, enhancing the existing sales dashboard.

1.2 Objective

The objective of the Blueprint is to communicate the system 'vision' without committing to very specific implementation details.

The Blueprint should provide:

- an opportunity for the management to understand the proposed system
- a guideline in which the management can make informed decisions
- the team with a consistent statement of direction
- the team with a guiding principle in which to conduct detailed analysis.

The Blueprint should be a conceptual document that communicates the overall structure of the proposed system.

The Blueprint is not a detailed application design document and should only include enough information about the structure of the application to show how it fits into the overall architecture.

The Blueprint should be viewed as the target (to-be) toward which the analysis and development teams are to direct their efforts.

1.3 Scope

The scope of this document is limited to the solution blueprint for Microsoft Dynamics and Microservices for the below modules:

- Leads – SG, MY, TH
- Lending Account Opening – SG, MY, TH
- Liabilities Account Opening – SG (online & offline)
- Repayment Account Opening - SG
- Auto Leads Assignment & Campaign management – SG, MY, TH
- Customer 360 – SG,MY,TH

This document does not cover detailed Implementation/detailed design information. These details would be covered in the Technical Design Document (TDD) for the respective modules.

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1.4 Abbreviations

Abbreviations	Description
BRM	Microsoft CRM Platform used by UOB Business Banking users.
SFA	SalesForce Automation
BB	Business Banking
MSD	Microsoft Dynamics
DB	Database
TBD	To be Determined
SG	Singapore
MY	Malaysia
TH	Thailand
SharePoint	Document Library
XRM	As-is system (MSD 8.2) containing BB, GWB and PFS modules.
BRM	To-be system (MSD 9.0 with BB modules only)
SFTP	Secured File transfer Protocol
HTTPS	Secured Hyper Text Transfer Protocol 
MQ	Message Queue Protocol
EAI	Enterprise Application Integration (ESB layer to interface with core banking)
ESB	Enterprise Service Bus
REST	Representational State Transfer protocol
JSON	JavaScript Object Notation
XML	eXtensible Mark-up Language

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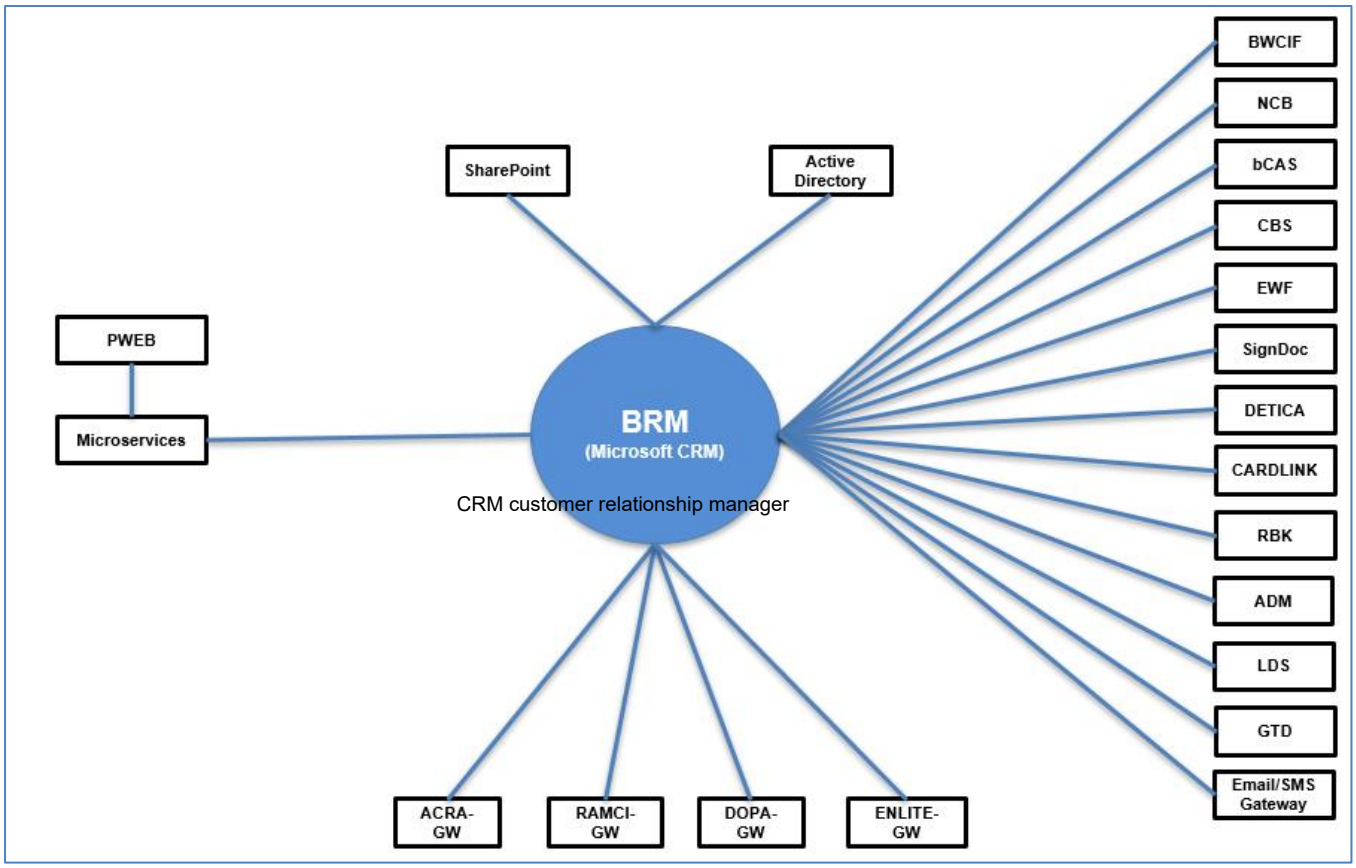
2 SOLUTION ARCHITECTURE

2.1 System Context

A system context diagram defines the boundary between the system, or part of a system, and its environment, showing the entities that interact with it. This diagram is a high-level view of a proposed system. The below diagram shows the BRM solution and the related systems that BRM interacts with.



System Context

Systems and descriptions

System	Description
BWCIF	Bank wide Customer Information System
NCB	National Credit Bureau (TH)
CBS	Credit Bureau system (SG)
bCAS	Business Banking Credit Application System

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EWF	Enterprise Workflow System
SignDoc	E-Signature system
DETICA	Name Screening System
CARDLINK	Debit/Credit Card Management System
RBK	Retail Banking (CASA Account Management System)
ADM	Appraisal Database Management (TH) – A system where RM can request for collateral valuations.
LDS	Loan Documentation System (TH) – A system where RM can request for LA generation and collateral processing.
GTD	Global Time Deposit (Term Deposit management system)
Email Gateway	Gateway to send the emails.
SMS Gateway	Gateway to send the SMS notifications.
ACRA-GW	Accounting and Corporate Regulatory Authority Gateway (SG) – The Gateway to ACRA to retrieve company information.
RAMCI-GW	RAM Credit Information Sdn Bhd Gateway(MY) – The Gateway to RAMCI to retrieve company information.
ENLITE-GW	ENLITE Database gateway (TH) – The Gateway to ENLITE database to retrieve company information.
DOPA-GW	Department of Provision Administration (TH) Gateway – The gateway that provides service for Thailand National ID verification.
PWEB	Public Web site for UOB Bank
Microservices	Microservices – An architectural approach to build applications.
SharePoint	Microsoft Collaborative platform (Document Management Systems)
Active Directory	Microsoft Directory service

2.2 Solution Architecture

This section describes the high-level architectural overview of the UOB BizConnect phase 2 BRM solution. The proposed solution provides the guidance for the solution component implementation and describes how these components are interconnected.

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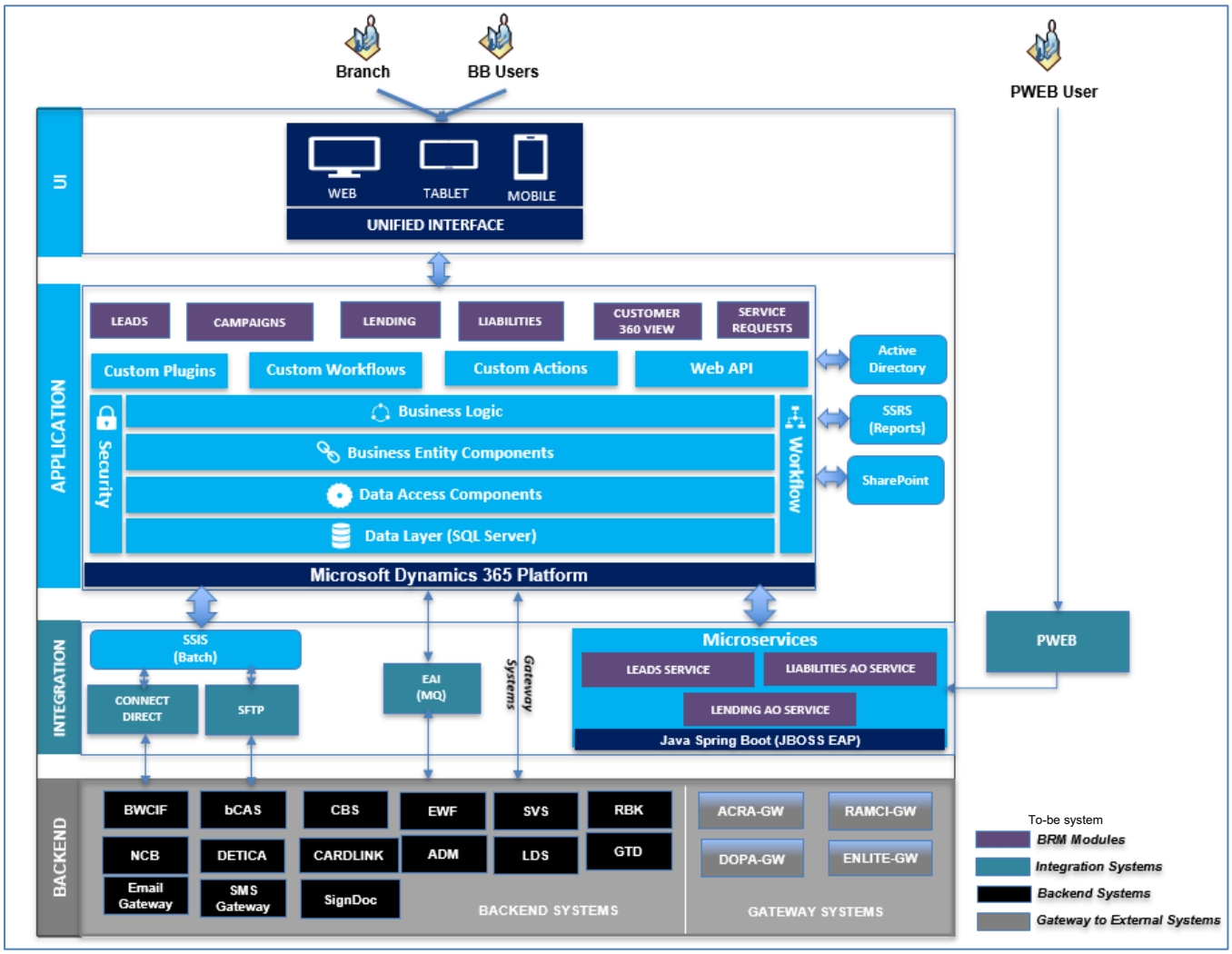

Solution Architecture

BWCIF Bank wide Customer Information System
NCB National Credit Bureau (TH)
CBS Credit Bureau system (SG)
bCAS Business Banking Credit Application System
EWF Enterprise Workflow System
SignDoc E-Signature system DETICA Name Screening System
CARDLINK Debit/Credit Card Management System RBK Retail Banking (CASA Account Management System)
ADM Appraisal Database Management (TH) – A system where RM can request for collateral valuations.
LDS Loan Documentation System (TH) – A system where RM can request for LA generation and collateral processing.
GTD Global Time Deposit (Term Deposit management system)

2.2.1 Solution Components

ACRA-GW Accounting and Corporate Regulatory Authority Gateway (SG) – The Gateway to ACRA to retrieve company information.
RAMCI-GW RAM Credit Information Sdn Bhd Gateway(MY) – The Gateway to RAMCI to retrieve company information.
ENLITE-GW ENLITE Database gateway (TH) – The Gateway to ENLITE database to retrieve company information.
DOPA-GW Department of Provision Administration (TH) Gateway – The gateway that provides service for Thailand National ID verification.

2.2.1.1 BRM Users

The BRM solution is designed for Business Banking users such as Relationship managers, Branch BB users, BET team, etc. These business users interact with BRM through the Desktop & Tablet, Mobile unified interface provided by Microsoft Dynamics 365.

Refer to the “Business User Access” section for the details on the various business users.

2.2.1.2 UI Layer

MSD provides the Unified Interface (explained below) which is typically used by the internal users. This layer renders the BRM UI components (HTML, CSS and JavaScript).

2.2.1.3 Application Layer

Application Layer, that is built on Dynamics 365 Customer Engagement, contains the core application logic and the solution components.

Guidelines for Application Layer Design:

1. System will be designed leverage on BRM v9 platform (after XRM v8.2 upgraded to v9) and will leverage on upgraded baseline solution (BRM v9) for application and Integration Design.
2. Common functionality across the country will be identified and endorsed by UOB Team before design and Implementation
    a. UOB shall have a Governance team to endorse new addition entity and field, and to determine the creation as COMMON or localized one.
    b. UOB shall have a Governance team to endorse deprecated entity and field. E.g. deletion/removal and renaming of entity and field.
    c. UOB shall be responsible to endorse naming convention such as prefixing entity and field with “UOB” for COMMON data model and prefixing “U”+<2-character Country Code> for any localized data model. Similarly, standard naming convention to apply for solution packaging.
    d. Core entities will be same across the countries, only country-specific entities, fields and components will be implemented for localisation.
3. Integration between systems should consider accessing through Microservice layer.
4. System will be re-using existing XRM customizations that are upgraded to v9, where applicable.
5. System will store documents in BRM document repository (i.e. SharePoint) while processing and archive the documents in enterprise document repository (i.e. EWF).
6. Only OOB Dynamics 365 functionality will be available in Mobile app, limited to the features available in existing XRM system for mobile apps.

The out of the box Dynamics 365 Customer engagement modules will be extended to implement the UOB specific business processes for Leads, Lending, Liabilities , Campaign management and Customer 360 views etc.

Below diagram shows the application architecture of the BRM built on MSD 9.0.

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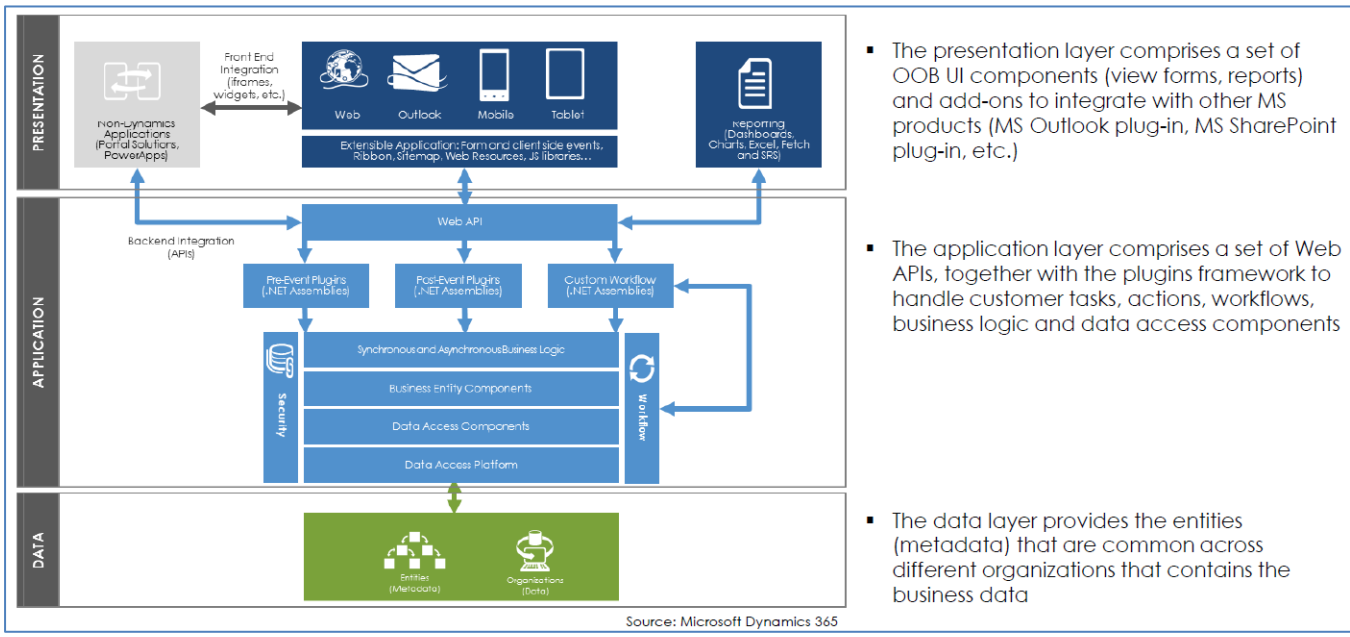

The core framework components of the Application Layer are

- Unified Interface
- Database Engine
- Plugins
- Actions
- Web API
- Workflows
- SharePoint
- Reporting Engine (SSRS)

2.2.1.3.1 Unified Interface

Unified Interface uses responsive web design principles to provide an optimal viewing and interaction experience. Whether users are on a browser, tablet, or phone, users will be able to consume similar experiences. BRM modules leverage on the Unified Interface feature provided by MSD to build the BRM UI. Refer to the link (Public website) for the details on the supported browsers.

https://docs.microsoft.com/en-us/dynamics365/customer-engagement/admin/supported-web-browsers-and-mobile-devices

Key features of Unified Interface:

- Similar form experiences to update and view our records.
- Interactive dashboards across all devices to view information and drill into it.
- All experiences on Unified Interface have accessibility features.

Capabilities not yet on Unified Interface:

There are certain capabilities that will not be unavailable in the Unified Interface.

- Custom styling of advanced chart properties (excluding colors and basic formatting)
- Composite address control
- Global notifications
- Admin experiences
- Editable grids on phones
- Learning Path

Source: https://docs.microsoft.com/en-us/dynamics365/customer-engagement/admin/about-unified-interface

2.2.1.3.2 Database Engine

Database engine is the core of the MSD components. MSD as a SOA (Service Oriented Architecture) offering from Microsoft works on application/object model instead of database model. Entity model is tightly coupled with application and synchronizes with application customization.

Most of the artefacts i.e. entities, configurations etc. are stored in Database engine, which is the tightly coupled with the MSD.

2.2.1.3.3 Plugins

MSD plug-ins are one of the most commonly used and powerful mechanism to extending the application. A plug-in is custom code, written and compiled in .Net, that is "triggered" when a specific event takes place within a specified entity. The objective of custom plug-in code is to enhance or modify the standard features/behavior of Dynamics 365 by injecting custom business logic into the execution of nearly any task a user performs.

Plugin code can be triggered to run when a record is created or updated or even when a group of records is queried. The MSD system contains a wide array of these events, commonly referred to as system messages, from which custom code can be triggered. Actions performed on entity will trigger the messages in MSD, which in turn trigger the plugin that is listening to the message/event.

Most BRM customizations are implemented as plugins which forms the core for the Business Layer implementation.

2.2.1.3.4 Actions

Actions in MSD are a capability to implement business logic that can be called in different ways such as through code or a workflow. Actions differ from Plugins which are triggered upon the changes to the entity. Actions are triggered by processes or code.

BRM customizations are implemented as actions where there is a requirement to trigger from various modules such as plugins/workflows or Web API.

2.2.1.3.5 Web API

The Customer Engagement Web API (OOB) provides a development experience that can be used across a wide variety of programming languages, platforms, and devices. The Web API implements

the OData (Open Data Protocol), version 4.0, an OASIS standard for building and consuming RESTful APIs over rich data sources.

Custom Web API's will be developed in BRM for exposing the BRM functionality for external systems to consume for example Microservices, RAMCI, bCAS etc.

2.2.1.3.6 Batch Jobs

SQL Server Integration Services is a platform for building enterprise-level data integration and data transformation solutions. Packages will be developed on SSIS with Kingswaysoft connector for MSD.

Console applications using .NET will be used for developing jobs for application batch processing.

Data migration modules will be developed in SSIS packages for data migration between XRM to BRM.

Batch data transfer between BRM and other systems (E.g.: BWCIF) will be performed using SSIS packages.

2.2.1.3.7 Reporting Engine (SSRS)

MSD for Customer Engagement apps includes reports that provide useful business information to the users. These reports are based on SQL Server Reporting Services and utilizes the same set of features that are available for the SQL Server Reporting Services reports.

MSD for Customer Engagement apps supports two types of reports:

SQL Server Reporting Services reports. These reports use SQL queries and filtered views to retrieve report data. Filtered views restrict the data to what is available to the security role of the person running the report. All the default reports included with MSD for Customer Engagement apps are SQL-based reports.

Fetch-based Reporting Services reports. These reports use FetchXML queries that are proprietary to MSD for Customer Engagement apps instead of filtered views to retrieve data for reports. Reports that created by using the Report Wizard in MSD for Customer Engagement apps are Fetch-based reports.

2.2.1.3.8 Workflow Engine

MSD comes with a powerful built-in workflow engine which enables the automation of business processes with minimal code. Workflows are processed in the background and can achieve complex business functionality.

Workflows allow for simple, or complex automation of tasks within MSD that can make an incredible difference to an organization. Workflows provide further utility in that they often act as an alternative to build the custom plug-in.

2.2.1.3.9 SharePoint

In the as-is (XRM) implementation documents are stored in MSD entity. In the BRM (to-be) implementation, application documents are stored in the SharePoint and location of the document is stored in BRM.

- BRM users do not access the SharePoint directly.
- Custom UI will be provided in BRM to access & upload documents to SharePoint.

2.2.1.4 Integration Layer

Integration Layer is built leverage on BRM components, SSIS, EAI and the Microservices (Java Spring Boot) to interact with the UOB Banking systems in online and batch modes. The key components of the integration layer are:

- Microsoft SQL Server Integration Services (SSIS) and .NET console program – Batch mode integration with the backend systems for offline file transfer.
- WebAPI – For online integration with backend systems to retrieve data and expose core BRM services for Microservices to consume.
- Microservices
- EAI

2.2.1.4.1 Integration Layer – EAI

EAI layer is the existing integration platform in UOB. EAI layer provides the interface for the Core Banking systems such as BWCIF. WebAPI and Microservices layer interface with the CoreBanking systems through EAI layer.

2.2.1.4.2 Integration Layer – Microservices

Microservices component will be developed to primarily integrate the other channels (such as PWEB) with BRM. The details of the Microservices are described under Section 3.

2.2.1.5 Backend Layer

Backend layer consists of non BRM systems that are existing in the UOB today.

- UOB Core banking systems that provide the services and data to BRM.
- Email/SMS gateway for customer communications
- External systems (External to Bank) accessed through internal gateway.

2.3 BRM Modules

The solution architecture defined in this document currently caters for the below functional modules and provides the guiding principles for the similar future modules to be built on BRM.

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BRM Module	Boundary	Interfacing BRM Module	Guidelines
Campaign Management	• Leads Upload • Sales Script • Capture Leads • Auto Assignment of Leads based on predefined rules	Leads	• Leverage on the OOB D365 Marketing module for campaign management. • Leverage on MSD Data Import functionality for uploading/updating campaign data. • Auto Assignment rules custom built by leveraging on D365 workflow capability
Leads	• Lead Capture • Lead Assignment • Lead Referral • Lead Qualification	Campaign Management Lending Liabilities Customer 360 Leads Services (PWEB)	• Leverage on the D365 OOB Leads functionality and D365 platform capabilities.
Lending	• Initiate Application • Capture applicant details from country specific authorised party as well as from Bank downstream system • Perform Due Diligence (Capture Consent, KYC, Credit Check) • Validate & Complete application (SiteVisit, EApplication, Signature Capture, Document Checklist, MAS Compliance) • Approvals (RMTL approval) • Application Fulfilment (Submit to bCAS)	Leads Customer 360 Lending AO Services (PWEB)	• Leverage on the D365 custom entity to capture Application Details • Leverage D365 OOB Business Process Flow (BPF) to capture different stages of Application • Leverage on D365 plug-in capability to execute Business logic automatically. • Leverage on D365 SSRS and iTEXT solution for Reports and E-Application, where applicable.
Liabilities	• Initiate Application • Capture applicant details from country specific authorised party as well as from Bank downstream system • Perform Due Diligence (Capture Consent, KYC, FATCA/CRS, Compliance,) • Validate & Complete application (Accounts & Services, Document Checklist) • Approvals (RMTL approval) • Application Fulfilment	Leads Customer 360 Liabilities AO Services (PWEB)	• Leverage on the D365 custom entity to capture Application Details • Leverage D365 OOB Business Process Flow (BPF) to capture different stages of Application • Leverage on D365 plug-in capability to execute Business logic automatically. • Leverage on D365 SSRS and iTEXT solution for Reports and E-Application, where applicable. • Leverage on D365 workflows to auto-create tasks for CMOC, COPC operations.

	(Account Opening, Customer Creation, Operations (CMOC, COPC)		
Liabilities – Repayment Account Opening	• Link existing CASA account with Lending Account. • Create New CASA account and link with Lending account.	Liabilities Lending	• Leverage on the D365 platform capabilities and Lending & Liabilities components mentioned above.
Customer 360 View	• 360 view of Customer showing • Customer Overview (Open Leads, Application and product recommendations) • Customer Information (contact details, service requests) • Accounts & Services • Borrowing information • KYC • View of Leads & Applications • Activities • Wallet Sizing	Leads Liabilities Lending Service Requests	• Customer 360 view will leverage on Real Time Data Service(RTDS) and BRM. • Data that is not owned by BRM will be fetched from RTDS.
Service Requests	• Service Requests to update/add on services. • Debit/Card Setup • Cheque book Issuance • eAlert service setup • BizSmart Setup • Corporate PayNow	Customer 360	• Leverage on the D365 Case Management module to implement service request capabilities.
Reports and Dashboards	• OOB Dashboard • Custom Reports • Custom Analytics Reports & Dashboard	Across modules	• Use OOB dashboard where applicable. • Leverage on Report Wizard to generate basic reports when data is available in BRM. • Leverage on SSRS to develop custom (complex) reports when report wizard cannot be fulfil the requirements. • Leverage on Power BI to develop Analytics Reports and Dashboards.

2.4 Application Design Guidelines

MSD allows to configure the system to meet needs of the business. For the BRM implementation the key design principle for the implementation is to follow UOB's design guidelines for MSD.

MSD Component	Principles
View/Child View	1. Prioritize the use of OOB UI controls.

	2. Use web resources instead of pages that require server-side processing whenever possible. 3. Don't use of ActiveX 4. Don't use custom JavaScript for data validations 5. Use a confirmation dialog box to confirm user actions 6. Don't use anonymous access.
Business Process Flow	1. Use Business Process flow to guide the execution of the work in a coherent way 2. Use Task flows for Mobile Experience. Whenever is required don't expose the full Process flow for mobile users
Workflows	1. Use sync execution for workflows that are manually initiated and/or operate in real-time 2. Use async execution for workflows that doesn't require user interaction 3. Use Actions to automate common commands as part of a workflow whenever is possible 4. Don't use workflows for scenarios with off-line execution (access to the system without connection to the server)
Business Rules Extensions	1. Use Business Rules for Business Process Flows and Workflows, whenever is possible 2. Use business rules to abstract the values used by Workflows or BPF. 3. Increase reusability encapsulating process specific rules in an external component whenever is possible (micro/service). 4. External component rules would be store in a Rules Engine (Drools/ILOG)
Integration Extensions	1. Use post-event plugin extensions to integrate with core systems whenever is possible. 2. Use threading support the application to break up the work across multiple CPUs. 3. Use early-bound plugins whenever is possible 4. Don't use service orchestration in the plugins 5. Don't use point-to-point integration
Data Model	1. Use the entity schema name to refer to a custom entity in code and queries 2. Don't use sensitive data on off-line entities 3. Limit operations that cascade to related entities 4. Extend entities instead of creating new ones whenever possible 5. Create new entities to manage specific custom concepts

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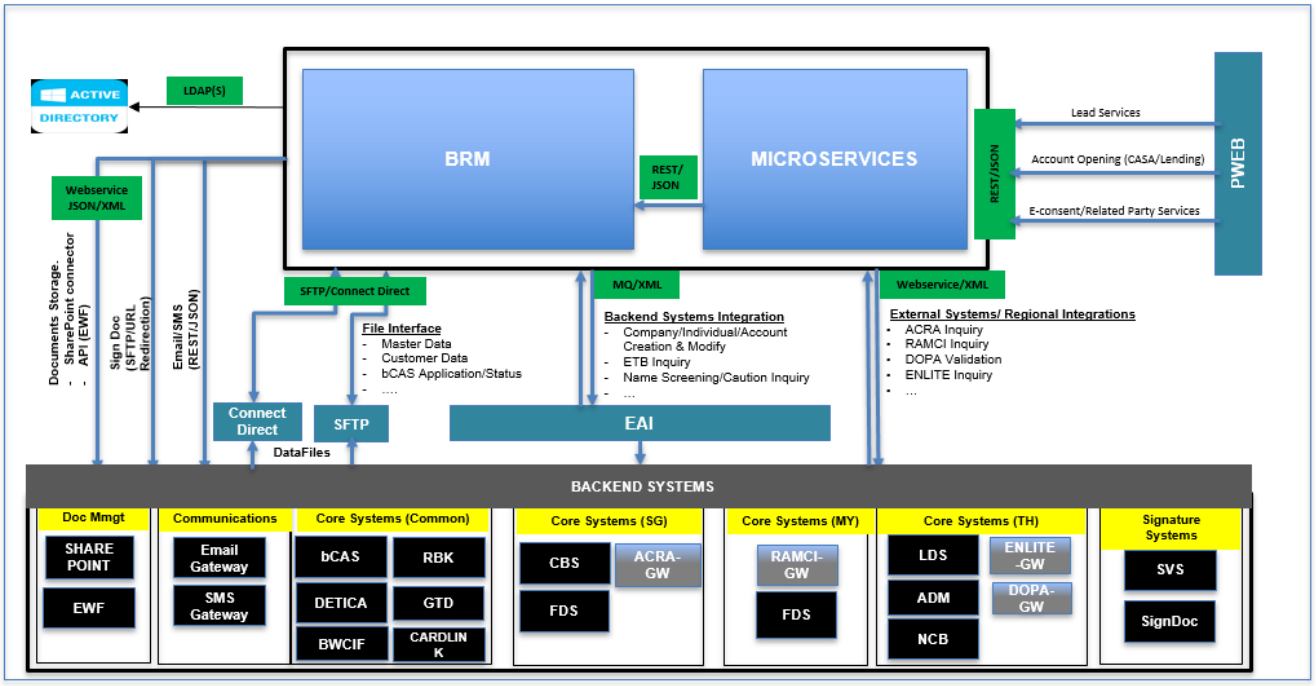
3 INTEGRATION ARCHITECTURE

3.1 Integration Architecture

This section describes the high-level integration architecture of the UOB BizConnect Phase 2 BRM solution. The diagram below describes the technical Integration solution that represents the building blocks for all BRM integration modules. The architecture includes guidance and design principles (described below) on how applications should be integrated.



Integration Architecture

3.2 Integration Modes

This section describes the various integration modes identified for the BRM implementation. These patterns serve as the guidelines for the future integrations originating from BRM as well as the external systems integration with BRM.

3.2.1 BRM Batch Integration (Offline integration)

BRM leverages on the SSIS capability for the implementation of the batch (offline) integration. Below diagram describes the batch pattern implementation in BRM.

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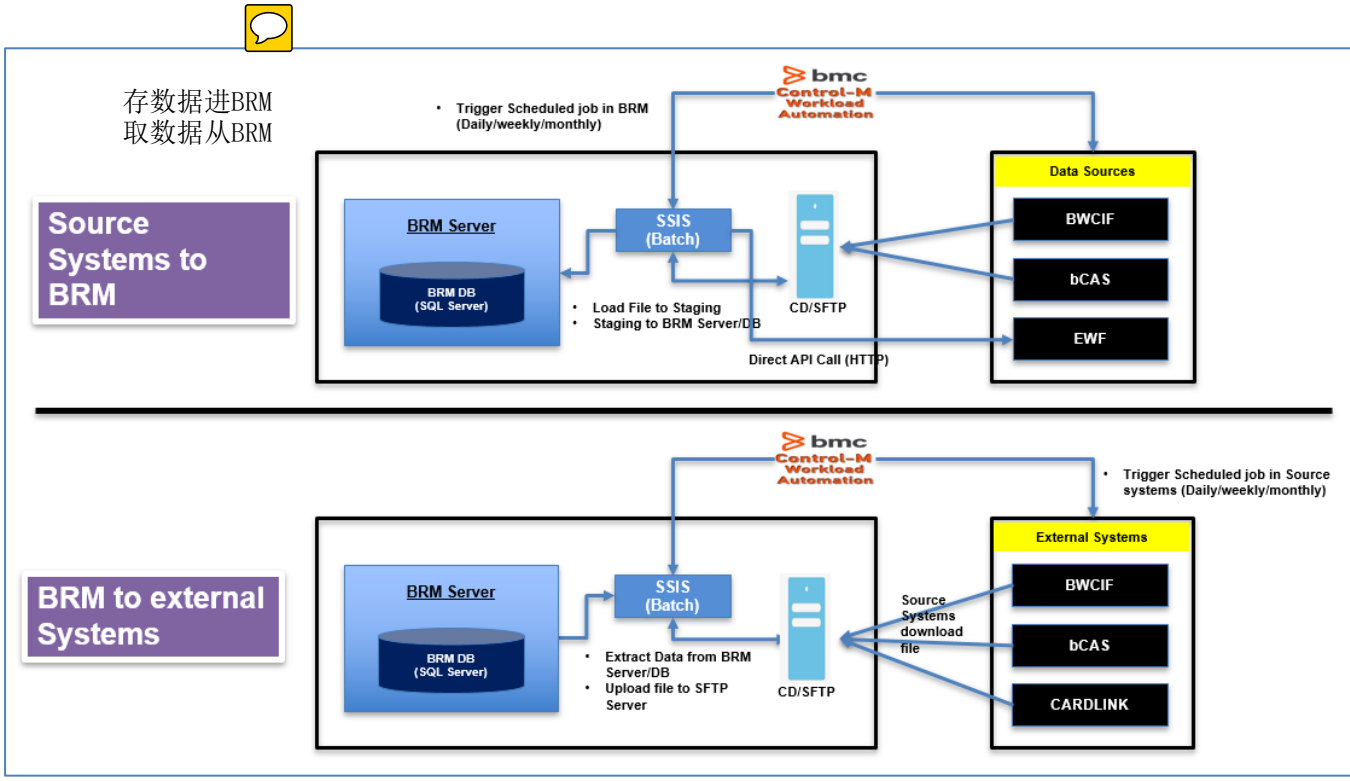

Note: Data Sources and external systems shown here are examples of the source systems.

Below are the guidelines that would require for batch integrations.

- All batch interfaces should be developed using SSIS packages or .NET console app.
- Batch jobs should capture any failure and should have retrigger mechanism and should continue from the failure point, where applicable.
- Batch jobs should capture batch execution log in DB.

3.2.2 BRM Online Integration

BRM modules call various backend systems (E.g., ACRA-GW, RAMCI-GW, DOPA-GW, ENLITE-GW) for the online data retrieval and for updating data to the backend systems.

- The calls originated by the action performed by the user in UI layer or via workflow will be channelled through the WebAPI, Actions or Plugins as shown in the diagram below.
- BRM should connect through microservice services to get response from source system if service is available in microservice otherwise it uses point to point API mechanism.
- All request and response XML/JSON going through BRM should be logged.
- System should capture request and response time for all integration.

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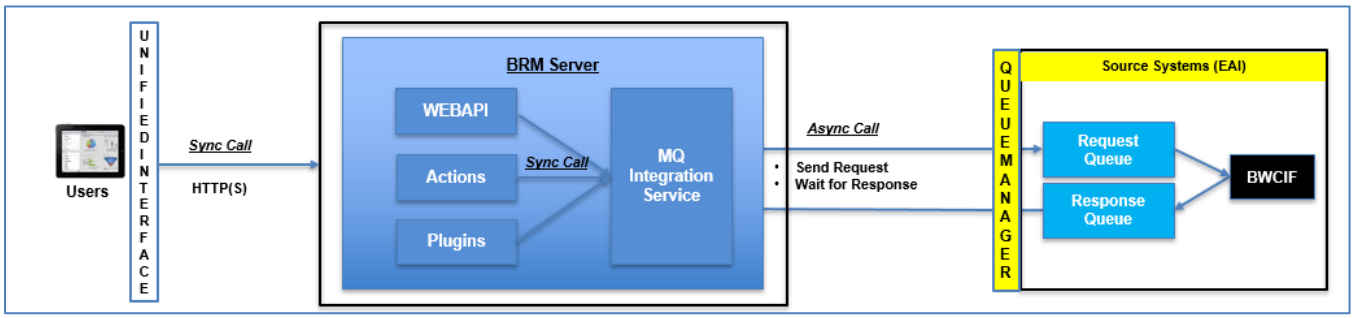

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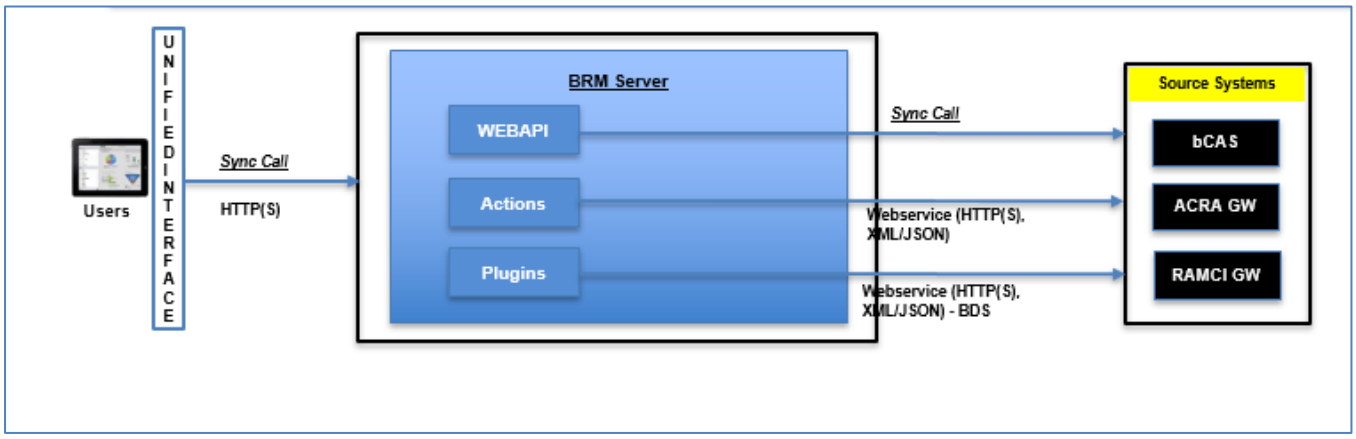

Note: Data Sources and external systems shown here are examples of the source systems.

3.3 Integration Systems

Below table shows the summary of the various systems that BRM interacts with various systems as shown in the integration architecture diagram.

Source	Target	Protocol	Mode	Purpose	Remarks
BWCIF	**BRM**	SFTP (Datafiles)	Batch	Customer data	SSIS Batch jobs
bCAS	**BRM**	SFTP (Datafiles)	Batch	Lending Application status.	SSIS Batch jobs
BRM	**CardLink**	SFTP (Datafiles)	Batch	Debit Card services	SSIS Batch jobs
BRM	**EAI**	MQ	Online	Provides interface to the Bank's backend systems such as BWCIF, RBK, CBS etc.	
BRM	**bCAS**	MQ	Online	Lending Application submission.	

BRM	**GATEWAY**	HTTPS - REST/JSON	Online	Provides interface to the external systems such as ACRA, RAMCI, ENLITE, DOPA inquiry services.	
PWEB	**MICROSERVICES**	HTTPS - REST/JSON	Online	Leads, Lending and CASA Account Opening services	
MICROSERVICES	**BRM**	HTTPS - REST/JSON	Online	BRM WEBAPI for Leads, Lending and CASA Account opening services	
BRM	**Active Directory**	LDAP(S)	Online	Security and Authentication	
BRM	**Share Point**	HTTPS – SharePoint API	Online	Store Application & applicant documents	
BRM	**EWF**	HTTPS - REST/JSON	Batch	Store documents	
BRM	**SignDoc**	SFTP – For document transfer URL – For Viewer	Online	Signature capture.	

3.3.1 BRM Service Inventory

This section contains the Service inventory that BRM services will interface with the Backend systems. The details of the service invocation (request and responses) are documented in the Technical design document of the respective modules i.e. Lending, Liabilities etc.

Please refer to the working document **BRM BizConnect P2 – MasterInterfaceInventory excel (latest version)** for the list of BRM API's and the interfacing systems used by BRM.

Note: The above document will be updated during the detailed design and development phase.

3.4 Microservices

Microservices component will be developed to primarily integrate the other channels (such as PWEB) with BRM. For the core functional modules built in BRM such as Leads, Application Opening for Liabilities accounts, Lending accounts and Repayment accounts BRM provides the User Interface which is mostly used by the internal users. However, these services need to be consumed by non-BRM channels such as PWEB which provides public interface for external users. Microservices services expose the BRM services to be consumed by the partners and 3rd party vendors such as PWEB, FINTECH etc.

Microservices shall consider the design principles defined by UOB, if any.

List of microservices identified for the BRM implementation:

- **Lead Service -** This service provides the interfaces for leads to the external system.
- **Lending AO Service -** This service provides the interfaces for Lending Account Opening Process to the external system.
- **Liabilities AO Service -** This service provides the interfaces for Liabilities Account Opening Process to the external system.

3.4.1 BRM Microservice modules

BRM Module	Boundary	Interfacing BRM Module	Guidelines
Leads Service	• Lead Creation • Lead Update • Lead Inquiry	Leads	• Expose the BRM capabilities as WEB API. • Expose Microservice to Interface with Channels (PWEB).
Lending AO Service	• Application Creation • Application Update • Application Inquiry • Document Upload • Update Related Party Details	Lending Leads	• Expose the BRM capabilities as WEB API. • Expose Microservice to Interface with Channels (PWEB).
Liabilities AO Service	• Application Creation • Application Update • Application Inquiry • Update Related Party Details • Update Consent • Document Upload • Inquiry Services (ETB/NTB Check, C2C Check).	Liabilities Leads	• Expose the BRM capabilities as WEB API. • Expose Microservice to Interface with Channels (PWEB).

3.4.2 BRM Microservice Inventory

Please refer to working document **BRM BizConnect P2 – Microservices excel (latest version)** for the list of BRM API's and the interfacing systems used by BRM.

Note: The above document will be updated during the detailed design and development phase.

3.5 Integration Design Guidelines

The following are the set of guidelines/principles that are recommended for the integration design:

Integration Design Guidelines

- Open standards and methodologies, such as Webservice/JSON or XML, should be adopted in preference to proprietary solutions for developing BRM integration modules.
- Integration modules and Microservices should be designed for reusability & agility across various modules for ex, Lending, Liabilities as well as across regions i.e. SG, MY, TH.
- Integration modules (Web API) should be loosely coupled with the application modules (for example Plugins & Actions)

Security Guidelines – Applicable for both Integration modules in BRM and Microservices

- Integration modules should comply with UOB security policies.
- To log audit trail of each request and response (to & from integrated systems) that is originated from BRM & Microservices.

4 ENVIRONMENTS AND OPERATIONAL VIEW

4.1 Environments Plan

BRM implementation follows the SDLC software engineering process that includes

- Analysis and design
- Development including Unit Test and System Test
- Testing
  - Systems Integration Test
  - User Acceptance Test
- Production Release

For a typical BRM Module implementation the following environments are minimally required:

- 1 DEV Environment
- 1 Data Migration DEV Environment (if data migration is required)
- 1 SIT Environment
- 1 Data Migration SIT Environment (if data migration is required)
- 1 UAT Environment
- 1 Data Migration UAT Environment (if data migration is required)
- 1 Data Migration Mock Run Environment (if data migration is required)
- 1 Staging Environment
- 1 Production Environment

However, there are multiple implementation teams could be running in parallel implementing different modules. The attached document shows the environment plan listing the various environments required for the BRM implementation.

Please refer to the working document **BRM BizConnect P2 – EnvironmentPlan excel (latest version)** for the environment plan.

Note: The environment plan needs to update based on the changes to project schedule.

4.2 DEV/SIT Environments

Below diagram demonstrates the proposed DEV/SIT environments structure for the BRM implementation.

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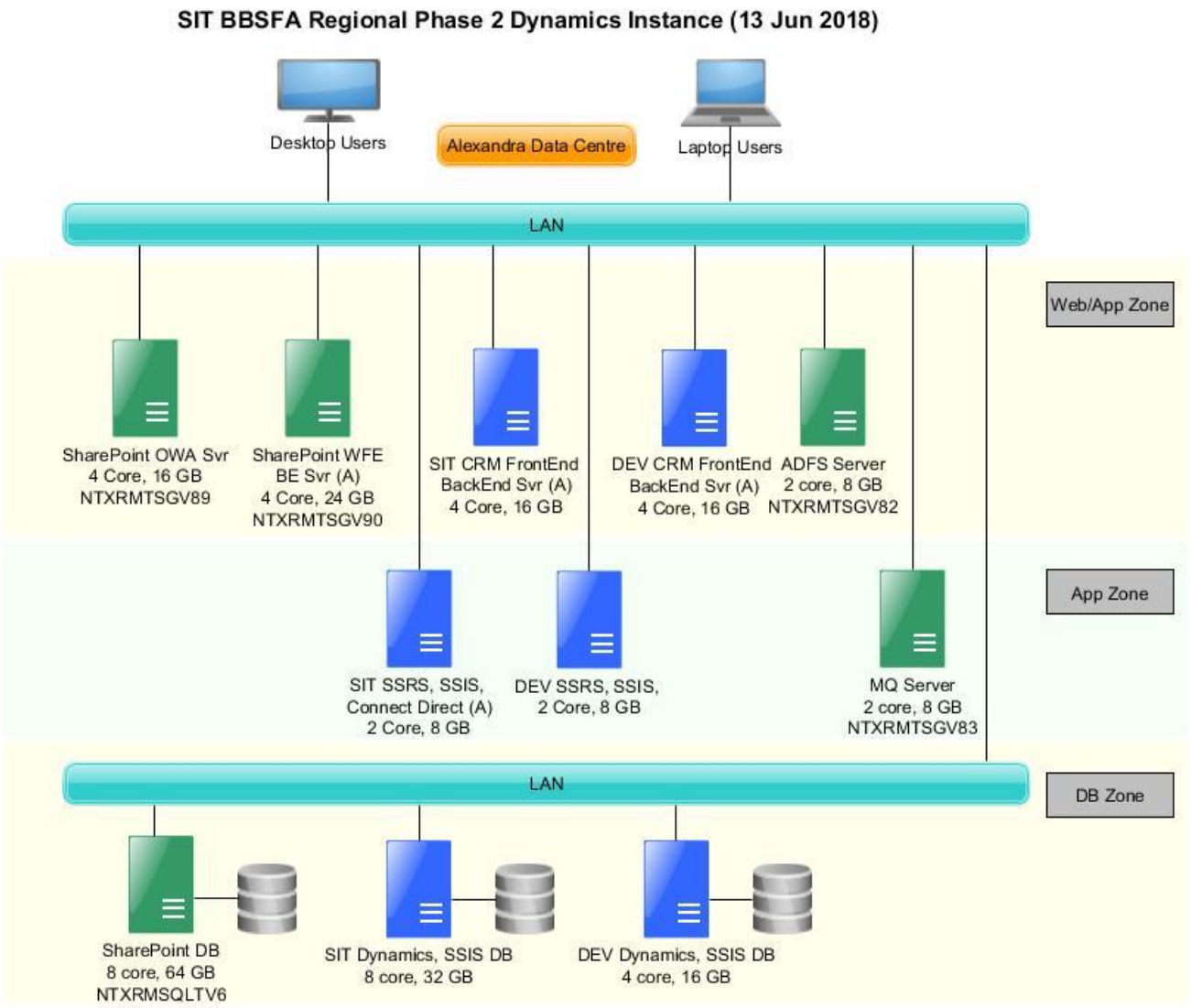

4.3 UAT & Mockrun Environments

Below diagram demonstrates the proposed UAT and Mockrun environments structure for the BRM implementation.

Project Code :	Date Created : 10-Jan-2019	File Name : BRM Regional BizConnect P2 – Solution Blueprint
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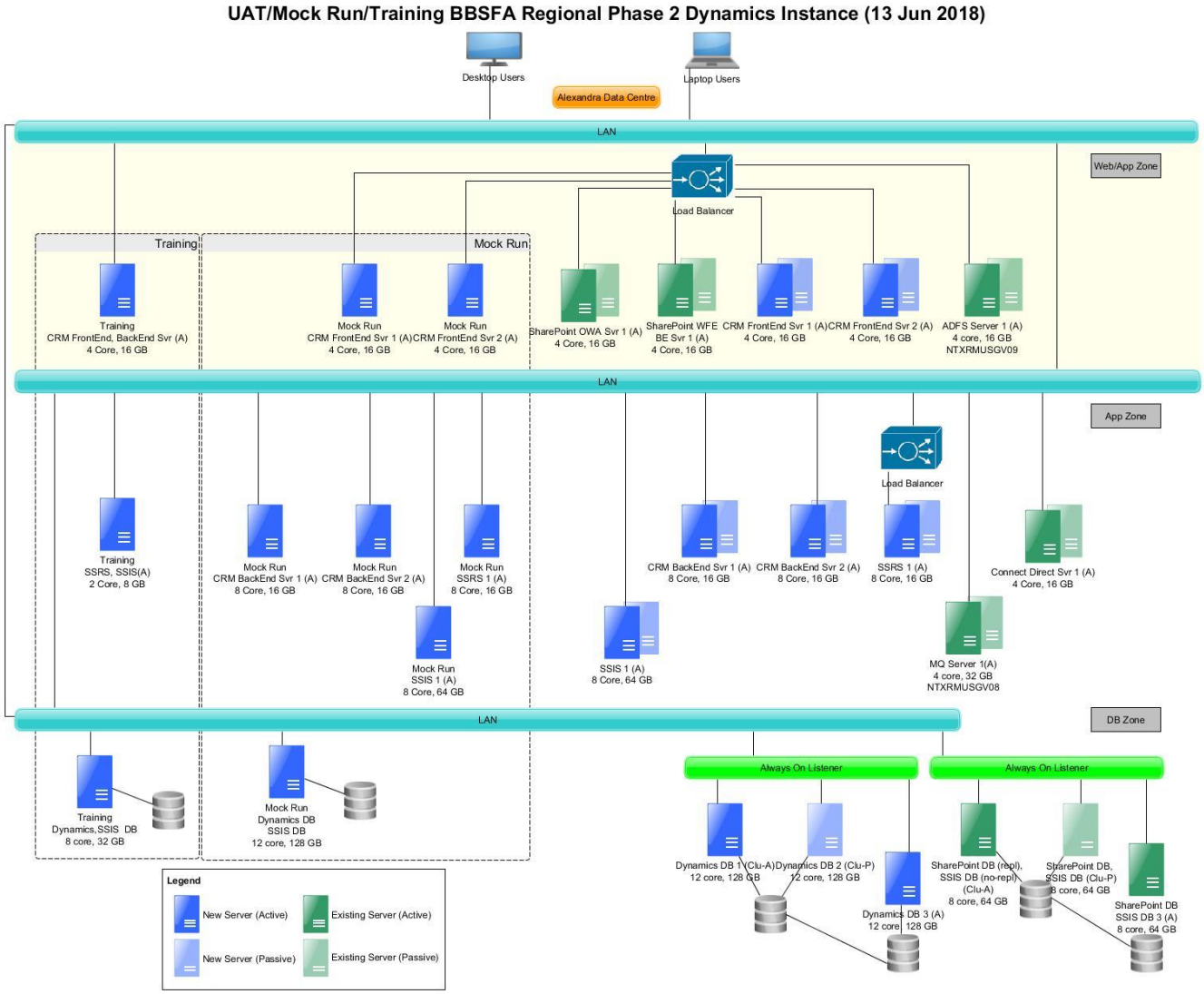

4.4 Production & DR Environments

Below diagram demonstrates the proposed Production and DR environments structure for the BRM implementation.

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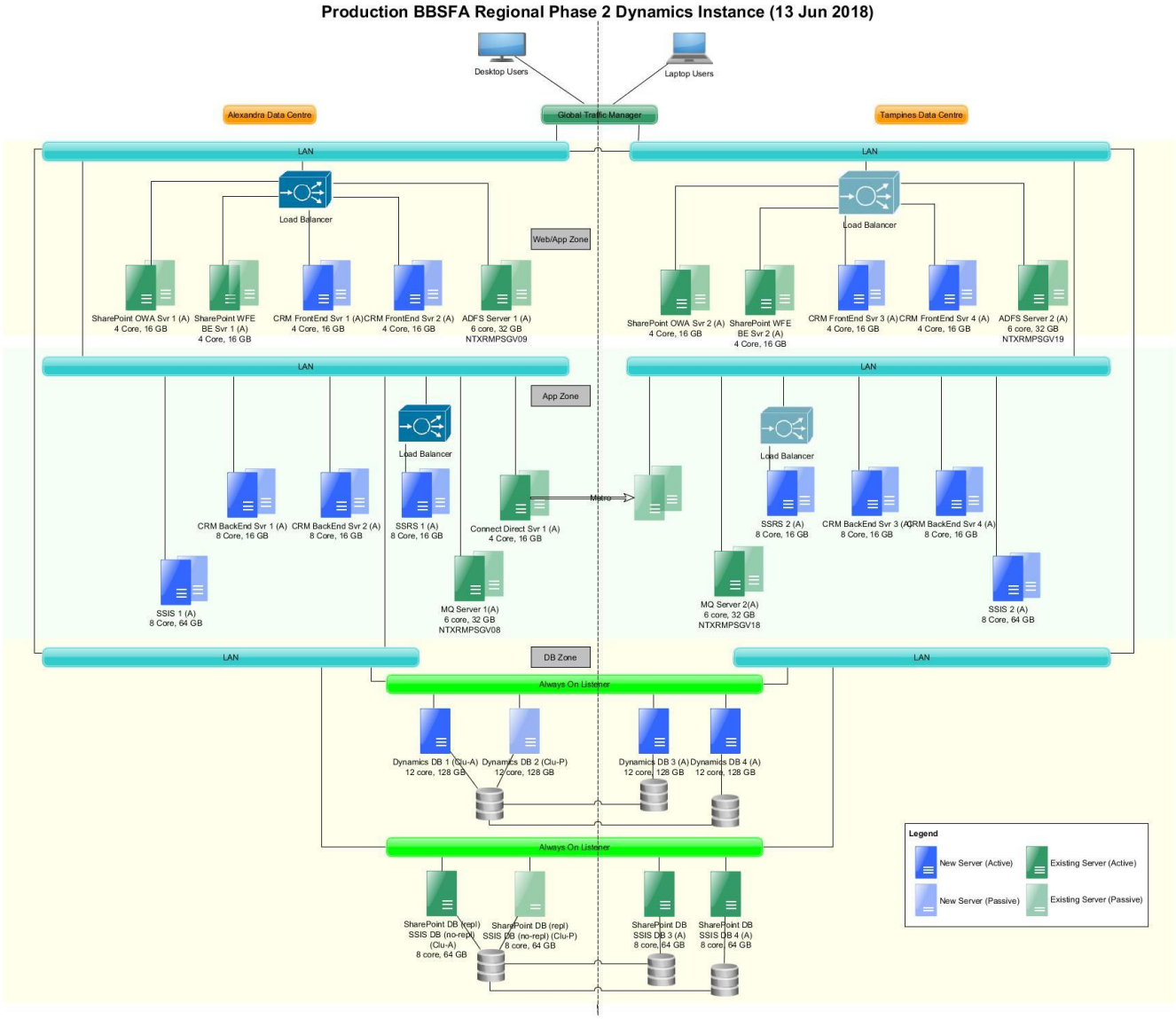

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5 BRM ENTITIES

This section describes the BRM entity categories and the classification of entities into regional and common/base.

5.1 BRM Entity Categories

BRM entities are categorized into the below high-level categories. Existing entities will be enhanced, and new entities may be developed during the detailed design phase for implementation of each modules.

Entity Category	Description
System Entities	The list of Microsoft Dynamics 365 Out Of Box entities. No modifications allowed on these entities.
Master Data Entities	These entities hold the master data that is required to support the BRM system. These master data entities are maintained within BRM.
Core Entities	Core entities support the key business operation for Leads, Lending and Liabilities. These are usually the transactional containing the key information.
Linked Entities	These entities hold the data from external systems i.e. BWCIF, BCAS that is used as a list of values in core entities.

5.2 Base/Regional Entity classification guidelines

Classification	Guidelines
Base Entities and fields	• Entities which are using across all regions such as Leads, Applications, Company and customers. • D365 custom entities which are using across all regions should be prefix with “uob_” • Entity description should start with “(Base)” to identify base entities. • D365 custom fields used across regions (base) should follow below extensions: ○ uob_

Regional Extensions for fields	• Extend the base entities to include regional fields for regionalization of forms and integration.
	• D365 Entity fields used only for specific region should follow below extensions:
	  ○ Singapore: uob_sg_
	  ○ Malaysia: uob_my_
	  ○ Thailand: uob_th_
	• Entity description should start with “(Regional)” to identify common entities.

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Regional Entities	• Create the regional entity where ever possible to capture regional information, that can be separated from base entity, either from Form or Integration • These entities should be prefix with “uob_regionname_” • Entity Description should start with “RegionName” and include purpose of Entity to identify region entities

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6 SYSTEM ACCESS AND SECURITY

This section describes the various users, user groups and organizational structure of the Business Banking for which the BRM system will be implemented. The system access requirements for BRM system is determined based on the organization structure and the role performed by the user, as documented in the functional FSD. The detailed access requirements for users and groups will be documented in Technical Design document of the respective module. System access requirements are divided into 2 categories

- Business user groups – Based on the organizational structure and functional requirements.
- System Access and Security groups – Technical users/accounts that need to run, perform support and maintain the BRM systems.

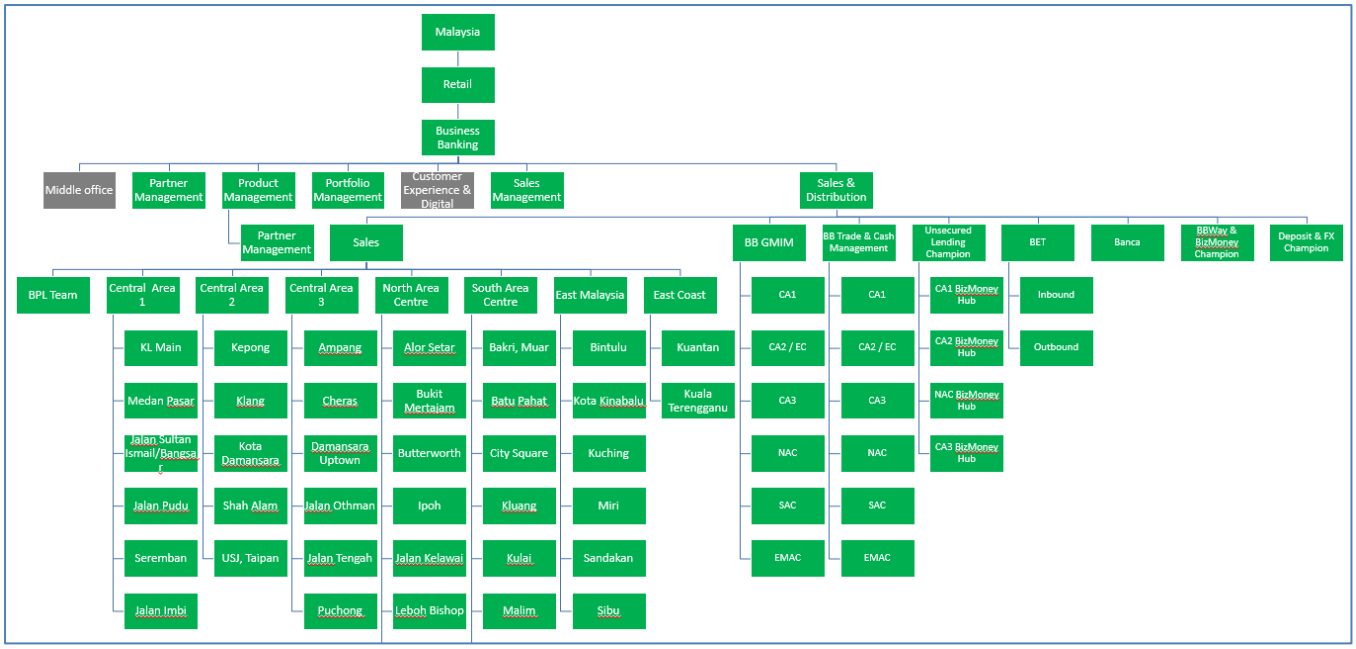
6.1 Business User groups

6.1.1 BB SG Organization structure

Refer to the attached excel for UOB SG organization and branches.

BB SG Org Chart.xlsx

6.1.2 BB MY organization structure



UOB MY Organization and Branches

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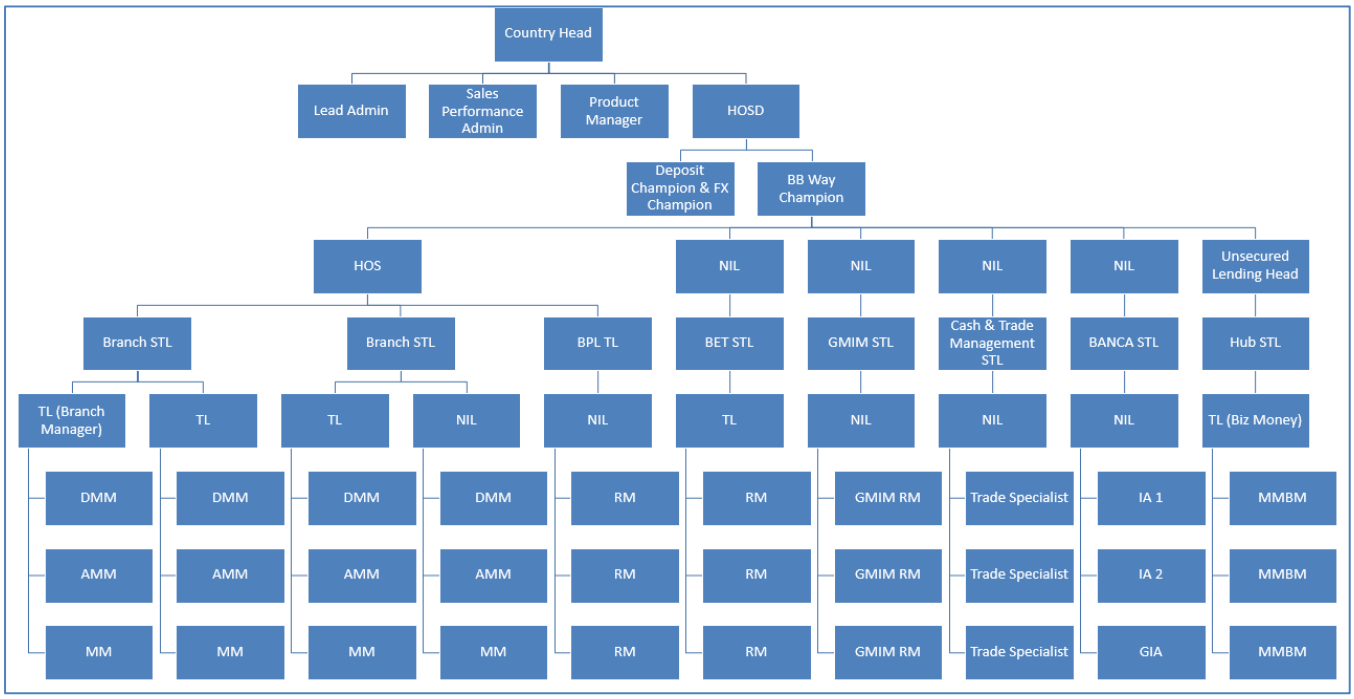
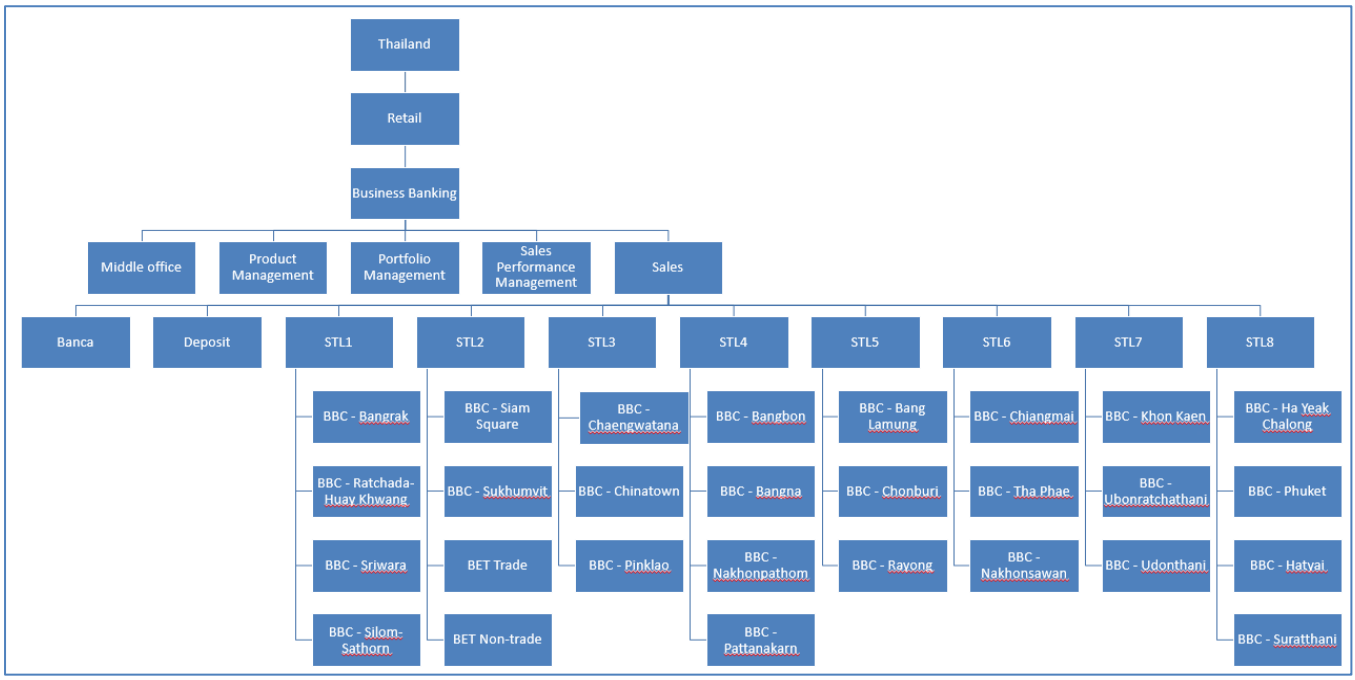


UOB MY BRM User Roles Hierarchy

6.1.3 BB TH organization structure



UOB TH BRM User role hierarchy

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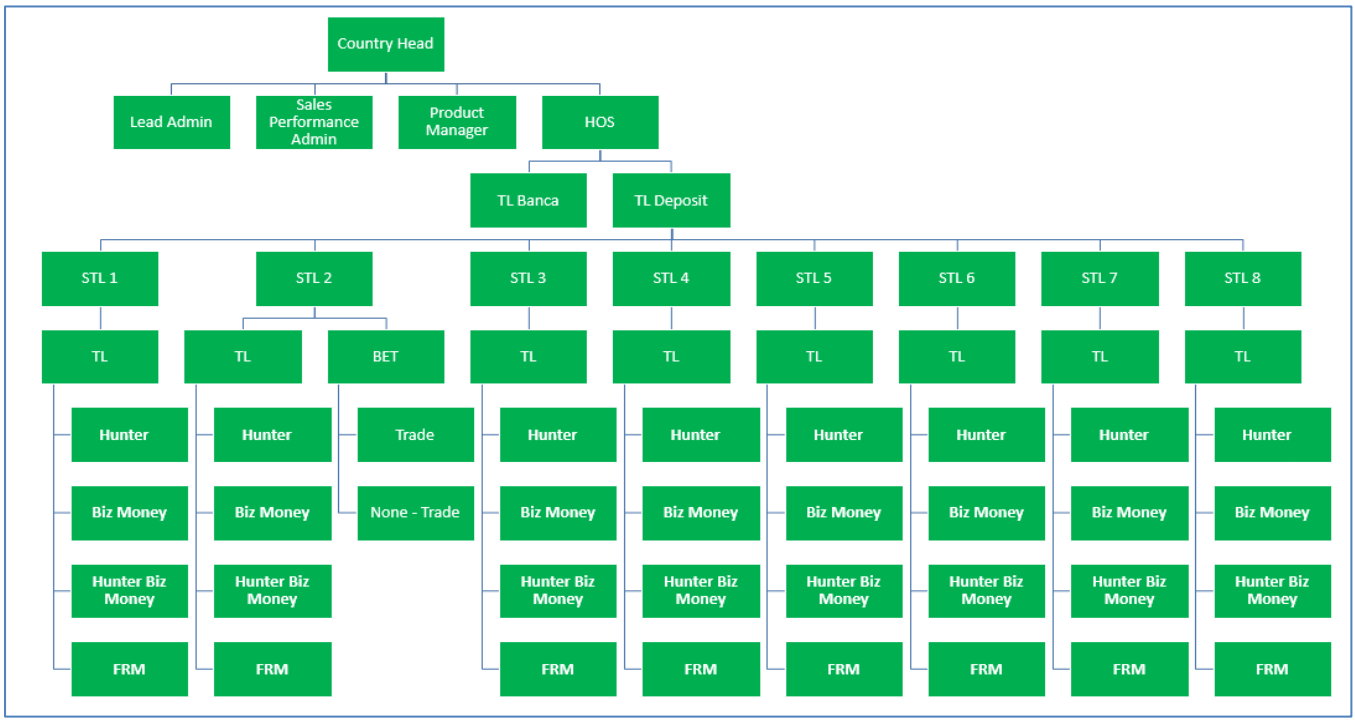

UOB TH Organization and Branches

6.1.4 BRM Roles

Roles are created according to the security best practice of least privilege, providing access to the minimum amount of business data required for the task. Users should be assigned the appropriate role for their job.

Based on the UOB organization charts (**Error! Reference source not found.**), the below user groups (this can be extended based on the requirements) will be created in BRM and access will be granted on the respective modules.

Note: New role(s) can be created with those specific privileges and add the user to the new role if a user needs additional access levels or rights. A user's rights are the union of all the roles to which he or she has been assigned. Teams can be used to create cross-functional groups so that specific objects can be shared with the team.

User Group	Organization Role	Remarks
UOB-BB-Relationship Manager	RM/RMTL	
UOB-BB-Lead Admin	Lead Admin	
UOB-BB-BusinessEngagementTeam	BET	
UOB-BB-Country of Head	Country of Head	
UOB-BB-DistrictManager – Branch	Branch STL	

UOB-BB-RMTL	RMTL	
UOB-BB-HeadOfSales	Head Of Sales	
UOB-BB-Product Manager	Product Manager	
UOB-BB-Sales Performance Admin	Sales Performance Admin	
UOB-BB-TeamLeader – Branch	TL (Branch)	
UOB-BB-TeamLeader	TL	
UOB-BB-OPS-CMOC-Team	CMOC Operational Team	
UOB-BB-OPS-CMOC-CheckerTeam	CMOC Operational Team	
UOB-BB-OPS-COPC-Team	COPC Operational Team	
UOB-BB-OPS-COPC-Checker Team	COPC Operational Team	
UOB-BB-OPS-CMOC Manager	CMOC Operational Team	
UOB-BB-OPS-COPC Manager	COPC Operational Team	

6.2 System Access and Security

This section describes the system access security for running BRM modules. The below security groups and roles are recommended for running MSD in Production environment.

6.2.1 Security Considerations

This section describes the general security considerations for running and operating MSD.

Service account type

Domain User account: If the service interacts with network services, accesses domain resources like file shares or if it uses linked server connections to other computers, minimally-privileged domain account should be used. Many server-to-server activities can be performed only with a domain user account and can provide the most secure option. This account should be pre-created by domain administrator.

Network Service Account: The Network Service account is a built-in account that has more access to resources and objects than members of the Domain Users group. Services that run as the Network Service account access network resources by using the credentials of the computer account.

Permissions required for MSD Setup and services

MSD Server Setup

- The user account used to run Dynamics 365 Server Setup that includes the creation of databases requires the following minimum permissions:

- Be a member of the Active Directory Domain Users group. By default, Active Directory Users and Computers adds new users to the Domain Users group.
- Be a member of the Administrators group on the local computer where Setup is running.
- Have Local Program Files folder read and write permission.
- Be a member of the Administrators group on the local computer where the instance of SQL Server is located that will be used to store the Dynamics 365 for Customer Engagement databases.
- Have sysadmin membership on the instance of SQL Server that will be used to store the Dynamics 365 for Customer Engagement databases.
- Have organizational unit and security group creation and add membership permission to those groups in Active Directory. Alternatively, Setup XML configuration file can be used to install Dynamics 365 Server when security groups have already been created.
- If SQL Server Reporting Services is installed on a different server, add the Content Manager role at the root level for the installing user account. Add the System Administrator Role at the site-wide level for the installing user account.

6.2.2 BRM Service Accounts

Below table describes the list of BRM service accounts required and recommended.

System ID / Group Name	Purpose	Type
BRM_PRIV_GRP	Privileged Microsoft Dynamics CRM user group for special administrative functions, including CRMAppPool identity.	Group
BRM_SQL_GRP	All server processes/service accounts that require access to SQL Server, including CRMAppPool identity.	Group
BRM_REPORT_GRP	All Microsoft Dynamics CRM users are included in this group.	Group
BRM_PRIVREPORT_GRP	Privileged Microsoft Dynamics CRM user group for reporting functions.	Group
BRMSVC_SDES	To run SQL Database Engine Service	ID
BRMSVC_AGNT	To run SQL Agent Service	ID
BRMSVC_SSRS	To run SQL Server Reporting Service	ID
BRMSVC_SSIS	To run SQL Server Integration Service	ID
BRMSVC_APPPOOL	To run CRMAppPool and Handles the uncompressing of zipped files for data import.	ID
BRMSVC_DEPL	To manage organizations, servers, and licenses for deployments of Microsoft Dynamics CRM.	ID

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BRMSVC_VSCS	Provides an interface to back up and restore Microsoft Dynamics CRM data by using the Windows Server Volume Shadow Copy Service (VSS) infrastructure.	ID
BRMSVC_MONI	Monitors all Microsoft Dynamics CRM Server roles that are installed on the local computer	ID
BRMSVC_SBPS	The Sandbox Processing Service server role enables an isolated environment to allow for the execution of custom code, such as plug-ins	ID
BRMSVC_ASYN	Services asynchronous processes such as bulk email and workflow	ID
BRMSVCADM_ONL	Service account to be configured in IIS to be used for MQ web applications to insert/update records into DB	ID
BRMUDEPLADM	ID will be used to support BRM deployment automation via Aldon	ID
BRMUCONFADM	This account will be used for application installation and configuration. This account will act as application admin after the installation.	ID

6.2.3 BRM Admin access Considerations

Below set of users might require the System admin access for OS and MSD on demand basis. The security policies of the UOB Tier 1 systems should be applied for the admin access.

- **Operational Technical user** – uses BRM to manage maintain parameters, rules etc. and configures system
  and performs backup and restore if required.
- **Infrastructure Administrator** – configures and maintain database, servers, network etc.
- **Security Administrator** – configures and maintains system users, roles, access etc.

6.2.4 Microservice System Access and Security

Microservice layer should consider the UOB recommended system access and security policies for Microservices platform.

7 NONFUNCTIONAL REQUIREMENTS

7.1 Performance Requirements

Below table shows the projected performance requirements for the proposed BRM system:

NFR	Requirement	Remarks
Total Number of Users	**Target** **SG – 600** **MY – 250** **TH – 300**	BRM application should support number of users per country and organization.
Number of Concurrent Users	**350**	BRM Application should support up to 350 concurrent users across the 3 counties and organizations. Performance test result would determine the number of servers required to support the concurrent users.
Availability	**Up Time : 24/7** **User Support : 12/5**	
API/Microservice Transactions	**1000 per day**	Microservice and the respective CRM Integration service should support 1000 transactions per day.
Response Time (UI)	**within 5 seconds**	BRM Response time depends on the backend systems (non-BRM) response time.

7.2 Performance Best Practices

To ensure efficient of our solution, it is recommended to follow Microsoft's recommended best practices to write code that performs better:

- Improving code
- Identifying network bottlenecks and expensive queries
- How to implement custom indexes
- Leveraging networking diagnostics tools to evaluate client latency to Dynamics 365 datacentres

Best Practice	Description
Use multiple threads	Add threading support to the application to break up the work across multiple CPUs
Allow the system to create GUIDs	Allow the system to automatically assign the GUID (Id) instead of manually creating it. This suggestion allows Dynamics 365 for Customer Engagement apps to take advantage of sequential GUIDs, which provide better SQL performance.
Use early-bound types	Use the Entity class when the code must work on entities and attributes that aren't known at the time the code is written.

Disable plug-ins	If possible, disable registered plug-ins before running the application
Write plug-ins that execute faster	Always write a plug-in that takes the least time to perform its intended task. If the plugin register plug-ins for synchronous execution, it is recommended to design them to complete their operation in less than 2 seconds. It's best to minimize processing time in plug-ins to maintain interactivity of the client applications that are connected to the same organization service that executes the plug-in.
Limit the data retrieval	When the methods that retrieve data from the server, retrieve the minimum amount of data that application needs. This can be done by specifying the column set, which is the set of entity attributes to retrieve.
Limit the number of entities that are enabled for offline use	Carefully consider if an entity must be available for people while working offline. Each entity that is enabled for offline capability directly affects the time required for people to synchronize data when they come back online. This is especially true for people with less powerful computers.
Limit operations that cascade to related entities	When the Update method or UpdateRequest message is used, do not set the OwnerId attribute on a record unless the owner has actually changed. When this attribute is set, the changes often cascade to related entities, which increases the time that is required for the update operation
Improve service channel allocation performance	You can establish a connection to the Dynamics 365 for Customer Engagement web services and authenticate users by using the OrganizationServiceProxy and DiscoveryServiceProxy service proxy classes. However, improper use of these service proxy classes can sometimes reduce application performance.

Refer to the https://docs.microsoft.com/en-us/dynamics365/customer-engagement/developer/best-practices-sdk for the updated best practices for D365.

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8 BACKUP AND RESTORE

Backup and Restore policies will follow the same process which is applicable to the Tier 1 systems in UOB.

BRM Application backup should include the below sub systems:

Server	What to backup
Domain controller	Full System State
SQL Server	MSCRM_CONFIG OrganizationName_MSCRM OrganizationName_CNG OrganizationName_STG master msdb ReportServer ReportServertempdb
SharePoint	SharePoint Site Collection and Database.
Microsoft Dynamics 365 Server	Refer to SQL Server database backup

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9 ARCHIVAL AND PURGE

Archival and Purge policies will follow the same process which is applicable to the Tier 1 systems in UOB.

There are no archival or deletion of any application data performed in the BRM application.

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10 APPENDIX

10.1 Data Migration Approach

For the data migration approach refer to **BRM Regional BizConnect P2 – Data Migration Approach V1.0.docx**.

Note: The Data Migration Approach document to be updated (where applicable) if there are changes on the Data Migration TDD.

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11 SIGN OFF

We confirm that we have reviewed and accepted the Solution blueprint dated __24/05/2019____, subject to the following qualifications/conditions (if any):

Name of User Department/Division

Name/Designation	Signature	Date
Name/Designation	Signature	Date

Business Technology Services Division

Name/Designation	Signature	Date
Name/Designation	Signature	Date

Name of Vendor (if applicable)