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Forwarding Letter

August 3, 2023

To,

Vice President & Head

Facility Management Division

Prime Bank Limited

Dear Sir,

We express our sincere gratitude for the opportunity to engage in your Request for Proposal (RFP) process regarding the implementation of the Supply Chain Financing (SCF) Solution. It is with great enthusiasm and confidence that we propose our advanced Software as a Service (SaaS) product, BORNALI, tailor-made to seamlessly fulfill your requirements.

BORNALI is an advanced SCF Process Automation Platform designed to meet the unique requirements of Prime Bank Limited. BORNALI offers an end-to-end solution to streamline and automate the entire SCF process, from customer onboarding to collection management. Spectrum Software and Consulting (Pvt.) Ltd. (SSCL) is a leading provider of software solutions, specializing in delivering tailored solutions to meet the unique needs of our clients. We are confident that BORNALI will provide Prime Bank Limited with the best tools and technology to help streamline its operations and enhance customer service.

With the implementation of BORNALI, Prime Bank Limited will attain several benefits. BORNALI is designed to maximize productivity, reduce costs, and improve customer experience. It is user-friendly, efficient, and designed to seamlessly integrate with the bank's existing IT systems. Additionally, BORNALI is optimized to provide the highest level of security.

We understand that implementing a new software system can be a significant undertaking. We are committed to providing the highest level of customer service and support throughout the implementation process. Our team of experts is available to answer any questions and provide guidance, assistance, and training to ensure a successful transition.

We have outlined the features, benefits, and pricing of our SCF solution, along with the legal and technical details to help you make an informed decision. We look forward to the opportunity to work with Prime Bank Limited to ensure that our software product is successfully implemented and that all necessary steps are taken to ensure the best possible outcomes.

Thank you for considering our proposal. Please do not hesitate to contact us if you have any further questions or require additional information.

Sincerely,

Mushfiqur Rahman

Managing Director

Spectrum Software & Consulting Ltd. (SSCL)

Executive summary

Spectrum Software and Consulting (Pvt.) Ltd. is pleased to present this proposal for the implementation of our innovative software product, BORNALI, to Prime Bank Limited. As a leading software solution provider, our team of experts has designed an efficient and secure solution for businesses to manage their accounts payable, increase liquidity, reduce risk, and maximize profit.

Small and medium-sized enterprises (SMEs) in emerging markets often face challenges accessing credit and liquidity. Supply chain finance (SCF) provides an alternative solution to finance their daily working capital needs. This type of financing offers benefits for all stakeholders involved, including large enterprises, their SME trade partners, and financial institutions. By leveraging commercial and trust relationships between SMEs and corporates, banks can extend working capital finance to SMEs. This finance extension then enables large corporations to improve their working capital management and reduce supply chain disruptions. Furthermore, SCF allows banks to better assess, measure, and manage the risks associated with extending financing to SMEs. Thus, supply chain financing creates a win-win situation for all stakeholders.

BORNALI is a cutting-edge platform that automates the supply chain finance process and offers a comprehensive solution for the SCF department. BORNALI supports all four SCF structures currently used by Prime Bank Limited, namely Purchase Order (PO) Financing, Factoring Financing, Reverse Factoring, and Distributor Financing. BORNALI is designed to streamline and automate the entire SCF process, from customer onboarding to collection management. It leverages a workflow engine, allowing users to quickly and easily create new financial process flows.

BORNALI's core strength lies in its ability to streamline and automate the end-to-end SCF process, thereby reducing the time, cost, and errors associated with manual processes. By implementing BORNALI, Prime Bank Limited can improve its SCF operations by reducing processing times and errors, while increasing transparency and efficiency. By offering this cutting-edge SCF solution, Prime Bank Limited can distinguish itself from competitors and attract more clients seeking reliable and efficient SCF services.

This proposal details BORNALI's features, benefits, pricing, as well as its associated legal and technical details. BORNALI presents an excellent opportunity for Prime Bank Limited to enhance its SCF operations, improve client satisfaction, and drive growth in the Bangladeshi SCF market. We hope the information presented will enable you to make an informed decision. We are excited about the prospect of collaborating with Prime Bank Limited to ensure the successful implementation of our software product, while taking all necessary measures to achieve optimal outcomes.

Confidentiality Statement

Spectrum Software and Consulting Ltd. (SSCL) has prepared this proposal in response to the invitation from Prime Bank Limited for a proposal on Supply Chain Finance Management System.

The information contained in this document is confidential and proprietary to SSCL. It has been made available to Prime Bank Limited, solely for its consideration for evaluation of our services. In no event shall all or any portion of this document be disclosed or disseminated without the written permission of SSCL.

This proposal document is submitted to Prime Bank Limited on July 25, 2023.

SECURITY WARNING

The information contained herein is proprietary to Spectrum Software and Consulting Ltd. Client may not use, reproduce, or disclose to others except as specifically permitted in writing form by Spectrum Software and Consulting Ltd. The recipient of this document, by its retention and use, agrees to protect the same and the information contained therein from loss or theft.

Acronyms

#	Term	Elaboration and definition
1	SCF	Supply Chain Finance
2	SSCL	Spectrum Software and Consulting (Pvt.) Ltd.
3	BRD	Business Requirements Document
4	SaaS	Software as a Service
5	SME	Small and Medium-sized Enterprise
6	BAB	Bangladesh Association of Banks
7	CCC	Cash Conversion Cycle
8	DSO	Days Sales Outstanding
9	DPO	Days Payable Outstanding
10	EBIT	Earnings Before Interest and Taxes
11	UI	User Interface
12	UX	User Experience
13	DDoS	Distributed Denial of Service
14	LI	Lawful Interception
15	BOQ	Bill of Quantity
16	I/O	Input/Output

1. Introduction

Supply Chain Financing

Supply Chain Finance (SCF) is a cash flow solution that helps businesses free up working capital trapped in supply chains. It is a solution designed to benefit both suppliers and buyers: suppliers get paid early, and buyers can extend their payment terms. This solution allows businesses to unlock working capital as well as reduce the associated risk. SCF is typically applied to open account trades and is triggered by supply chain events. The visibility of underlying trade flows is a critical component of such financing arrangements. Financial institutes utilize technology-based solutions to ensure visibility, lower financing costs, and improve business efficiency for buyers and sellers linked in a sales transaction.

Let us assume a buyer purchases goods or services from a supplier. Under traditional circumstances, the supplier ships the goods and then submits an invoice to the buyer, who approves the payment on standard credit terms of 30 days. But if the supplier is in dire need of cash, it may request immediate payment, at a discount, from the buyer's affiliated financial institution. If this is granted, that financial institution issues payment to the supplier and, in turn, extends the payment period for the buyer by an additional 30 days, for a total credit term of 60 days rather than the 30 days mandated by the supplier. Essentially, SCF refers to a situation where a buyer will approve a supplier’s invoice for financing from a bank or finance institution.

Supply Chain Financing in Bangladesh

SCF is a critical component of the business ecosystem in Bangladesh, particularly for small and medium-sized enterprises (SMEs) that face significant financial constraints. The country's economy heavily relies on the manufacturing and agriculture sectors, which are largely composed of SMEs, making access to working capital a major challenge. SCF addresses this challenge by providing financing options to businesses that are part of a supply chain, typically in the form of short-term loans that are secured against invoices or other receivables.

The government of Bangladesh has recognized the importance of SCF in promoting the growth of SMEs and the economy as a whole. In recent years, various initiatives have been launched by the government, the central bank, and private sector organizations to promote and facilitate SCF. These initiatives have helped increase awareness and adoption of SCF among businesses in Bangladesh, leading to increased disbursements and beneficiaries.

The Bangladesh Bank, the central bank of Bangladesh, has launched many initiatives to promote supply chain financing, including a refinancing scheme for banks and financial institutions to provide working capital to SMEs. The Bangladesh Association of Banks (BAB) has also introduced an SCF scheme to help SMEs access credit. According to a report by the Bangladesh Bank, SCF disbursements reached BDT 136.74 billion ($1.6 billion) in 2019, up from BDT 117.98 billion ($1.4 billion) in 2018.

The same report showed that the manufacturing sector accounted for the largest share of SCF disbursements in 2019, with BDT 64.82 billion ($0.8 billion) disbursed to this sector. The agriculture sector received the second-largest share of SCF disbursements in 2019, with BDT 40.89 billion ($0.5 billion) disbursed. The report also showed that the number of SCF beneficiaries increased from 38,119 in 2018 to 52,925 in 2019, indicating a growing awareness and demand for this type of financing.

Overall, supply chain financing is an essential aspect of business operations in Bangladesh. Efforts are being made to increase its availability and accessibility to SMEs, who are vital contributors to the country's economy.

2. Objective

Supply Chain Finance (SCF) represents a formidable financial methodology, empowering enterprises to liberate entangled working capital confined within their intricate supply chain, presenting both suppliers and buyers with reciprocal advantages. While suppliers secure early payments, buyers leverage the option to elongate their payment terms, facilitating astute cash flow management, risk mitigation, and the acquisition of otherwise elusive capital. Each stakeholder engaged in the SCF process bears bespoke aims and objectives, succinctly enumerated hereunder:

Supplier's Goals:

1. Enhancing working capital efficiency, suppliers can reduce Days Sales Outstanding (DSO).
2. By securing early payments from the financial institution, suppliers can optimize their Cash Conversion Cycle (CCC) compared to the usual payment schedule from buyers.
3. Certain SCF solutions may present SME suppliers with a cost-effective financing option, leveraging the financial and commercial robustness of prominent anchors.
4. Supply Chain Finance (SCF) enhances the symbiotic interplay between suppliers and buyers, fostering stronger rapport by virtue of amplified collaboration, stemming from elevated integration across the entire supply chain.
5. The implementation of Supply Chain Finance (SCF) delivers substantial advantages to vital stakeholders in both the treasury and sales departments. It facilitates the augmentation of the company's overall liquidity by optimizing the cash cycle, thereby enhancing financial fluidity for improved operational efficiency.
6. Moreover, it enables the sales team to broaden their revenue streams by facilitating an increase in credit-based sales. As the company can effortlessly secure financing against these credit sales, the expansion of overall sales becomes more feasible and achievable.
7. In the case of payables finance (reverse factoring), the seller gains access to off-balance sheet financing as the financial institution assumes ownership of the underlying receivable, preventing it from being reflected on the company's balance sheet.
8. With distributor finance, sellers can typically mitigate the risks associated with their balance sheets, ensuring the sustenance of adequate primary sales while effectively managing inventory levels at the distributor's end.

Buyer's Goals:

1. Buyers can enhance working capital efficiency and elongate Days Payable Outstanding (DPO) by securing payment extensions from the financial institution.
2. With reverse factoring, buyers can achieve supply chain stabilization by enlisting strategic suppliers into the SCF program.
3. Supply Chain Finance (SCF) enables the establishment of enduring and secure relationships with a reliable supplier base, ensuring lasting partnerships for the buyer.
4. Cutting-edge solutions in the supply chain finance realm, such as dynamic discounting, offer buyers an early payment discount, resulting in a favorable effect on the company's EBIT (Earnings Before Interest and Taxes).

Distributor's Goals:

1. Distributors can enhance working capital efficiency by extending their Days Payable Outstanding (DPO) through payment extensions facilitated by the financial institution
2. SCF grants distributors access to financing by leveraging their business association with a major manufacturer
3. SCF can enhance distributors' rapport with their sellers by fostering greater collaboration, driven by heightened integration throughout the supply chain

Financial Institution's Goals:

1. SCF nurtures enduring bonds with prominent buyers by actively engaging key stakeholders within their organizations, such as CFOs, treasurers, and heads of procurement.
2. SCF contributes to the expansion of the financial institution's clientele, offering access to new SME customers through initiatives like reverse factoring and distributor finance, while also creating opportunities for cross-selling.
3. SCF constitutes an exceptionally stable and low-risk source of revenue when juxtaposed with traditional lending offerings. Firstly, the funding structure for SCF products revolves around a substantial anchor, ensuring self-liquidating or waterfall transactions. Secondly, SCF programs generate income through fees in addition to interest, while also typically featuring shorter durations compared to perpetually extended working capital lines.
4. In the domain of SCF, a common characteristic entails a reduced acquisition cost coupled with enhanced risk management, arising from augmented accessibility to comprehensive data and information.
5. Through its involvement in transactional business, SCF engenders value addition, resulting in an expanded wallet share and amplified returns on client relationships.

3. Compliance

		Vendor's Feedback	
Sl	**Description**	**Fully Complied**	**Comments**
1.	Each vendor those who qualified primarily, will be called for a session to pitch and show proof of concept/demo in front of RFP evaluation committee of the bank and within 3 days of that session, final financial offer to be submitted in sealed envelope.	Fully Complied	Proof of concept/demo will be provided accordingly
2.	Vendors shall have the capability to deploy/design SCF platform which can serve with both online and offline modules. In case of Online module, platform must have the capability to integrate with third party's ERP on demand basis.	Fully Complied	For SCF with online module: Please go to Chapter 7 (Proposed Solution BORNALI) For SCF with offline module: Please go to Chapter 7 (Proposed Solution BORNALI) For SCF with online module with experience of integration with 3rd party ERP: Please go to Chapter 7 (Proposed Solution BORNALI)
3.	Vendor having one live deployment at a bank with similar services will get added advantage.	Fully Complied	For more details please go to Appendix-B (SSCL SCF Technical An Financial Proposal Submission)
4.	Proposed solution must be hosted in Prime Bank premises	Fully Complied	For more details please go to Chapter 8.5.4 (Network Diagram)
	Vendors should enclose following documents with their response	Fully Complied	Please refer below.
5.	Company Profile along with Board of Directors	Fully Complied	SSCL: Please refer Section 15.8 of this document. Spectrum: Please refer Section 16.8 of this document.
6.	Trade License	Fully Complied	SSCL: Please refer Section 15.1 of this document. Spectrum: Please refer Section 16.1 of this document.
7.	Certificate of Incorporation	Fully Complied	SSCL: Please refer Section 15.5 of this document. Spectrum: Please refer Section 16.5 of this document.
8.	TIN certificate	Fully Complied	SSCL: Please refer Section 15.6 of this document. Spectrum: Please refer Section 16.6 of this document.
9.	Company Annual report (if any)	Fully Complied	SSCL: Please refer Section 15.2, 15.3 and 15.4 of this document. Spectrum: Please refer Section 16.2, 16.3 and 16.4 of this document.
10.	Company Organogram	Fully Complied	SSCL: Please refer Section 15.7 of this document. Spectrum: Please refer Section 16.7 of this document.
11.	Similar Implementation Experience (if any)	Fully Complied	SSCL: Please refer Section 15.8 of this document. Spectrum: Please refer Section 16.8 of this document.
12.	The bid submitted and the price quoted therein shall remain valid for six months (180 days) from the bid submission date.	Fully Complied	

3.2. Technical Requirements

		Vendor's Feedback			
Sl	**Description**	**Fully Complied**	**Solution Ready**	**Need Development/ Customization**	**Comments**
	Integration	Fully Complied	Solution Ready		
1.	Vendor has to provide a micro-service-based Middleware service if required	Fully Complied	Solution Ready		
2.	Solution should have capability to login by AD authentication and regular authentication	Fully Complied	Solution Ready		
3.	Some CBS transaction should be real time through API and some should be queue based which will be executed from a scheduler based application if required. PBL will decide the integration approach.	Fully Complied	Solution Ready		
4.	API request & response must be encrypted & required to follow Prime Bank API Check List	Fully Complied	Solution Ready		
	User Interface	Fully Complied	Solution Ready		
5.	Scheduler should have ability to configure dynamically and also be configured by front-end.	Fully Complied	Solution Ready		
6.	Vendor must need to provide a solution which should have different role-based dashboard	Fully Complied	Solution Ready		
7.	Any type of approval (transaction/reversal/creation/ modification /delete) must have multiple control like maker, checker.	Fully Complied	Solution Ready		
8.	Vendor has to ensure the centrally monitoring all the audit logs and activities.	Fully Complied	Solution Ready		
9.	Vendor has to give us a solution which should allow multiple teams/users to deploy, monitoring and administering related works.	Fully Complied	Solution Ready		
10.	Vendor has to give us a solution which should have a panel for monitoring service wise audit trails and also any type of administering, deploying audit trails.	Fully Complied	Solution Ready		
11.	Ul for Parameter configuration to keep into DB as encrypted	Fully Complied	Solution Ready		
12.	System Should have standard Audit Trail Report/Module	Fully Complied	Solution Ready		
	User Administration	Fully Complied	Solution Ready		
13.	User Creation/modification/lock/unlock/activation/deactivation from a panel	Fully Complied	Solution Ready		
14.	User Management (Role Based access control)	Fully Complied	Solution Ready		
15.	Granting multiple Roles and Branches to a single user	Fully Complied	Solution Ready		

16.	Must have multiple control like maker checker for user creation/Authorization/Update/Inactive etc.	Fully Complied	Solution Ready		
17.	Two Factor Authentication for Login if Bank Decide	Fully Complied	Solution Ready		
	Customization	Fully Complied	Solution Ready		
18.	System should support to do the customization and add new business process/logic/ data entry screen and change existing process by trained bank users.	Fully Complied	Solution Ready		
	Architecture	Fully Complied	Solution Ready		
19.	Vendor has to configure the load balance of service as per PBL requirement. It can be both software and Hardware load balancer.	Fully Complied	Solution Ready		
20.	Vendor has to propose a solution which should support latest OS and other related software's updated patch which will release time to time by OS and software vendor like Microsoft, oracle, Linux etc. and also, solution should run after vulnerability mitigation where vulnerability may raise by vulnerability assessment tools, audit and PBL Information security division.	Fully Complied	Solution Ready		
21.	Stress Testing & Load Testing need to be done and report must be submitted by vendor during product implementation for both Application and middleware service.	Fully Complied	Solution Ready		
22.	Identified VAPT must be mitigate by vendor at any time without any cost.	Fully Complied	Solution Ready		
23.	Minimum security baseline (MSB) should be complied by vendor	Fully Complied	Solution Ready		
24.	Prime Bank audit risk assessment, BB audit observations and any external audit observations must need to mitigate by vendor at any time without any cost.	Fully Complied	Solution Ready		
25.	Solution should have ability to grow horizontally during load.	Fully Complied	Solution Ready		
26.	Solution should have capabilities to access through Internet and intranet. Permission should be granted by role/user, which need to be managed by admin panel	Fully Complied	Solution Ready		
27.	Vendor has to provide Database Server requirement of Core, RAM (GB) and HDD storage or others which are needed.	Fully Complied	Solution Ready		
28.	Vendor must need to give a detail technical architecture diagram for Live, HA, UAT and DR environment	Fully Complied	Solution Ready		
29.	The system should support a smooth transition from primary site (DC) to backup site (DR) for disruptive events such as fire, flood, earthquake, etc.	Fully Complied	Solution Ready		

30.	Preferred DB platforms (i.e., Oracle, MSSQL, MySQL, PostgreSQL etc.)	Fully Complied	Solution Ready		
31.	Is there any encryption mechanism with application?	Fully Complied	Solution Ready		
32.	Is there any auditing policy with application?	Fully Complied	Solution Ready		
33.	Vendor must need to support database retention and purging as per Prime Bank policy.	Fully Complied	Solution Ready		
34.	Vendor has to provide the List of all the pre-requisite software needed by the product (e.g., database, JDK, JRE, any other licensed software) and also need to confirm which we need to procure or not for the solution.	Fully Complied	Solution Ready		
35.	Vendor must need to give us web server, database and other related tools/ component lists	Fully Complied	Solution Ready		
36.	Does your product support SaaS, customer-managed and hybrid deployments?	Fully Complied	Solution Ready		
37.	How does your platform support continuous integration and deployment practices?	Fully Complied	Solution Ready		
38.	Does the solution support zero downtime patching and updates?	Fully Complied	Solution Ready		
39.	Vendor solution must need to Ability to deploy in VM environment	Fully Complied	Solution Ready		
40.	The system should provide the facility to take backups of data and system software at user defined intervals with minimal/without operator intervention. The system should allow these backups to be both:	Fully Complied	Solution Ready		
	(a) full - a complete image of the data and/or software	Fully Complied	Solution Ready		
	(b) Interim - a backup of transactions or changes which have been made since the last backup	Fully Complied	Solution Ready		
41.	Vendor must need do prepare Live, HA, test, HA and DR environment setup, configuration related work. Activities need be done on premises	Fully Complied	Solution Ready		
42.	Vendor solution must need to ensure details log so that any transaction can be easily identified.	Fully Complied	Solution Ready		
43.	The unique identifier must be introduced for every log so that the log can be trace easily for every request.	Fully Complied	Solution Ready		
44.	The log must be compressed on a daily basis and automatically shifted to other locations.	Fully Complied	Solution Ready		
45.	Vendor must provide full hardware sizing.	Fully Complied	Solution Ready		
46.	Vendor solution must be hardware platform independent i.e., should be run on any hardware platform.	Fully Complied	Solution Ready		
47.	System should be capable to handle latest Database.	Fully Complied	Solution Ready		

	Installation, Configurations and Post deployment support	Fully Complied	Solution Ready		
48.	Vendor must have to provide step by step detail installation guideline	Fully Complied	Solution Ready		
49.	Vendor must install all the prerequisite of solutions in Live, DR and UAT environment. Activities need be done on premises.	Fully Complied	Solution Ready		
50.	Vendor must install and configure the full solutions in Live, DR and UAT environment. Activities need be done on premises.	Fully Complied	Solution Ready		
51.	Vendor has to implement Software or Hardware (If bank provides) load balancer with clustering features in live environment	Fully Complied	Solution Ready		
52.	Vendor has to configure solutions with SSL certificate which will support only latest TLS.	Fully Complied	Solution Ready		
53.	Vendor must apply security policy in each server. Primarily we will refer PBL Security Baseline like PCI-DSS.	Fully Complied	Solution Ready		
54.	Vendor has to ensure a process which should periodically patch update of Operating System and database all patches	Fully Complied	Solution Ready		
55.	Vendor must need to provide a detail plan for post deployment support.	Fully Complied	Solution Ready		
	Guides	Fully Complied	Solution Ready		
56.	Installation / Implementation guide: Vendor has to provide an installation guide mentioning details of installation & parameter value setup at OS during product implementation.	Fully Complied	Solution Ready		
57.	Vendor has to provide detail data dictionary as per prime bank requirement	Fully Complied	Solution Ready		
58.	Vendor must need to provide setup and configuration related detail document	Fully Complied	Solution Ready		
59.	Service Development guide: Vendor has to provide a guideline for integration with new service provider with business logic implementation and validations.	Fully Complied	Solution Ready		
60.	Administration guide: Vendor has to give an administration guide where detail information about application logs, system logs, temporary file locations, performance monitoring scripts/commands and system maintenance guidelines are incorporated. It should include high level definition of process flow. Also administration guide should include standard operating procedure (SOP) for system administration.	Fully Complied	Solution Ready		
	Training	Fully Complied	Solution Ready		
61.	Vendor has to provide training for different module.	Fully Complied	Solution Ready		

62.	Vendor should provide detail technical, administrative, operational and others related training, so that PBL can manage by themselves.		Fully Complied	Solution Ready		
63.	Vendor should provide training materials for all modules.		Fully Complied	Solution Ready		
64.	Must need to give third party library list with information details		Fully Complied	Solution Ready		
65.	Application deployment architecture diagram with HA and DR consideration		Fully Complied	Solution Ready		
66.	Application development environment set up document step by step		Fully Complied	Solution Ready		
67.	Live server readiness document step by step		Fully Complied	Solution Ready		
68.	Application architecture detail diagram		Fully Complied	Solution Ready		
69.	Following documents need to provide during Implementation:		Fully Complied	Solution Ready		
	1.	SRS	Fully Complied	Solution Ready		
	2.	Deployment document	Fully Complied	Solution Ready		
	3.	Release document	Fully Complied	Solution Ready		
	4.	Technical Architecture	Fully Complied	Solution Ready		
	5.	Data Flow Diagram	Fully Complied	Solution Ready		
	6.	Audit Log document	Fully Complied	Solution Ready		
	7.	Data Dictionary	Fully Complied	Solution Ready		
	and other related documents need to handover time to time as per bank requirement. Please note that above are only development related		Fully Complied	Solution Ready		
70.	All modules should have the capabilities to work from source code repository		Fully Complied	Solution Ready		
71.	Application code build or publish process must need to be easy		Fully Complied	Solution Ready		
72.	All Framework, libraries and tools must be updated		Fully Complied	Solution Ready		

3.3. Functional Requirements

Supply chain finance is a broad category of financing with multiple products namely Purchase Order (PO) Financing, Factoring Financing, Reverse Factoring and Distributor Financing:

		Vendor's Feedback			
SL #	**Functional Requirements with Description**	**Fully Complied**	**Solution Ready**	**Need Development/ Customization**	**Comments**
1.	**Purpose and Objectives:** Prime Bank, intends to onboard Supply Chain Finance (SCF) platform for both online & offline module through software as A service (SaaS) from prospective vendors to implement align with CBS.	Fully Complied	Solution Ready		
	In order to create a successful, scalable and sustainable SCF Business, a dynamic SCF solution has become an immediate requirement which will integrate CBS and Anchor's ERP as well as will bring the suppliers/distributors, corporates and Bank together through a common digital platform.	Fully Complied	Solution Ready		
2.	**Product Overview:** Overdraft (deal wise maturity maintain by platform) — Revolving - 01 (one) year with renewal option. Mainly for Purchase Order (PO) Financing, Factoring, Reverse Factoring & Distributor Financing.	Fully Complied	Solution Ready		
3.	**Customer onboarding:** Platform have to have integration facility with CBS to avoided repetitive manual input.			Need Development/Customization	
4.	**Limit Management:**				
	- System should be able to set and manage multiple inner limits (Buyer/Supplier/Dealer Wise) under Single Mother Limit.	Fully Complied	Solution Ready		For more details please go to - Chapter 20 (Project Screenshot (Annexure1))
	- System should have the ability to set drawdown wise limit expiry date automatically.	Fully Complied	Solution Ready		For more details please go to - Chapter 20 (Project Screenshot (Annexure1))
	- System shall have the capability to block limit automatically as per sanction terms.	Fully Complied	Solution Ready		For more details please go to - Chapter 20 (Project Screenshot (Annexure1))
5.	**Automatic Deal Management**				For more details please go to - Chapter 20 (Project Screenshot (Annexure1))

	-	System shall have the ability to initiate bulk disbursement against multiple transaction and create transaction wise deal automatically and or vice versa	Fully Complied	Solution Ready		For more details please go to - Chapter 20 (Project Screenshot (Annexure1))
	-	System shall track invoice/deal wise due date and will initiate Auto collection instruction (if require) from designated account or will collect and for will collect /capture data from CBS through API to adjust the deal	Fully Complied	Solution Ready		For more details please go to - Chapter 20 (Project Screenshot (Annexure1))
	System shall have the ability to allocate requested settlement amount automatically on FIFO basis.		Fully Complied	Solution Ready		For more details please go to - Chapter 20 (Project Screenshot (Annexure1))
6.	**Drawdown, Limit Control & Fund Transfer:**					
	-	Drawdown, Limit Setup, Interest, LPC, Processing Fee or any other charges, Expiry Date etc. will be dynamic in SCF Platform and shall be set before allowing drawdown to the spokes (Distributor / Supplier / Vendor)	Fully Complied	Solution Ready		For more details please go to - Chapter 20 (Project Screenshot (Annexure1))
	-	Related parties (i.e Buyer/Supplier/Dealer/Bank) might be integrated/connected through Web Base Solution or ERP Integration based on the requirement.	Fully Complied	Solution Ready		For more details please go to - Chapter 20 (Project Screenshot (Annexure1))
	-	In case of disbursement, for Factoring, Reverse Factoring, PO Finance deal will have created invoice wise whereas for Dealer Financing deal will be created transfer wise, as per approved credit period.	Fully Complied	Solution Ready	Customization needed on PO Finance	For more details please go to - Chapter 20 (Project Screenshot (Annexure1))
	-	Customer's Invoice / Purchase Order Documents will be available in SCF Platform. Such availability may be ensured through:	Fully Complied	Solution Ready		For more details please go to - Chapter 20 (Project Screenshot (Annexure1))
		Approved Invoice / Purchased Order Confirmation will be automatically arrived from Anchor's integrated ERP	Fully Complied	Solution Ready		For more details please go to - Chapter 20 (Project Screenshot (Annexure1))
		Anchor will push the Invoices / Purchase Orders in SCF platform to bank for facilitating the financing	Fully Complied	Solution Ready		For more details please go to - Chapter 20 (Project Screenshot (Annexure1))

		Spoke (Dealer / Vendor) will upload the copy of invoices / Purchase Orders for asking the financing.	Fully Complied	Solution Ready		For more details please go to - Chapter 20 (Project Screenshot (Annexure1))
		Customer's requested invoices / purchase orders will be visualized in SCF Platform.	Fully Complied	Solution Ready		For more details please go to - Chapter 20 (Project Screenshot (Annexure1))
		Assigned Bank Official of Credit Administration will input the necessary fields (if not automated from Anchor's ERP) and forward to Anchor for approval / validation.	Fully Complied	Solution Ready		For more details please go to - Chapter 20 (Project Screenshot (Annexure1))
		Anchor will Approve the invoice / Purchase Order (using defined user interface / via reply to auto generated e-mail from SCF platform)	Fully Complied	Solution Ready		For more details please go to - Chapter 20 (Project Screenshot (Annexure1))
		Assigned Bank Official of Credit Administration (Maker) will Cross Verify the data inputted and approval attained from Anchor	Fully Complied	Solution Ready		For more details please go to - Chapter 20 (Project Screenshot (Annexure1))
		After successful validation by Credit Administration Official (Maker), he will approve the financing using SCF Platform.	Fully Complied	Solution Ready		For more details please go to - Chapter 20 (Project Screenshot (Annexure1))
		SCF Platform will push the financing to Spoke (Supplier / Distributor/vendor) in CBS and will transfer the money to Anchor/Supplier Nominated Account after making necessary validation from SCF Platform integrated with CBS. SCF Validations shall be made (at least) for:	Fully Complied	Solution Ready		For more details please go to - Chapter 20 (Project Screenshot (Annexure1))
		Limit Availability	Fully Complied	Solution Ready		For more details please go to - Chapter 18 (Project Screenshot (Annexure1))
		Availability of Expiry as per Sanction Terms	Fully Complied	Solution Ready		For more details please go to - Chapter 18 (Project Screenshot (Annexure1))
		Overdue Payment History	Fully Complied	Solution Ready		For more details please go to - Chapter 18 (Project Screenshot (Annexure1))

		No. of Times Overdraft Limit has been adjusted.	Fully Complied	Solution Ready		For more details please go to - Chapter 18 (Project Screenshot (Annexure1))
7.	**Customer Sales Ledger Status:** (SLB) Must have a SLB calculation module for each customer.		Fully Complied	Solution Ready		For more details please go to - Chapter 18 (Project Screenshot (Annexure1))
8	**Payment Realization Process:**					
	-	SCF Platform will track invoice/deal wise due date and will initiate Auto collection instruction (if require) from designated account or will collect and /or will collect /capture data from CBS through API to adjust the deal.	Fully Complied	Solution Ready		For more details please go to - Chapter 18 (Project Screenshot (Annexure1))
	-	Daily interest will be kept in Interest Receivable Account of SCF Platform at EOD.	Fully Complied	Solution Ready		For more details please go to - Chapter 18 (Project Screenshot (Annexure1))
	-	Monthly Interest Receivables will be kept in SCF Platform, which will be transferred in Interest Receivable Account of CBS, which will be charged in customer's account at the end of each quarter as per prevailing practice.	Fully Complied	Solution Ready		For more details please go to - Chapter 18 (Project Screenshot (Annexure1))
	-	In case of non-adjustment within due date penal interest charge will be imposed.	Fully Complied	Solution Ready		For more details please go to - Chapter 18 (Project Screenshot (Annexure1))
9.	**Data Capture, upload ,Convey & Store**					
	-	System must be able to capture/upload the image/scanned copy of the invoices, delivery challan ,others related documents and convey it to the required user ends for read, verification or reservation purposes.	Fully Complied	Solution Ready		For more details please go to - Chapter 18 (Project Screenshot (Annexure1))
	-	System must have the ability to manage both the forward and backward flow of the data/documents.	Fully Complied	Solution Ready		For more details please go to - Chapter 18 (Project Screenshot (Annexure1))
	Data Read and Generation					
	-	System should be capable of reading and fetching data generated from CBS via API and update accordingly into the platform in pursuit of creating limit and settling the deal.	Fully Complied	Solution Ready		For more details please go to - Chapter 18 (Project Screenshot (Annexure1))
11.	**Generation of Customized Report**					

	-	System should be able to generate and download customized reports by the relevant stakeholders as required including but not limited to PDF/MS Excel/CSV etc.	Fully Complied	Solution Ready		For more details please go to - Chapter 18 (Project Screenshot (Annexure1))
12.	-	Mobile Number verification through OTP (2FA)	Fully Complied	Solution Ready		
	-	System should be able to send OTP (4 digits numeric value) to the mobile number for verification OTP validity must be configurable (X minute)	Fully Complied	Solution Ready		
13.	**Integration with other systems**					
	-	System supports integration with other systems of the bank including but not limited to: Core banking, Tax, Payment hub, ESB, Trade Finance, Billing, SMS, Email, ECM, Global limit, 2FA, Teller System, Remittance System and so on	Fully Complied	Solution Ready		
	-	System has future readiness in integrating with other banking back-end solution/ platform. Please describe in detail.	Fully Complied	Solution Ready		
	-	System has future readiness in integrating with other third-party Systems	Fully Complied	Solution Ready		
	-	System provides Host to Host capability, including but not limited to:	Fully Complied	Solution Ready		
	a)	System supports integration directly with customers' (corporates or financial institutions) system.	Fully Complied	Solution Ready		
	b)	System supports mapping many ERP source file formats such as iDoc, EDIFACT, IS020022, XML, CSV to bank internal formats.	Fully Complied	Solution Ready		
14.	The software must provide the ability for multiple users to be on the system at the same time and multiple users to be in the same programs at the same time.		Fully Complied	Solution Ready		
15.	The system should support Mozilla Firefox, Google Chrome Internet Explore and readiness to adopt upcoming browsers		Fully Complied	Solution Ready		
16.	Solution Provider has developed applications for IOS devices available through the Apple App Store.		Fully Complied	Solution Ready		
17.	System supports remote access through use of VPN.		Fully Complied	Solution Ready		
18.	**Compliance**					
	-	System supports compliance with the international practices/rules	Fully Complied	Solution Ready		

	-	System supports to accommodate new instructions/ regulations.	Fully Complied	Solution Ready		
19.	**Workflow management**					
	-	System has capability to provide configurable workflow processes for different type of activities	Fully Complied	Solution Ready		
	-	System supports to display all multiple steps of workflow for each activity and guide Customers/ Users to take the next step	Fully Complied	Solution Ready		
	-	System supports to set up workflow rules which define:				
	a)	How many and which role playing users are required to approve an activity;	Fully Complied	Solution Ready		
	b)	Which role players are mandatory and which are optional;	Fully Complied	Solution Ready		
	c)	Those rules could be applied for all processes or some specific process	Fully Complied	Solution Ready		
	-	System has capability to create new products/ new workflows based on parameterization.	Fully Complied	Solution Ready		
	-	System has capability to customize different steps in the workflow process without affecting the system structure.	Fully Complied	Solution Ready		
20.	**Service architecture**					
	-	System has capability to call different services/functions/ processes for different request generated from other Bank or third-party systems.	Fully Complied	Solution Ready		
	-	Services/ functions/ processes can be changed, updated or removed without hampering other services/ functions/ processes listed or included in the system	Fully Complied	Solution Ready		

3.4. Non-Functional Requirements

			Vendor's Feedback			
SL#	**Description**		**Fully Complied**	**Solution Ready**	**Need Development/ Customization**	**Comments**
1.	Audit Trail & User Activity Report		Fully Complied	Solution Ready		
2.	Password Guideline		Fully Complied	Solution Ready		
	a.	Passwords for user-level shall be at least eight (8) characters long, whereas for admin-level passwords shall be at least twelve (12) characters long.	Fully Complied	Solution Ready		
	b.	Passwords must contain both upper- and lowercase characters (i.e., a-z, A-Z);	Fully Complied	Solution Ready		
	c.	Passwords must contain digits and/or special characters/punctuation. (e.g. 0-9,1—@#$ %^&*()_=+-[(1}—;:,<.>/?\ I,);	Fully Complied	Solution Ready		
	d.	Password history mechanism shall be implemented in systems/ applications and users shall not be allowed to reuse their last six (6) passwords	Fully Complied	Solution Ready		
	e.	Users shall be enforced to change 2their password after thirty (30) days;	Fully Complied	Solution Ready		
	f.	User ID shall be locked after three (3) unsuccessful password attempts.	Fully Complied	Solution Ready		
3.	Roll based access control system		Fully Complied	Solution Ready		
4.	Disable the multiple session options for the application		Fully Complied	Solution Ready		
5.	Session time out period should be set		Fully Complied	Solution Ready		
6.	SQL Injection prevention shall be ensured		Fully Complied	Solution Ready		
7.	Preventing Sensitive Data Exposure		Fully Complied	Solution Ready		
8.	Please confirm whether API is aligned or complied with OWASP API security Guideline or not.		Fully Complied	Solution Ready		
9.	Password should not be hard coded in any application		Fully Complied	Solution Ready		
10.	System must be able to allow role privileges to be assigned by module, record and Fields.		Fully Complied	Solution Ready		
11.	Authentication must not be based on the knowledge of a secret URL		Fully Complied	Solution Ready		
12.	No default, test or temporary user accounts shall exist		Fully Complied	Solution Ready		

13.	Password brute forcing must be prevented	Fully Complied	Solution Ready		
14.	User name enumeration must be prevented	Fully Complied	Solution Ready		
15.	A denial of service using automatically locked accounts must be prevented.	Fully Complied	Solution Ready		
16.	System must be able to track user log-on (and logoff) activities and the location from which a user has logged on (and logged off).	Fully Complied	Solution Ready		
17.	System must be able to track changes in the records made by users.	Fully Complied	Solution Ready		
18.	System must support the ability to generate robust security audit reports describing who, what, when and where security was assigned, modified or deleted.	Fully Complied	Solution Ready		
19.	Ability to perform user profile reporting easily, using flexible reporting mechanism.	Fully Complied	Solution Ready		
20.	System must force time-out based on time parameters. Time out parameters should be flexible, based on job role and function.	Fully Complied	Solution Ready		
21.	Session-IDs must be generated with sufficient entropy	Fully Complied	Solution Ready		
22.	User generated session-IDs must be rejected	Fully Complied	Solution Ready		
23.	Session-cookies must be transmitted via HTTPS	Fully Complied	Solution Ready		
24.	The secure flag must be set on the session cookies	Fully Complied	Solution Ready		
25.	The http only flag must be set on the session cookies	Fully Complied	Solution Ready		
26.	Sessions must be revoked if the session-id is not received via HTTPS.	Fully Complied	Solution Ready		
27.	A session-bound token must be validated for each POST request	Fully Complied	Solution Ready		
28.	A conservative size limit must be enforced on uploaded files	Fully Complied	Solution Ready		
29.	System must be able to protect itself- from various application vulnerability issues	Fully Complied	Solution Ready		
30.	System must be able to protect itself from Cross Site Scripting Attack	Fully Complied	Solution Ready		
31.	Click jacking should be handled	Fully Complied	Solution Ready		
32.	XSRF - Using user's logged in session to manipulate	Fully Complied	Solution Ready		
33.	Session Hijack - Compromise user's session by editing and injecting session cookie	Fully Complied	Solution Ready		

34.	Client deployment over internet must be secured by 128-bit SSL and PKI System must be flexible on adding new feature in future without alerting any.	Fully Complied	Solution Ready		
35.	Ability to encrypt passwords and other sensitive data based on industry-standard encryption mechanisms	Fully Complied	Solution Ready		
36.	Ability to configure the system using parameter-or table-driven approach. This includes data structures, screens, functions, key fields and reports.	Fully Complied	Solution Ready		
37.	Ability to linearly scale based on reasonable growth patterns by adding incremental computing resources. Also to support clustering at each layer i.e. Web server, Application Server and Database for Fault Tolerance & Load Balancing. The system would be developed to support clusters environments on N servers.	Fully Complied	Solution Ready		
38.	The system should be parameterized to facilitate initial system set-up and future maintained activates, as well as allow creation of new banking products without the need to alter application source code or data structures	Fully Complied	Solution Ready		
39.	Is this application support container-based platform /Micro service? (Docker/Kubernetes)	Fully Complied	Solution Ready		
40.	Application should be responsive from any device (desktop/laptop/mobile/tablet/or any other devices).	Fully Complied	Solution Ready		
41.	Application shall comply with the Latest OWASP Application security guidelines	Fully Complied	Solution Ready		
42.	API (if any) shall comply with the OWASP API security guidelines & bank's API security checklist.	Fully Complied	Solution Ready		
43.	For container-based approach, "Application Container Security Guideline" by NIST shall be ensured	Fully Complied	Solution Ready		
44.	Please share the details of version control management of the application	Fully Complied	Solution Ready		

3.5. Queries

1 What is the Language of the software?

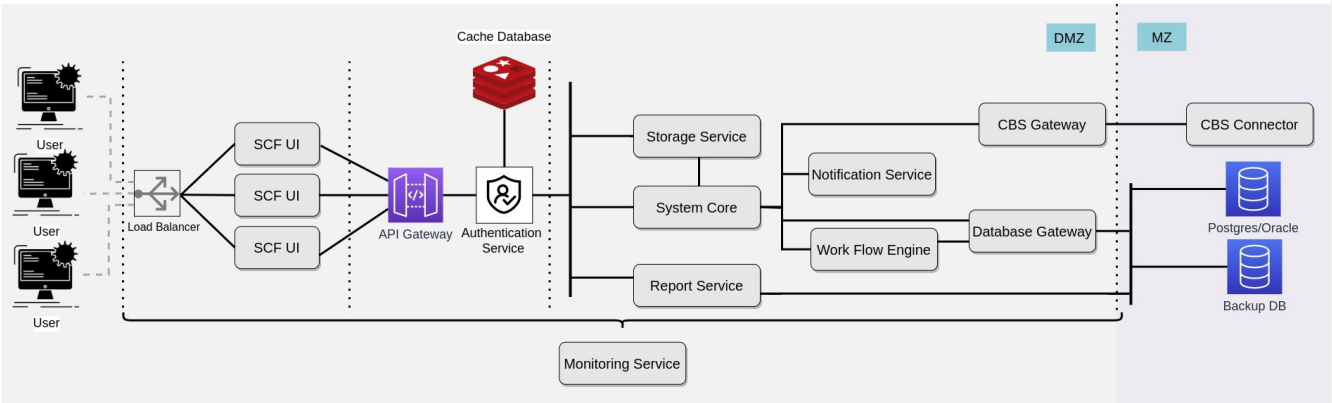
Ans:	Our Supply Chain Financing (SCF) Solution, BORNALI, has been developed with a focus on robustness, efficiency, security, and adaptability. The software architecture leverages an array of modern technologies and languages that collaborate seamlessly to offer an enriched and secure user experience. The primary programming language used for the development is **TypeScript**. TypeScript is a statically typed superset of JavaScript, which introduces type safety to our development process, enhancing code reliability, readability, and maintainability. We utilize TypeScript due to its static typing feature, augmented maintainability, superior tooling support, and increased scalability. TypeScript contributes to the early detection of potential errors, simplifies code documentation, and promotes effective collaboration amongst team members. Consequently, this leads to a more robust and reliable application, which further assures the safety and reliability of our end-user experience.

2 What is the Application Platform/architecture? Please share the Details Application Architecture Diagram, Data Flow Diagram?

Ans:	BORNALI is designed using a microservice architecture and adheres to the three-tier architecture principles. These tiers include the Presentation Layer (frontend), Application Logic Layer (business logic/backend), and Data Storage Layer (databases).	
•	**Frontend (Presentation Layer):** This is our User Interface (UI), through which end-users interact with the application. It communicates with the backend services via an API Gateway. We use Load Balancers to manage and distribute incoming network traffic efficiently among multiple UI instances. This layer utilizes the following frameworks:	
	Next.js	Next.js is used by some of the world's largest companies like Netflix, Uber, Starbucks, or Twitch. It enables us to create full-stack secure web applications by extending the latest React features, and integrating powerful Rust-based JavaScript tooling for the fastest builds.
	React.js	Utilizing React.js in our application allows us to leverage its efficient component-based architecture and swift rendering capabilities. This results in a highly interactive and dynamic user interface, optimized to provide an enriched user experience. Further, React.js's expansive ecosystem helps us streamline our development processes, resulting in a more reliable and swift product delivery.
	Redux	By incorporating Redux in our application, we proficiently manage the application's state, centralize data flow, and simplify state management. This eases the integration with React components and significantly enhances the application's overall performance. Moreover, Redux contributes to maintaining application consistency and ensures easier debugging, fostering overall application maintainability.
	Redux Toolkit	Our application leverages Redux Toolkit due to its simplified API and built-in tools, which optimizes performance and streamlines state management. By reducing boilerplate code, it enhances developer productivity. These features make Redux Toolkit an exemplary choice for managing intricate states and data flow within our application, fostering an environment of efficiency and effectiveness.
	Tailwind CSS	Our application employs Tailwind CSS due to its utility-first philosophy, comprehensive selection of pre-designed styles, and capacity for swift prototyping. Tailwind CSS facilitates the creation of consistent, responsive, and aesthetically pleasing user interfaces in an efficient manner. This not only saves development time but also ensures the application's visual elements are secure and user-friendly, enhancing the overall user experience.
•	**Backend (Application Logic Layer):** This comprises the core of our application's functionality. It includes several microservices that cooperate to provide the functionalities of BORNALI. The microservices are implemented with the following frameworks:	

	Node.js	Leveraging Node.js in our application, we take advantage of its event-driven, non-blocking I/O model, which promotes scalability and high-performance. The broad array of libraries and frameworks available with Node.js allows us to construct real-time applications adept at efficiently managing concurrent requests. Moreover, Node.js's seamless integration with TypeScript on the front end further ensures a responsive and dynamic user interface, enhancing user experience and application robustness.
	Express.js	Utilizing Express.js in our application provides us with a minimalistic yet flexible framework, streamlining the management of routing and middleware, and the handling of HTTP requests. Express.js empowers us to construct robust and scalable backend services with efficiency, contributing to the overall performance enhancement and improved maintainability of our application.
•	**Database (Data Storage Layer):** This layer provides persistent storage to the application layer microservices. It consists of Primary and Secondary Databases, Session Database, and Storage Services. For the database, we employ SQL due to its relational data model, standardized querying capabilities, and robust data integrity. SQL underpins our application's reliable data management and facilitates the execution of complex queries and joins essential to our application's data analysis and reporting requirements.	

The architecture of BORNALI is shown in the following figure:



The following table describes the BORNALI microservices. They serve different functions, such as handling authentication and session data, managing workflows and business processes, generating reports and notifications, communicating with databases, monitoring the health and performance of the system, etc. Together, these services work to support the overall functionality of the application.

•	**Load Balancer:** Distributes network traffic across multiple frontend instances.
•	**SCF UI:** User interface of BORNALI and communicates with the API gateway.
•	**API Gateway:** Connects the UI with System Core, Report Service, Storage Service, and Authentication Service.
•	**Authentication Service:** Connects with Cache Database and API Gateway.
•	**Session DB:** Communicates with System Core, Database Gateway.
•	**Workflow Engine:** Connects to Workflow Engine, Notification Service, Database Gateway, CBS Gateway, Storage Service.
•	**System Core**: Connects to Workflow Engine, Notification Service, Database Gateway, CBS Gateway, Storage Service.
•	**Report Service:** Connects to both Primary and Secondary Databases.
•	**Notification Service:** Communicates with System Core.
•	**CBS Gateway:** Connects the System Core to CBS Connector.

•	**Storage Service:** Stores user files.
•	**Database Gateway:** Connects the Workflow Engine and System Core to the Databases.
•	**CBS Connector :** Connects the CBS Gateway to the Core Banking System.
•	**Monitoring Service:** Monitors all the System Components in the DMZ.

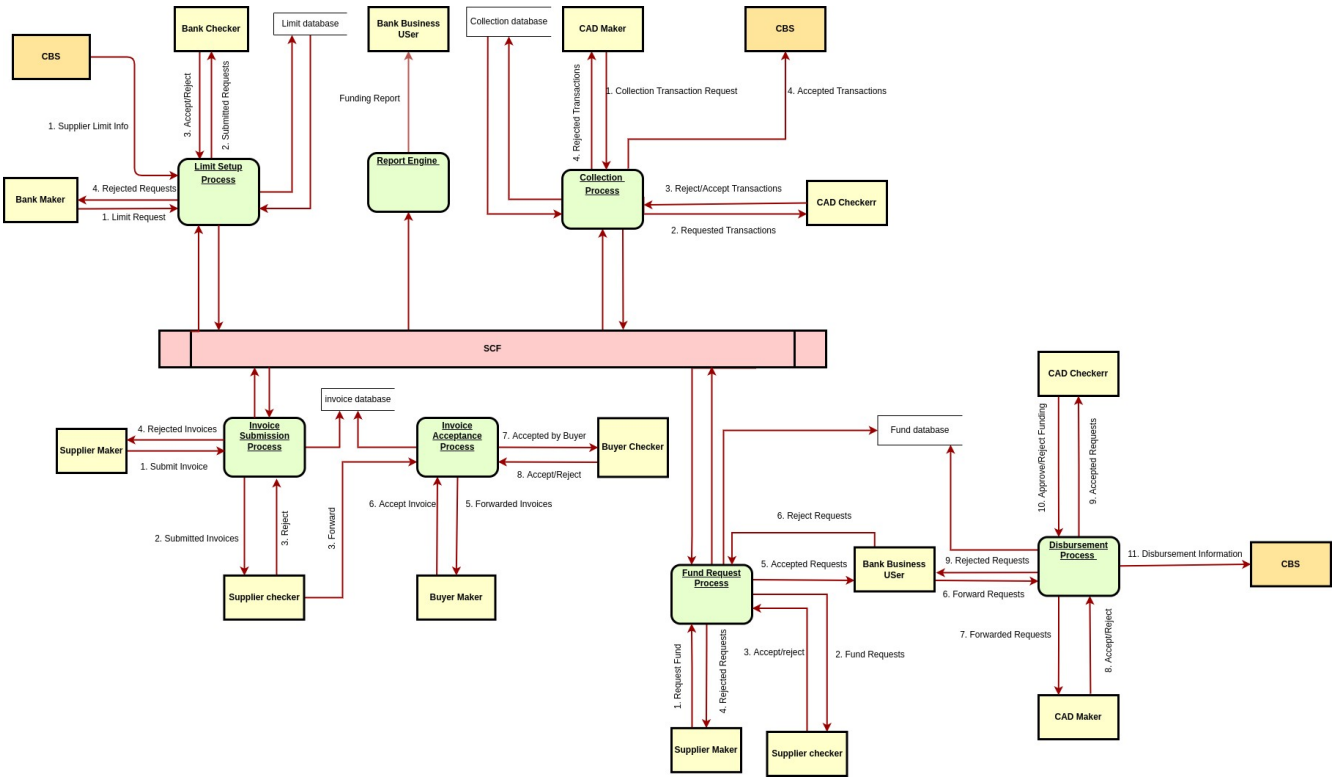


Figure 01: Data Flow Diagram

3 What is the Application Framework?

Ans:	The application framework for BORNALI is built on a hybrid structure combining a microservices architecture and the principles of three-tier architecture. This structure is designed to deliver a highly scalable, robust, and efficient solution for supply chain financing. The key components of the BORNALI system are organized as follows:
•	**Frontend (Presentation Layer):** This is developed using a combination of React.js for creating dynamic and responsive UI, Redux for efficient state management, and Tailwind CSS for designing visually appealing interfaces. TypeScript is employed to ensure type safety, code maintainability and better tooling support.
•	**Backend (Application Logic Layer):** The backend services are developed using Node.js due to its event-driven, non-blocking I/O model which provides scalability and efficient handling of concurrent requests. Express.js is utilized as the web application framework for managing routing and handling HTTP requests.
•	**Database (Data Storage Layer):** PostgreSQL is used for managing relational data due to its standardized query language, strong data integrity, and ability to facilitate complex data queries and joins. Redis is used for caching and storing user login sessions.
•	**Testing:** Jest is used as the primary testing framework for both unit and integration testing, helping to ensure the quality and reliability of the application's code.

•	**Microservices**: Various services such as Authentication Service, Workflow Engine, System Core, Report Service, Notification Service, CBS Gateway, and Storage Service, each perform specific functions within the overall system. They are orchestrated to work together to support the system's functionality.

4 Supported Browser (should be independent)

Ans:	The BORNALI Supply Chain Financing (SCF) Solution is engineered to be browser-agnostic, prioritizing a seamless and efficient user experience across various platforms. As such, our application is fully compatible with an array of modern web browsers. These include Google Chrome, Mozilla Firefox, Apple's Safari, and Microsoft Edge. It's worth noting that while we always aim for comprehensive compatibility, for optimal performance and security, we recommend using the latest versions of these browsers as our system leverages the most recent advancements in web technologies.

5 Browser Version Compatibility issue (if any)

Ans:	Our BORNALI Supply Chain Financing (SCF) Solution is designed to be compatible with the latest versions of all major browsers for optimal performance and enhanced security. That said, it's always possible that users running significantly outdated versions of these browsers may experience minor compatibility issues. These issues can include slow performance, visual inconsistencies, or certain features not functioning as intended. To prevent such issues, we strongly recommend users to keep their browsers updated to the latest version. Doing so not only ensures an optimal experience with our application but also strengthens protection against security vulnerabilities that older versions may be susceptible to. To our knowledge, there are no specific version compatibility issues as of now, but if users encounter any problems we are committed to solve them.

6 Whether Audit Trail log incorporated in Security admin Module?

Ans:	The audit trail log holds immense significance in the context of a **Supply Chain Financing (SCF) Solution.** With the intricate financial transactions and collaborations involved in supply chain financing, the audit trail log becomes a critical tool for maintaining transparency, trust, and security within the ecosystem. It meticulously captures every action taken by buyers, suppliers, financial institutions, and administrators, providing a comprehensive trail of financial activities and decisions. By enabling real-time monitoring and tracking of SCF operations, the audit trail log ensures that all stakeholders remain accountable for their actions, bolstering the overall integrity of the SCF Solution.

We provide a comprehensive solution that includes a panel for monitoring service-wise audit trails. This panel should allow for easy administration and deployment of audit trails, ensuring efficient tracking of activities across the system.

•	**Audit Trail Module:** The system incorporates a standard Audit Trail Module enabling users to access detailed logs of events and actions performed within the application. This module provides reports that display audit trail information, such as timestamps, user IDs, and activities, providing a comprehensive overview of system activities.
•	**Audit Trail & User Activity Report:** The system generates an Audit Trail Report encompassing user activity, providing insights into actions taken by each user. This report should facilitate effective auditing and compliance monitoring, enhancing the system's overall security and accountability.
•	**Incorporation of Audit Trail Log in Security Admin Module:** Supply Chain Financing (SCF) Solution includes the integration of the Audit Trail log within the Security Admin Module. This integration ensures that authorized administrators can access and manage the Audit Trail functionalities from the Security Admin Module. By centralizing these features, administrators can efficiently monitor, configure, and analyze audit trails while maintaining a comprehensive view of security-related activities.
•	**Granular Information:** The Supply Chain Financing (SCF) Solution audit trail log captures granular information, such as the date and time of each event, the user or entity involved, the action performed, and the source of the event.

•	**Non-Repudiation:** Supply Chain Financing (SCF) Solution audit trail log provides non-repudiation, meaning that actions performed by users or systems can be attributed to specific individuals or entities, preventing denial of responsibility.
•	**Security Monitoring:** Audit trail logs are crucial for real-time security monitoring, allowing administrators to detect and respond promptly to suspicious activities or potential security breaches.
•	**Forensic Analysis:** In the event of security incidents or investigations, audit trail logs serve as valuable forensic evidence to identify the sequence of events and potential root causes.
•	**Data Integrity:** The audit trail log can help verify the integrity of data by tracking changes and modifications made to critical records or files.
•	**Log Retention:** Prime Bank Ltd. will define log retention policies to determine how long audit trail logs should be kept. This ensures historical data availability for analysis and compliance purposes.
•	**Integration with PBL Security System:** Integrating with PBL Security Baseline systems allows for centralized log analysis, correlation, and alerting, enhancing overall security monitoring capabilities.
•	**Secure Storage:** To maintain the integrity and confidentiality of audit trail logs, they should be stored securely and protected from unauthorized access or tampering.
•	**Log Review and Analysis:** Regular review and analysis of audit trail logs are essential to identify patterns, anomalies, or potential threats, and to proactively address security risks.

7 How access control is managed, whether it can be customized?

Ans:	Access control in the **Supply Chain Financing (SCF) Solution** is managed through a combination of user authentication, role-based permissions, and data-level security. Users need to authenticate themselves before accessing the system, and their access privileges are defined based on their assigned roles. This ensures that each user can only perform actions and access data relevant to their role and responsibilities. The access control system is customizable to match the role specific requirements. Administrators can define new roles and permissions or modify existing ones as needed. Additionally, data-level security is implemented to restrict access to sensitive information, ensuring that only authorized users can view or modify certain data. Customizable access control further enhances security and adaptability to meet the Prime Bank Limited's unique needs.

8 Any kind of System notification by Email, SMS, Dashboard to the System Administrator?

Ans:	Yes, system notifications can be sent to the system administrator through various channels such as email, SMS, and a dashboard.

9 End Point Security related suggestion to implement in Database, Application or Web Server

Ans:	Endpoint Security suggestions for Database, Application, and Web Server:

Database:

•	Implement strong authentication mechanisms to control access to the database.
•	Regularly apply security patches and updates to the database management system.
•	Set appropriate access controls and permissions to limit user privileges.
•	Monitor database activity and implement auditing to detect suspicious behavior.

Application:

•	Use secure coding practices to prevent common vulnerabilities like SQL injection and XSS.
•	Implement role-based access controls to restrict user privileges.
•	Validate and sanitize input data to prevent data manipulation and injection attacks.
•	Regularly update and patch the application software to address security vulnerabilities.

Web Server:

•	Use HTTPS with valid SSL certificates to secure data transmitted between clients and server.
•	Regularly monitor server logs to identify and respond to potential security threats.
•	Harden the web server configuration by disabling unnecessary services and reducing attack surface.

10 Should Application and Web Server will reside in the same server or in different server?

Ans:	We recommend that the application server and the web server reside on separate servers. This approach facilitates improved performance, scalability, and security, as resources can be independently allocated and managed for each server. It can effectively handle high traffic loads and provides an additional layer of security, minimizing risk exposure. However, we understand that organizations may face resource constraints. In such scenarios, both the application and web server can indeed be hosted on the same server. While this may simplify the setup and reduce immediate costs, please be aware that it might potentially affect the overall performance and scalability of the application in the long run. Ultimately, the decision should be driven by the specific operational requirements, budget considerations, and IT strategy of your organization.

11 Integration Method (API/user ID and Password Based, etc.) to collect data from different sources, please share?

Ans:	Our approach to data integration for the BORNALI SCF solution is both flexible and secure. We will primarily use API-based integration to collect data from different sources, such as the bank's Core Banking System (CBS), Management Information System (MIS), and Anchor's ERP. As Prime Bank is employing the T24 CBS, we will integrate our BORNALI system with this through the provided APIs. This method allows for a robust, efficient, and reliable data exchange between the systems. The authentication process for this integration will be primarily based on secure authorization tokens. This stateless, self-contained method ensures secure transmission of information and enables efficient tracking of users and roles in the system. Only sessions authenticated with valid tokens will be permitted to invoke API calls, ensuring a secure environment for data exchange. This approach guarantees a secure, seamless, and efficient integration of BORNALI with the bank's existing infrastructure, effectively supporting the SCF functionalities.

12 How PBL will approach if any BUG is detected during Post Live operation? How the Change request will be attended by vendor?

Ans:	If any bug is detected during the post-live operation of the Supply Chain Financing (SCF) Solution, the bank should follow these steps:
•	**Bug Reporting:** When a bug is identified, either by the bank's internal team or by the end-user, it should be promptly reported to the designated IT support team.
•	**Bug Verification:** The reported bug is then verified to ensure its reproducibility and confirm its existence. This step helps prevent false or duplicate bug reports.
•	**Bug Prioritization:** The support team prioritizes the bug based on its severity and impact on the system's functionality and business operations. Critical bugs that significantly affect critical processes or data integrity are given higher priority for immediate attention.
•	**Bug Documentation:** The bug details, including its description, steps to reproduce, affected functionality, and priority, are documented to maintain a comprehensive record of reported issues.
•	**Bug Fixing:** The development team starts working on resolving the bug by identifying its root cause and implementing the necessary code changes to address it.
•	**Bug Testing:** Once the bug fix is implemented, thorough testing is conducted in the Tesing environment to ensure that the issue is indeed resolved and that the fix does not introduce any new issues (regressions).

•	**Bug Deployment:** After successful testing, the bug fix is deployed to the production environment to replace the affected code and rectify the issue.

Regarding change requests, PBL should follow the process outlined below:

•	**Change Request Submission:** If the bank needs to make changes to the system within the existing scope or expand the scope, it submits a formal change request to the vendor. This request includes detailed information about the proposed changes, their rationale, and the expected impact on the system.
•	**Change Request Evaluation:** The vendor's project team evaluates the change request, considering factors such as feasibility, impact on the project timeline, budget, resources, and overall alignment with the system's objectives.
•	**Effort Estimation:** The team estimates the effort required to implement the requested changes, considering the complexity of the changes, skill requirements, potential dependencies, and additional resources needed.
•	**Change Request Approval:** The evaluation and effort estimation results are presented to the bank for approval. The bank reviews the proposed changes and budget implications before confirming or negotiating the approval.
•	**Change Request Implementation:** Upon approval, the vendor's development team proceeds to incorporate the approved changes within the agreed-upon timeline and budget.

By following these steps, SSCL ensures that bugs detected during post-live operations are addressed promptly, and change requests are handled systematically to enhance the functionality and performance of the system.

13 Does your application support Web certificate/SSL for internetbased modules?

Ans:	Yes, the Supply Chain Financing (SCF) Solution has been designed with a strong emphasis on security, especially for internet-based modules. It fully supports web certificates and SSL (Secure Socket Layer) encryption, which ensures that data transmitted between the web server and browser remains encrypted and confidential.

14 Supported Database Platform

Ans:	The supported database platform for our **Supply Chain Financing (SCF) Solution** is PostgreSQL, an open-source relational database management system. PostgreSQL is chosen for its robustness, data integrity, scalability, and extensive features, providing a secure and efficient storage solution for Supply Chain Financing (SCF) application's critical data.

15 Supported Server Operating Systems

Ans:	The supported server operating systems for our application are Red Hat Enterprise Linux (version 8 and above). These Linux-based systems are known for their stability, security, and performance optimization, making them an ideal choice for hosting and running our application. Leveraging Red Hat Enterprise Linux ensures that we align with industry standards and best practices, further enhancing the overall efficiency and reliability of our Supply Chain Financing (SCF) Solution.

16 Supported Operating Systems for Clients

Ans:	The Supply Chain Financing (SCF) Solution is designed to be platform-independent, allowing clients to access it from various operating systems. As long as the client system is equipped with a modern web browser such as Google Chrome, Firefox, Safari, or Microsoft Edge, the SCF Solution can be accessed without any restrictions. This approach ensures compatibility across a broad range of desktop and mobile operating systems including Windows, macOS, Linux, iOS, and Android, thereby providing flexibility and convenience to users regardless of their preferred platform

17 What is the Brand, Model, Storage of the server suggested?

Ans:	For more details: Please go to - Chapter 8.3 (BoQ of Hardware Requirements)

18 Application tier, two or three?

Ans:	The application is designed using a three-tier architecture, consisting of the Frontend Tier, responsible for user interactions, rendering the graphical user interface, and communicating with the backend; the Backend Tier, which serves as the application's processing and logic center, handling requests from the front end, processing data, and communicating with the database; and the Database Tier, dedicated to data storage, retrieval, and manipulation.

19 What mechanism is being used for source coded hardcoding?

Ans:	The application follows best practices to avoid hardcoding of sensitive information within the source code. Instead of embedding credentials or other secure data directly in the code, we utilize environment variables and secure configuration files. These are managed through a centralized configuration management system, which allows for the separation of configuration from the code, enhancing security, and maintainability. Additionally, version control mechanisms and code review processes are in place to ensure that hardcoding of sensitive information does not occur, aligning with secure coding standards and compliance requirements. We utilize SonarQube to identify and manage code quality issues, including hardcoded values. This tool assists in maintaining a high level of code hygiene and compliance with best practices.

20 User manual of the the Application

Ans:	The user manual of the application is provided in Chapter 4.2 (User Manual)

21 Detail Hardware sizing considering as mentioned below: 1. In DC: live, backup and testing/ 2. UAT system environment 3. In DRS: live system environment

Ans:	Hardware sizing is outlined in Chapter 8.3 (BoQ Of Hardware Requirements)

22 Application/Web server- requirement of Core, RAM (GB) and HDD storage or others which are needed. (Mention storage requirement for online data and offline data)

Ans:	Application/Web server sizing is outlined in Chapter 8.3 (BoQ Of Hardware Requirements)

23 Database Server: requirement of Core, RAM (GB) and HDD storage or others which are needed.

Ans:	Database server sizing is outlined in Chapter 8.3 (BoQ Of Hardware Requirements)

24 How memory overflow will be handled?

Ans:	Handling memory overflow within an application is a complex task that requires a multifaceted approach to ensure stability and performance. In our system, we employ the following measures to efficiently manage and prevent memory overflow:
•	**Efficient Memory Allocation:** By meticulously allocating and deallocating memory within the application, we minimize the risk of memory leaks, which can lead to overflow.
•	**Bounds Checking:** This technique ensures that the application does not write data outside the allocated memory space, thereby preventing unexpected behavior and potential overflow.
•	**Utilizing Memory Management Tools:** Tools such as garbage collection and memory profilers actively monitor memory usage, aiding in the early detection and resolution of memory-related issues.
•	**Regular Testing and Monitoring:** We conduct extensive stress and load testing to identify potential vulnerabilities, coupled with continuous monitoring to ensure that memory consumption remains within acceptable limits.

•	**Error Handling:** Our system is equipped with sophisticated error handling mechanisms for graceful termination or recovery from overflow conditions. This ensures that an overflow does not lead to catastrophic failure but is managed effectively.
•	**Safe Programming Practices:** By adhering to best practices in programming, we reduce the risk of memory overflow, ensuring that all aspects of memory management are handled with due care.
•	**Compatibility Assurance:** We rigorously ensure that our application is compatible with supported server operating systems and database platforms, which further diminishes the risk of memory-related issues.
•	**Use of Security and Quality Tools:** Tools like SonarQube for code quality management and DAST & SAST for identifying security vulnerabilities are incorporated to catch hardcoded values and other potential risks that may contribute to memory overflow.
These measures collectively contribute to a resilient system that is well-equipped to handle memory overflow. By implementing a comprehensive strategy, we not only mitigate the risk but also enhance the overall robustness, reliability, and efficiency of the application.	

25 How will you provide required SDK for new change request?

Ans:	The provision of the required SDK for a new change request follows a structured and collaborative process:
•	**Assessment of Change Request:** When a change request is submitted, our team first assesses the exact requirements and understands the scope of the changes needed. This involves analyzing what modifications are necessary and identifying if any specific SDK is required to implement those changes.
•	**Selection of Suitable SDK:** Depending on the nature of the change request, we select the appropriate SDK that aligns with the technical requirements. The SDK might already exist in our development environment, or we may need to obtain a new one that fits the purpose.
•	**Licensing and Compliance:** If a new SDK is required, we ensure that it complies with all legal and licensing requirements. We also verify that it meets the quality and security standards necessary for the project.
•	**Integration and Development:** The selected SDK is then integrated into the development environment. Our development team uses it to implement the changes requested, adhering to best practices and coding standards.
•	**Testing and Validation:** We thoroughly test the changes made using the SDK to ensure that they meet the specified requirements and do not introduce new issues. This includes unit testing, integration testing, and user acceptance testing as needed.
•	**Documentation and Support:** Comprehensive documentation is provided, including guidelines on how to utilize the SDK for the changes implemented. We also offer ongoing support and maintenance to ensure that the SDK continues to function correctly as the application evolves.
•	**Cost Consideration:** Depending on the nature of the change request and the terms of our agreement, the provision and integration of the SDK may have associated costs. These would be communicated transparently and agreed upon with the client.
•	**Delivery and Implementation:** Once the change request has been successfully implemented using the required SDK, the updated version of the application is delivered to the client. If necessary, we assist with deployment and provide training on the new features.
By following this approach, we ensure a smooth process of providing and integrating the necessary SDK to meet the specific needs of a new change request. This enables us to respond flexibly to changes while maintaining the quality, security, and integrity of the application.	

26 Please mention your licensing model. Licensing should be perpetual.

Ans:	Our licensing model for the BORNALI system is based on the Software as a Service (SaaS) model. This approach provides flexibility, ease of access, and ensures that you are always working with the latest features and updates. The specific details of the pricing structure, including various packages and options tailored to meet your needs, will be comprehensively outlined in the financial offer we provide. This model aims to align with your operational requirements and budget considerations, providing a scalable and cost-effective solution.

4. Implementation Details

Implementation plan for the **Supply Chain Financing Solution**:

- **Project Management Approach:** Our proposal also encompasses the employment of a robust project management methodology. Utilizing Agile methodology, we aim to foster adaptability and encourage incremental progress through regular sprints. We will be utilizing project management tools for tracking tasks, setting milestones, and ensuring the timely delivery of each module. This approach will allow us to seamlessly adapt to changes, provide regular updates, and deliver quality results efficiently.
- **Stakeholder Involvement:** We will establish a consistent stakeholder involvement plan to ensure smooth communication and progress. Regular meetings will be scheduled for updates, discussions, and brainstorming sessions. We believe that transparent communication is the key to success in any project, and thus, we intend to involve the stakeholders in every major decision-making process. Regular progress reports will be shared to keep everyone abreast of the project's developments.
- **Requirements, Clarifications, Elaborations, and Analysis:** Our proposal encompasses the setup and configuration of a domain, hosting, and SSL certificate, in addition to comprehensive requirement analysis and documentation. Our team will provide evidence of performing their configuration and conduct a final requirement analysis. We will furnish all pertinent documents and diagrams, including the Software Requirements Specification (SRS) and other diagrams that are mutually agreed upon with Prime Bank Limited. Furthermore, we will scrutinize the deliverables with the counterpart, and make modifications (if needed) based on the recommendations from the validation workshop.
- **Risk Management:** Our team is experienced in identifying potential risks that could impact the project timeline, cost, or quality. We will conduct risk assessments at every stage of the project, from initiation to closure. The aim is to proactively address issues before they become problems. Our risk management process will include risk identification, analysis, response planning, and monitoring.
- **Design & Development:** Our proposal includes delivering the user interface design, data schema, and business logic for each module. Our team will develop each module's frontend, backend services, and database functionality according to the design specifications. Implement any necessary integrations between the modules. Perform unit testing for each module.
- **Validation and Verification:** We propose that we will work with the Prime Bank Limited team to perform security testing. The team will also provide the necessary certificates and reports related to security testing. Additionally, the team will conduct thorough testing of the software to ensure it meets quality standards and work with the client's team to make any necessary updates or modifications based on recommendations.
- **Rollout (Deployment):** We propose to deploy the software and database system to the live server. The team is experienced in software deployment and database management, and they will obtain consent from the client's team on previous deliverables to ensure all necessary modifications and updates have been made to the software. The team will ensure that the live environment is properly configured and installed to meet all necessary security standards. The team will work diligently to minimize downtime or disruption to the system, ensure the scalability of the server, and also provide regular progress reports to keep the client informed.
- **Performance Metrics:** To ensure that the project is progressing as per expectations and delivering value, we will use specific key performance indicators (KPIs). These KPIs will be decided mutually and will align with the project's objectives. We will continuously monitor these KPIs and adjust our strategies based on the findings to ensure we meet the set targets.
- **Change Management:** In a dynamic project environment, changes are inevitable. Our team is prepared to manage changes in project requirements, scope, or timeline efficiently. We propose to incorporate a change management process that will document, analyze, prioritize, and implement changes without impacting the project's progress or quality adversely.
- **Support, Training & Maintenance**: The proposal is to deliver all final documents, including manuals, troubleshooting documents, hand-over document, design document and data-flow diagram for Project components. Our experienced team will also provide comprehensive training to stakeholders on system operation and troubleshooting.

Following documents will be provided during Implementation:

•	SRS	If our Supply Chain Financing Solution is selected for implementation, we will collaborate with Prime Bank to develop a comprehensive Software Requirements Specification (SRS) document.
•	Deployment document	For more details please go to Chapter 8.6.1 (Build Deployment Staging Process)
•	Release document	For more details please go to Chapter 12 (Handover Documents)
•	Technical Architecture	For more details please go to Chapter 8.5.2 (Architecture Diagram)
•	Data Flow Diagram	For more details please go to Chapter 8.5.5 (Data Flow Diagram)
•	Audit Log document	For more details please go to Chapter 11.0 (Audit Trall Log)
•	Data Dictionary	We will provide the Data Flow Diagram (if rewarded)

Overall, this implementation plan will ensure a structured and predictable development process for the Supply Chain Financing Solution, and provide clear deliverables at each phase of the project.

4.1. Installation Instruction

The installation process for software DC (Data Center), DR (Disaster Recovery), High Availability, and Testing environments involves a series of steps:

•	**Software DC Installation:**	Procure and set up hardware components for the primary data center, including servers, networking equipment, and storage devices.
		Install and configure the operating system on the servers.
		Deploy the software applications on the servers, following vendor guidelines and best practices.
		Set up the necessary databases and configure integration with other systems if required.
		Conduct thorough testing to ensure proper functionality and performance.
•	**Software DR Installation:**	Establish a secondary data center at a different location to serve as the disaster recovery site.
		Replicate data from the primary data center to the DR site using data replication technologies.
		Set up hardware and software components at the DR site to mirror the primary data center's configuration.
		Conduct regular data backups to the DR site for quick recovery in case of a disaster.
		Periodically test the disaster recovery process to verify its effectiveness.
•	**High Availability Configuration:**	Implement redundancy and failover mechanisms to ensure continuous operation in case of hardware or software failures.
		Set up load balancers and clustering to distribute the workload across multiple servers for optimal performance.
		Configure automated failover processes to switch to backup systems seamlessly in case of a failure.
		Monitor the health and performance of the system to detect and address any issues
•	**Testing Environment Installation**	Set up a controlled testing environment with the necessary hardware and software to conduct UAT for the application.
		Create a comprehensive test plan with specific test scenarios and use cases that reflect real-world user interactions and business processes.
		Conduct UAT by having actual end-users interact with the application, verifying its functionality, user-friendliness, and adherence to business requirements.
		Record and document any discrepancies, defects, or issues encountered during UAT, providing clear descriptions and steps to reproduce the problems.
		Collaborate with stakeholders to address and resolve identified issues. Make necessary improvements to ensure the application meets user expectations before its final deployment.

These processes are critical to ensure reliable, fault-tolerant, and well-tested software deployment, supporting business continuity and smooth operations.

•	**System Requirements Check:**	Before proceeding with the installation, ensure that the target system meets all the specified hardware and software requirements for running the SCF Solution.
•	**Software Download:**	Obtain the SCF Solution software package from the vendor or designated source, ensuring it is the latest version compatible with the intended operating environment. For more details please go to Chapter 8.4 (Required Software for Implementing)

•	**Pre-Installation Preparation:**	Backup all relevant data and configuration settings to ensure a safe installation process and to have a recovery option in case of any issues.
•	**Installation Wizard:**	Launch the installation wizard or setup program provided by the SCF Solution. Follow the on-screen instructions to configure the installation settings, such as the installation directory, database setup, and integration options.
•	**Database Setup:**	If the SCF Solution requires a database, set up the database server and provide the necessary credentials during the installation process.
•	**Configuration:**	Customize the SCF Solution to fit the specific requirements of Prime Bank Ltd., such as configuring user roles, permissions, and integration with existing systems.
•	**Testing:**	Conduct thorough testing of the installed SCF Solution to ensure all features and functionalities are working as expected and that data is being processed accurately.
•	**User Training:**	Train the relevant personnel on how to use the SCF Solution effectively to maximize its benefits and ensure smooth operations.
•	**Post-Installation Support:**	After installation, monitor the SCF Solution's performance and provide ongoing support to address any issues that may arise.

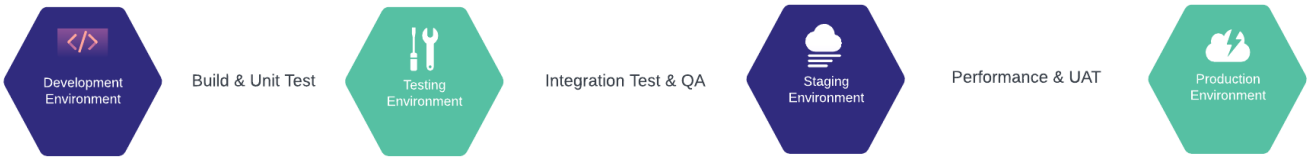
Building, deploying, and staging form the crux of the software development lifecycle, ensuring that the developed software is constructed, delivered, and configured for testing efficiently. This process plays a pivotal role in our Supply Chain Financing (SCF) Solution, enabling us to manage the software seamlessly from development to production.

Build Process

The build process involves converting source code files into standalone software artifact(s) that can be run on a system. In the context of our SCF system, the build process includes compiling the source code, running tests, checking for coding standard violations, and generating documentation.

For the back-end, which is primarily Java-based, we use Maven as our build tool. Maven helps manage dependencies, compile the source code, run tests, and package the compiled code into a JAR file.

Figure 02: Build Process



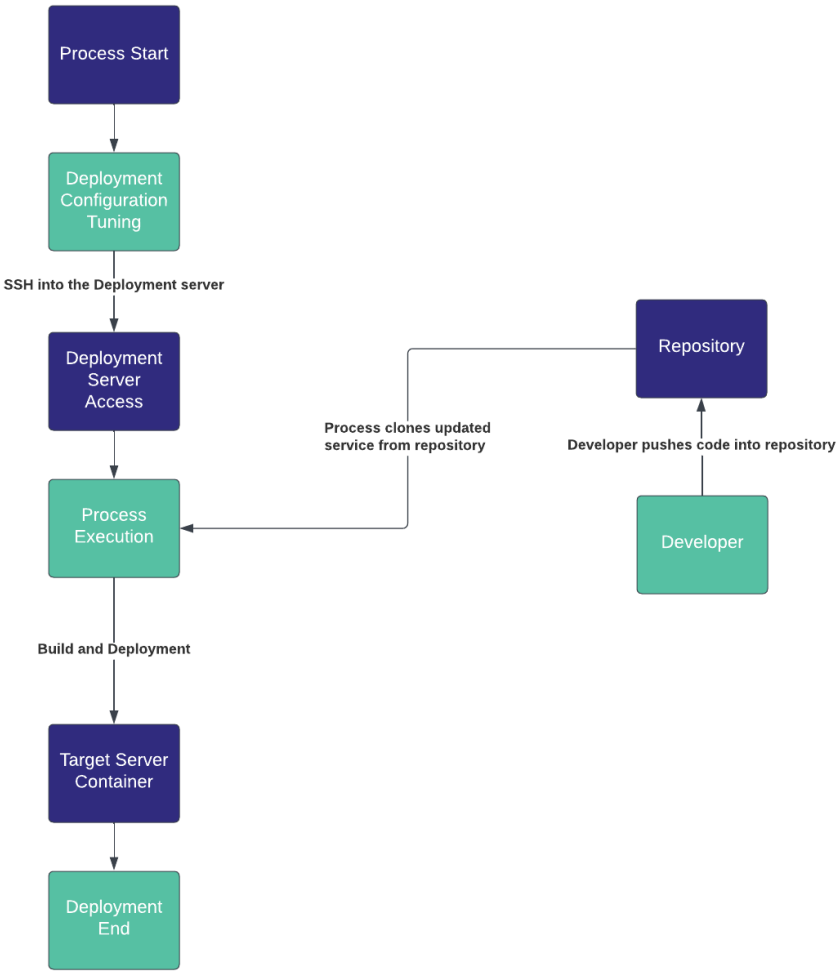
Continuous Integration (CI)

Continuous Integration is an integral part of our build process. We use a CI server (like Jenkins) that monitors our code repository for changes. Whenever changes are pushed, the CI server triggers the build process and provides feedback to the developers. This practice ensures that errors are detected and corrected as early as possible.

Deployment Process

The deployment process refers to all the activities that make a software system available for use. Our deployment process is designed to be repeatable and reliable, reducing the chances of deployment failures and increasing the speed of deployment activities.

Figure 03: Deployment Process



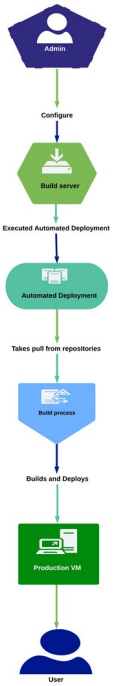
Automated Deployment

We use an automated deployment script for efficiency and consistency. This script is run inside an Admin Server in the same network as the other servers. It connects to a specific data source (Google Sheet in our case) to read the necessary configuration parameters, including information like which services to deploy, where to deploy, and database connections. Then, it executes the stages of the deployment pipeline, deploying all required services in one go. This automated deployment script is effectively a CI/CD tool used in both development and live servers.

Continuous Deployment (CD)

Continuous Deployment extends Continuous Integration by automatically deploying all changes that pass the automated testing phase. This practice allows us to reduce the lead time in getting changes to production and enables faster feedback.

Figure 04: Continuous Deployment (CD)



Staging Process

The staging process, often considered a pre-production phase, involves deploying the application to an environment that mirrors the production environment closely. This environment, known as the staging environment, is used to simulate the behavior of the application in production.

Staging Environment

Our staging environment is a replica of the production environment. It has the same hardware, software, databases, and configurations. The aim is to create a setting where we can test the application in a production-like situation before it's released to the actual production environment.

Testing in Staging

Once deployed in the staging environment, the application undergoes various tests including integration tests, performance tests, and security tests. Importantly, we also conduct User Acceptance Testing (UAT) in this environment. The goal of UAT is to verify if the system is working for the users as designed and expected.

Release

Upon successful testing in the staging environment, the application is deemed ready for production. The release process involves a final deployment to the production environment, where it's made available to end-users. This transition from staging to production is meticulously managed to ensure minimal downtime and maintain a seamless user experience.

By following this robust build, deployment, and staging process, we ensure that our Supply Chain Finance solution is reliable, robust, and ready to handle real-world scenarios.

4.2. User manual

The User Manual for the Supply Chain Finance Solution provides more details in **Appendix B - Documents**.

4.3. Configuration Parameters

Configuration parameters within BORNALI offer the flexibility to tailor the SCF platform to cater to specific business needs and requirements. These customizable settings and variables significantly influence the SCF system's behavior, functionality, and operations. Below, we provide a brief explanation of the key configuration parameters in the SCF platform:

•	**Funding Limits**	Set the maximum funding amount permissible for a supplier or buyer within the SCF program.
•	**Payment Terms**	Configure payment terms including the duration of credit and penalties for late payments.
•	**Invoice Approval Workflows**	Define the approval hierarchy and rules for the seamless processing of supplier invoices.
•	**Discount Rates**	Specify rates applicable for dynamic discounting or early payment incentives.
•	**Currency and Exchange Rates**	Configure the accepted currencies and determine the mechanisms for exchange rates, particularly beneficial for international transactions.
•	**Interest Rates**	Set the interest rates for the various financing options available to suppliers within the SCF platform.
•	**User Access and Permissions**	Manage user roles, determine access levels, and set permissions for different stakeholders within the SCF ecosystem.
•	**Reporting and Analytics**	Customize the reporting features and analytics tools to provide specific insights and data visualization that meet stakeholders' needs.
•	**Notifications and Alerts**	Configure automated notifications and alerts for critical events such as pending approvals, updates on payment status, or new financing offers.
•	**Risk Parameters**	Define the parameters for risk assessment and scoring to evaluate supplier creditworthiness and potential risk exposure.
•	**Approval Configuration**	Adapt the process of authorization to choose between a single-step approval, where only one maker's confirmation is necessary, or a dual-step approval that mandates an agreement from both a maker and an authorizer.
•	**Multi-Factor Authentication (MFA)**	Establish the rules for MFA to enhance the security of the platform.

These configuration parameters provide businesses the flexibility to adapt the SCF platform to their unique requirements, ensuring alignment with their financial strategies, risk tolerance, and operational processes. By carefully adjusting these parameters, organizations can fine-tune their SCF implementation to maximize efficiency and enhance the effectiveness of their supply chain financing program.

4.4. Passwords Policy

Password Policy

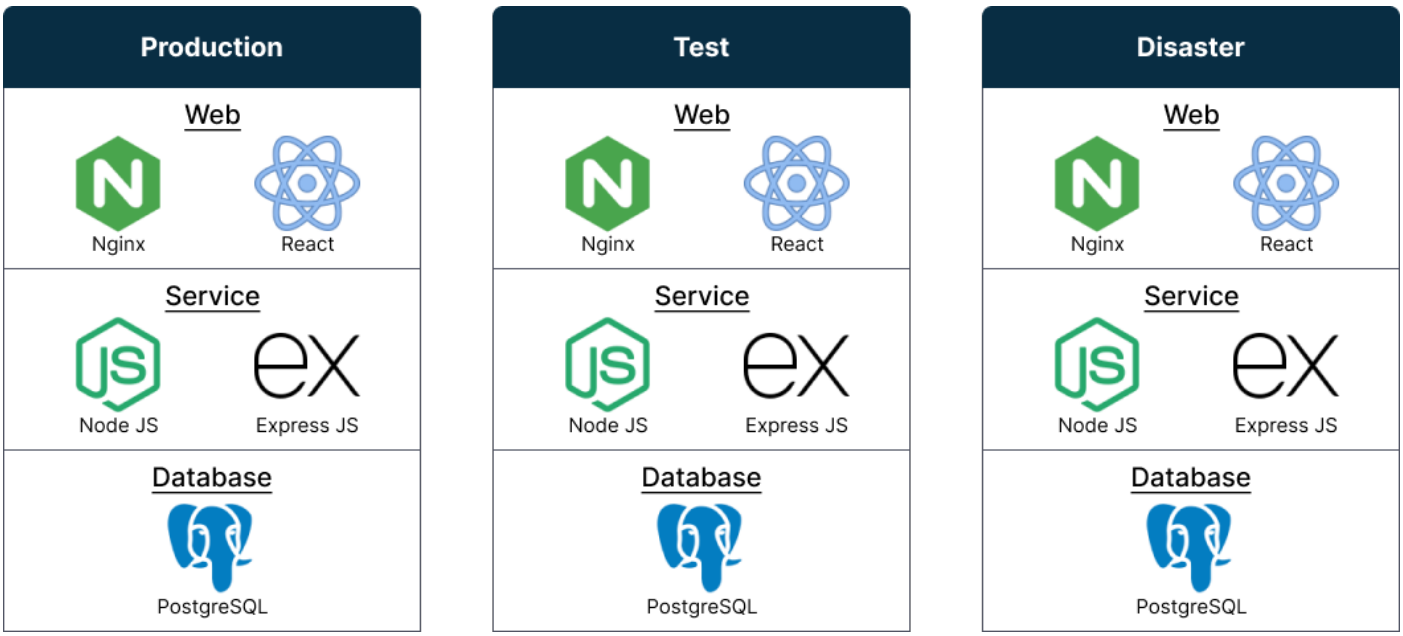
To ensure robust security for user and admin accounts, the following password policy guidelines shall be implemented:

•	**Length Requirements:**	User-level passwords will be a minimum of eight (8) characters long.
		Admin-level passwords will be a minimum of twelve (12) characters long.
•	**Character Composition:**	Passwords will contain a combination of both uppercase and lowercase characters (i.e., a-z, A-Z).
•	**Complexity:**	Password includes digits and/or special characters/punctuation (e.g., 0-9, !@#$ %^&*()_=+-[{]};:,<.>/?).
•	**Password History:**	Systems/applications shall maintain a password history mechanism, ensuring that users cannot reuse their last six (6) passwords. This prevents the recycling of old passwords and enhances security.
•	**Password Expiry:**	Users will be required to change their passwords after thirty (30) days. Enforcing password rotation at regular intervals enhances security by reducing the risk of prolonged exposure.
•	**Account Lockout:**	To prevent unauthorized access attempts, the user ID will be locked after three (3) unsuccessful password attempts. This feature discourages brute force attacks and strengthens account protection.
•	**Secure Password Storage:**	Implement one-way hashing with salt to securely store passwords, ensuring they are not stored in plaintext format.
•	**Password should not be hard coded in any application:**	Avoiding storing passwords directly in the source code or configuration files. We will Implement secure authentication mechanisms such as OAuth or token-based authentication to prevent exposing passwords in the codebase.
•	**Password brute forcing must be prevented:**	Implement measures to thwart brute force attacks, such as account lockouts or delays after multiple failed login attempts. Utilize multi-factor authentication (MFA) to add an extra layer of protection.
•	**Ability to encrypt passwords and other sensitive data based on industry-standard encryption mechanisms:**	Utilize strong encryption algorithms like AES or bcrypt to encrypt passwords and sensitive data. Implement proper key management practices to safeguard encryption keys and ensure data confidentiality.

By adhering to these password policy guidelines, the system will enhance security, reduce the risk of compromised accounts, and ensure the confidentiality and integrity of user and admin credentials.

4.5. Production Environment Setup

Figure 05: Environment Deployment Flow

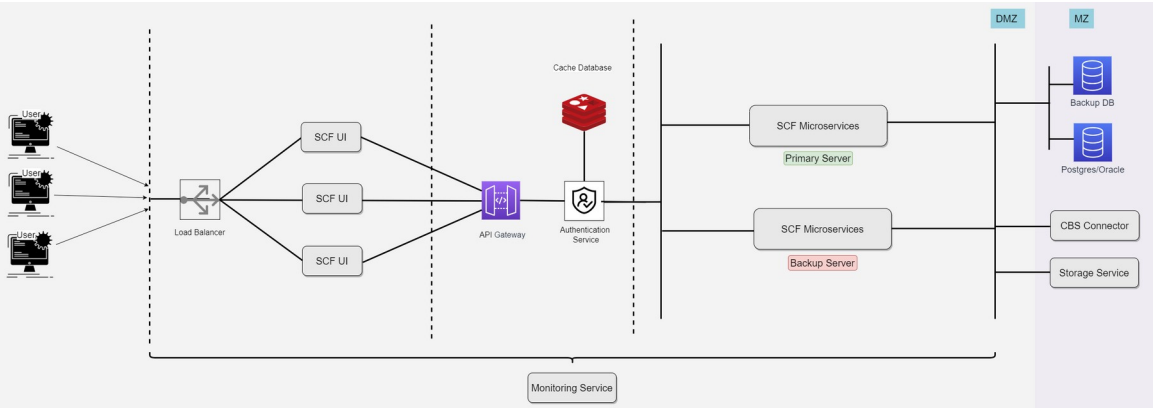


- In this diagram, we have three environments: Production, Test, and Disaster Recovery. The Production environment is the live environment that serves the end-users. The Test environment is used for testing new features and changes before they are deployed to Production. The Disaster Recovery environment is used in case of a disaster in the Production environment, such as a natural disaster or a cyber-attack.
- Each environment consists of three main components: Web Server, App Server, and Database. The Web Server handles incoming requests from the end users and returns the response. The App Server runs the application code and interacts with the Database to retrieve or store data. The Database stores the data that the application needs to function.
- In the Production environment, we have the live version of the application running. In the Test environment, we have a copy of the Production environment where we can test new features and changes before deploying them to Production. In the Disaster Recovery environment, we have a copy of the Production environment that can be activated in case of a disaster to ensure that the application can continue running even if the Production environment is down.

5. Miscellaneous

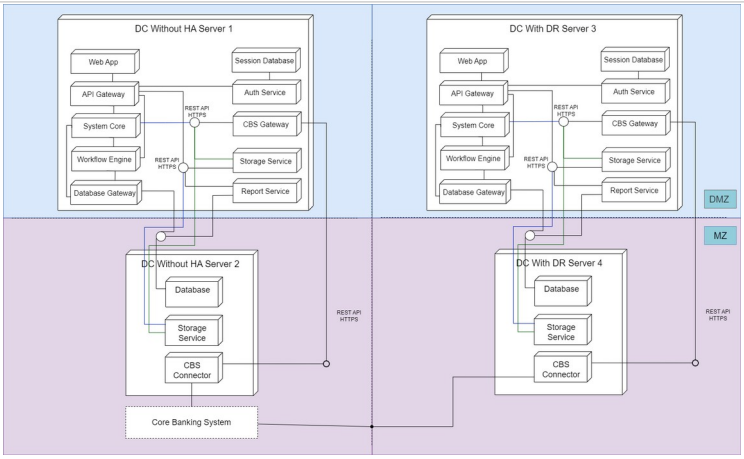
	•	**Distributed Architecture:**	Design the system using a distributed architecture that allows scaling in a systematic way

Figure 06: System Architecture



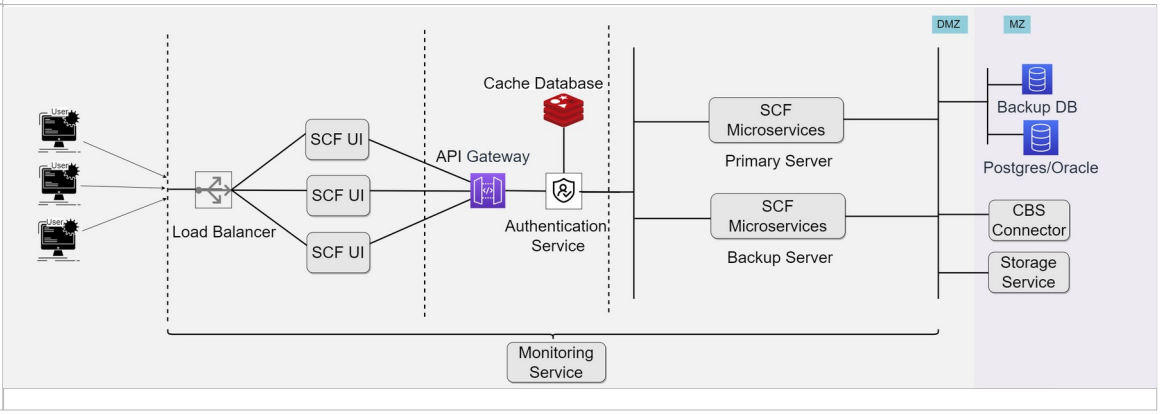
Solution Stability:	•	**Load Balancing:**	Introduce a load balancer that sits in front of the system.
	•	**Statelessness**	Make the application stateless.
	•	**Database Scaling:**	The Database is considered to use a distributed or sharded design.
	•	**Message Queues:**	Utilize message queues to decouple components and enable asynchronous processing.
	•	**Autoscaling:**	Implement an autoscaling mechanism that monitors the system's performance metrics, such as CPU usage, memory utilization, or request queue length and scales horizontally.
	•	**Containerization:**	Utilize containerization technologies like Docker to package and deploy your application.
	•	**Infrastructure as Code:**	Infrastructure-as-code tools like Terraform define and manage your system's infrastructure.

Figure 07: Proposed Deployment Diagram With High Availability



	•	**Monitoring and Logging:**	Implement robust monitoring and logging solutions to gain insights into system performance, identify bottlenecks, and troubleshoot issues.

Log Writing Process:	The audit trail log holds immense significance in the context of a Supply Chain Financing (SCF) Solution. With the intricate financial transactions and collaborations involved in supply chain financing, the audit trail log becomes a critical tool for maintaining transparency, trust, and security within the ecosystem. It meticulously captures every action taken by buyers, suppliers, financial institutions, and administrators, providing a comprehensive trail of financial activities and decisions. By enabling real-time monitoring and tracking of SCF operations, the audit trail log ensures that all stakeholders remain accountable for their actions, bolstering the overall integrity of the SCF Solution.		
	•	**Solution**	We will provide a comprehensive solution that includes a panel for monitoring service-wise audit trails. This panel should allow for easy administration and deployment of audit trails, ensuring efficient tracking of activities across the system.
	•	**Standard Audit Trail Report/Module**	The system should incorporate a standard Audit Trail Report or Module for Supply Chain Financing (SCF) Solution, enabling users to access detailed logs of events and actions performed within the application. This report should display relevant information, such as timestamps, user IDs, and activities, providing a comprehensive overview of system activities.
	•	**Audit Trail & User Activity Report**	The system must generate an Audit Trail Report for Supply Chain Financing (SCF) Solution encompassing user activity, providing insights into actions taken by each user. This report should facilitate effective auditing and compliance monitoring, enhancing the system's overall security and accountability.
	•	**Incorporation of Audit Trail Log in Security Admin Module**	Supply Chain Financing (SCF) Solution include the integration of the Audit Trail log within the Security Admin Module. This integration ensures that authorized administrators can access and manage the Audit Trail functionalities from the Security Admin Module. By centralizing these features, administrators can efficiently monitor, configure, and analyze audit trails while maintaining a comprehensive view of security-related activities.
	•	**Granular Information:**	The Supply Chain Financing (SCF) Solution audit trail log captures granular information, such as the date and time of each event, the user or entity involved, the action performed, and the source of the event.
	•	**Non-Repudiation:**	Supply Chain Financing (SCF) Solution audit trail log provides non-repudiation, meaning that actions performed by users or systems can be attributed to specific individuals or entities, preventing denial of responsibility.
	•	**Security Monitoring:**	Audit trail logs are crucial for real-time security monitoring, allowing administrators to detect and respond promptly to suspicious activities or potential security breaches.
	•	**Forensic Analysis:**	In the event of security incidents or investigations, audit trail logs serve as valuable forensic evidence to identify the sequence of events and potential root causes.
	•	**Data Integrity:**	The audit trail log can help verify the integrity of data by tracking changes and modifications made to critical records or files.
	•	**Log Retention:**	Prime Bank Ltd. will define log retention policies to determine how long audit trail logs should be kept. This ensures historical data availability for analysis and compliance purposes.
	•	**Integration with PBL Security System:**	Integrating with PBL Security Baseline systems allows for centralized log analysis, correlation, and alerting, enhancing overall security monitoring capabilities.

	•	**Secure Storage:**	To maintain the integrity and confidentiality of audit trail logs, they should be stored securely and protected from unauthorized access or tampering.
	•	**Log Review and Analysis:**	Regular review and analysis of audit trail logs are essential to identify patterns, anomalies, or potential threats, and to proactively address security risks.
	By effectively leveraging audit trail logs, Prime Bank Ltd. can enhance their security posture, gain valuable insights into system activities, and meet compliance requirements more effectively.		
On Site Support:	•	**Onsite Support:**	We are obligated to provide onsite support for a duration of two months after the completion of the project. This means that our technical team or representatives must be physically present at the project location to address any post-implementation issues, provide training if necessary, and ensure a smooth transition to the operational phase. Our commitment to providing two months of onsite support following project completion aims to address potential issues during the post-implementation phase. We will have a dedicated team on-site to facilitate a seamless transition to full operation. Comprehensive training will be provided if required, equipping your team with the necessary skills for efficient system operation. Our goal is to deliver a successful implementation with ongoing support and assistance throughout this critical phase.
	•	**Completion Certificate:**	As a part of our Supply Chain Finance solution, upon the successful completion of the project, Prime Bank Ltd. will issue a formal completion certificate to Spectrum Software and Consulting (Pvt) Ltd. This certificate will signify that the project has met all agreed-upon requirements and expectations of the bank, ensuring that the objectives of the project have been achieved. The certificate serves as official recognition of the successful execution of the supply chain solution, reinforcing our accountability in providing support and meeting the project's goals.
License:	•	**Open-source License**	We successfully developed Supply Chain Finance software using an entirely open-source tech stack, ensuring license compliance for all prerequisite software. The application utilizes PostgreSQL for database management, Docker for containerization, Node.js and Express.js for server-side development, React for the frontend, Nginx as the web server, and Tailwind css for the user interface, creating a robust and scalable solution.
	A load balancer can play a crucial role in meeting the supply chain financing requirements by enhancing the performance, reliability, and scalability of the application infrastructure. Here's how a load balancer can address these requirements:		
	Figure 08: System Architecture		
			

Load Balancer:	•	**Performance:**	Our application may experience varying levels of traffic and load, especially during peak times or when multiple users are accessing the system simultaneously. A load balancer distributes incoming network traffic across multiple servers or resources, ensuring each server operates within its capacity. This way, the application can efficiently handle user requests, leading to improved performance and reduced response times.
	•	**High Availability:**	Load balancers ensure high availability by detecting server failures and automatically redirecting traffic to healthy servers.
	•	**Scalability:**	Load balancers enable horizontal scalability by adding or removing servers seamlessly, allowing the system to handle increased or decreased traffic loads.
	•	**Session Persistence:**	Load balancers can maintain session persistence by directing subsequent requests from a client to the same server to ensure a consistent user experience.
	•	**Health Monitoring:**	Load balancers continuously monitor the health and availability of servers, removing or isolating unresponsive or faulty servers from the pool.
	•	**Traffic Management:**	Load balancers provide traffic management features such as SSL termination, caching, compression, and content-based routing to optimize performance and security
	By effectively managing and distributing traffic across backend servers, load balancers help ensure a smooth, reliable, and scalable operation of the supply chain financing application, meeting the critical requirements of the financial industry.		
API Encryption:	•	**Implementation:**	Implement TLS encryption for API communications.
	•	**Enforcement :**	Enforce HTTPS protocol for secure transmission.
	•	**Authentivation :**	Use secure authentication and authorization mechanisms.
	•	**Encryption :**	Encrypt sensitive data in API payloads.
	•	**Partices :**	Follow secure key management practices.
	By implementing TLS encryption, enforcing HTTPS, utilizing secure authentication and authorization, encrypting sensitive data, and following secure key management practices, the supply chain financing solution's APIs are fortified against potential security threats. This comprehensive approach ensures that sensitive financial data remains confidential, transactions are secure, and the overall solution meets the high-security standards required in the financial industry.		
Role Based Control:	•	**Role-based Access Control (RBAC):**	Implement RBAC to define different roles with specific permissions and access levels.
	•	**Customizable Dashboards:**	Provide the ability to create role-specific dashboards tailored to each user's needs.
	•	**Role Assignment:**	Enable administrators to assign roles to users based on their responsibilities and job functions.
	•	**Data Visualization:**	Present role-specific data and analytics in a visually appealing and easy-to-understand manner.
	•	**Personalization:**	Allow users to customize their dashboard layout, widgets, and data visualizations based on their preferences and requirements.
	The role-based control approach aligns perfectly with the supply chain financing solution's requirements. By implementing Role-Based Access Control (RBAC), users are assigned specific roles with defined permissions, ensuring secure and controlled access. Administrators can easily assign roles based on responsibilities, while personalization options empower users to customize their dashboard layout and data visualizations, enhancing usability and efficiency.		

VAPT Mitigation:	•	**Patch Management:**	Apply security patches and updates to address known vulnerabilities promptly.
	•	**Configuration Hardening:**	Configure systems and applications securely to minimize potential vulnerabilities.
	•	**Vulnerability Remediation:**	Address identified vulnerabilities by applying recommended fixes or workarounds.
	•	**Access Control:**	Enforce strong access controls and least privilege principles to restrict unauthorized access.
	•	**Network Segmentation:**	Segment networks to limit the impact of breaches and prevent lateral movement.
	•	**Security Monitoring:**	Implement robust monitoring and logging to detect and respond to security incidents.
	•	**Employee Training:**	Provide security awareness training to educate employees about common attack vectors and best practices.
	The VAPT (Vulnerability Assessment and Penetration Testing) mitigation measures effectively address the supply chain financing solution's security requirements. They include applying security patches, configuring systems securely, remediating vulnerabilities, enforcing access controls, implementing network segmentation, monitoring security incidents, and providing security awareness training to employees.		

6. Features of Supply Chain Financing

01. Flexible Automation

Flexible automation is a feature that helps streamline processes and improve efficiency. This feature allows users to automate certain tasks and processes within the system based on their preferences and comfort level with automation.

Here's a summary of the key points for the flexible automation feature in BORNALI:

1. Allows users to automate certain tasks and processes within the system based on their preferences and comfort level with automation.
2. Users can choose to automate as many or as few tasks as they feel comfortable with, and the system can be customized to meet their specific needs and preferences.
3. Helps to reduce errors and improve data accuracy, as automated processes are less prone to human error.
4. Frees up time for users to focus on more complex or strategic activities, such as analyzing financial data, identifying trends, and making strategic decisions.
5. It can help to streamline operations, reduce costs, and improve overall efficiency.
6. Provides a customizable level of automation to suit individual user needs and preferences.

02. User-Friendly Interface

This feature is focused on optimizing the user interface (UI) and user experience (UX) to ensure that users can quickly and easily access the information and features they need.

Here's a summary of the key points for the User-Friendly Interface feature in BORNALI:

1. Optimizes the user interface and user experience to ensure that users can quickly and easily access the information and features they need.
2. Simplifies navigation with a simple, intuitive structure that minimizes clicks and page loads.
3. Uses contextual menus to provide quick access to frequently used functions.
4. Uses responsive design to ensure that the system works well on different devices and screen sizes.
5. Provides helpful, actionable feedback to users to improve their understanding of the system and reduce errors.
6. Offers customization options to allow users to tailor the interface to their needs and preferences.
7. Provides easy access to help and support resources to assist users when they need it.
8. Enhances security by implementing appropriate access controls, permissions, and authentication mechanisms.

03. Automated Approval Workflows

Automated Approval Workflows automate and streamline the approval processes for financing requests. This feature involves creating dynamic workflows that can adapt to different financing scenarios and requirements.

Here's a summary of the key points for the Automated Approval Workflows feature in BORNALI:

1. Automates and streamlines the approval processes for financing requests.
2. Creates dynamic workflows that can adapt to different financing scenarios and requirements.
3. Automates the routing of financing requests through a predefined workflow based on customizable rules and criteria.
4. Allows for different levels of approval and collaboration, depending on the complexity and size of the financing request.

5. Provides real-time visibility into the status of financing requests and approvals, allowing for better tracking and management.
6. Offers customizable notifications and alerts to ensure that stakeholders are aware of the status of financing requests and any actions required.
7. Enables automated communication and documentation for each stage of the financing request process, reducing manual effort and improving accuracy.
8. Offers a centralized dashboard for managing and tracking financing requests across the organization.
9. Improves decision-making by providing real-time analytics and reporting on financing request data, enabling stakeholders to make informed decisions.
10. Enhances security by implementing appropriate access controls, permissions, and authentication mechanisms.

04. Flexible Financing Controls

Flexible Financing Controls enable users to set limits and controls on financing requests and transactions. This feature allows users to establish rules and criteria for financing requests based on various factors, such as amount, supplier, and anchor.

Here's a summary of the key points for the Flexible Financing Controls feature in BORNALI:

1. Allows users to set limits and controls on financing requests and transactions based on various criteria.
2. Customizable limits can be set based on factors such as supplier, anchor, and financing amount.
3. Provides real-time monitoring of financing requests and transactions, enabling users to track activity and ensure it stays within established limits and controls.
4. Offers automated alerts and notifications when financing requests or transactions exceed established limits, enabling users to take appropriate action.
5. Simplifies the configuration of financing limits and controls to help users easily establish and manage their preferred criteria.
6. Offers a centralized dashboard for managing and tracking financing requests and transactions across the organization.
7. Improves decision-making by providing real-time analytics and reporting on financing request data, enabling stakeholders to make informed decisions.
8. Enhances security by implementing appropriate access controls, permissions, and authentication mechanisms.
9. Reduces the risk of fraud and financial losses by enforcing established limits and controls on financing requests and transactions.
10. Helps ensure compliance with regulatory requirements by implementing appropriate limits and controls on financing requests and transactions.

05. Process Automation

This feature involves using technology to automate manual processes and tasks, enabling users to focus on more strategic and value-added activities.

Here are some key points for the Process Automation feature in BORNALI:

1. Enables the automation of repetitive and time-consuming tasks, freeing up users to focus on more strategic and value-added activities.
2. Reduces errors and improves accuracy by eliminating the need for manual data entry and processing.
3. Improves efficiency and reduces costs by automating tasks that would otherwise require manual intervention.
4. Provides real-time visibility into financing request status and progress, enabling stakeholders to make informed decisions and take appropriate actions.

5. Helps ensure compliance with regulatory requirements by automating key processes and providing audit trails.
6. Improves communication and collaboration among stakeholders by automating notifications, reminders, and alerts.
7. Enables faster decision-making by providing real-time analytics and reporting on financing request data.

7. Proposed Solution: BORNALI

BORNALI is an advanced Supply Chain Financing (SCF) Solution process automation platform that offers end-to-end solutions for all the needs of an Supply Chain Financing (SCF) Solution department. It is designed to streamline and automate the entire Supply Chain Financing (SCF) Solution process, from customer onboarding to collection management. BORNALI supports all five commonly used Supply Chain Financing (SCF) Solution structures:

1. Supplier Finance Factoring
2. Distributor Financing
3. Purchase Order Financing
4. Reverse Factoring

One of the core strengths of BORNALI is its workflow engine, which enables developers to develop any financial process flow quickly and easily, making it a highly versatile and customizable platform. The workflow engine is supported by a range of other features that enhance users' functionality and benefits. For example, BORNALI offers seamless integration with a bank's internal systems and most CBSs, which ensures that all financial transactions are accurately recorded and tracked.

With BORNALI, companies can streamline their financial operations, save time and resources, and improve efficiency and productivity. The platform also provides real-time visibility into cash flow, enabling companies to make informed decisions and optimize their financial operations. Moreover, BORNALI's user-friendly interface makes it easy to manage and monitor financial processes, while its advanced security measures ensure that all data is protected from unauthorized access.

Competitor Analysis:

BORNALI operates in a competitive market in Bangladesh, where several established players are already offering supply chain finance automation solutions. Here's a brief analysis of some of the major competitors in this space:

1. ISAF: ISAF Factor Financing Company is a full-service factoring company that specializes in helping small businesses finance their invoices. The company provides cash advances to small businesses based on their invoices, allowing them to access working capital without taking on additional debt. ISAF Factor Financing also provides back-office support, such as credit checks and collections services, to help businesses manage their accounts receivable.
2. FinUltimus: FinUltimus is a part of the Ultimus core banking system, which is a comprehensive, integrated banking platform for retail, commercial, and private banking.
3. Veefin Supply Chain Financing (SCF) Solution: Veefin is a cloud-based software platform for supply chain financing. It helps small businesses and large corporations manage their financing, payments, and collections across their entire supply chain. With Veefin, businesses can extend payment terms to suppliers and receive early payment discounts from buyers. It also provides analytics and reporting to help businesses track their performance and can integrate with other systems for automated invoicing, payments, and collections.

Compared to these competitors, BORNALI offers a versatile and customizable platform that supports end-to-end supply chain finance automation, including invoice factoring, distributor financing, purchase order financing, supplier factoring, and reverse factoring. BORNALI's workflow engine enables rapid development of new financial process flows, making it a highly flexible platform. Additionally, BORNALI offers seamless integration with other systems and provides real-time visibility into cash flow, which can help businesses make informed decisions and optimize their financial operations. BORNALI is secure and reliable software developed in Bangladesh by a team of experts with decades of experience in the financial technology sector. It is compliant with local regulations and trusted by leading financial institutions.

In the rest of this section, we will describe the components, overall architecture, deployment requirements, and network connectivity requirements of BORNALI.

7.1. Factoring Online

Factoring Finance Online process is a process where three (03) parties (Supplier, Buyer and Bank) will be integrated into the SCF Platform, however, in some cases, only two parties (i.e. Buyer and Bank) might be integrated. In case of three parties are integrated into the platform, Suppliers submit invoices and request for disbursement from the platform. Whereas In two parties integrated system, upon validation directly Buyer or Bank may submit /upload the invoices into the platform on behalf of the suppliers and subsequently suppliers request for financing against the validated invoices.

Finally, the bank will get the collection amount from the supplier to initiate the settlement.

Here system will be integrated with buyers' ERP. If the buyer's ERP system provides an API (Application Programming Interface) or other integration methods. APIs allow systems to communicate and exchange data securely. Identify the integration points and functionalities available through the API.

The system utilizes machine learning techniques to extract data from buyer invoices. By leveraging the power of machine learning techniques, the system can automatically identify and extract relevant information from invoices. (Please see ***annexure Figure 1: Factoring Finance Online***, Page no 01)

Steps in the Financing Process for Suppliers and Buyers:

1 **Supplier and Buyer limit setup**

After setting up the Supplier’s Mother Limit in the CBS as per Sanction Terms, the Limit will be updated further into the SCF Platform by inputting and fetching available data from CBS, During the limit setup process both Supplier and Buyer are specified for a specific credit limit. A supplier can have multiple buyers and the bank will do the limit setup for both supplier and buyer accordingly. (Please see annexure Figure A: Limit Setup Sub Process, Page no ##)

2 **Invoice Validation**

Invoice validation is the process by means of which invoices are validated by the Buyer against which suppliers can request for financing. Invoice Validation might be done in the following forms-

In case of three parties are integrated into the platform (Supplier Initiated Model):

To validate the invoices, by logging into the platform, Supplier will upload invoices along with the required documents and forward them to the Buyer for validation, Buyer will validate the invoices by accepting and forwarding the same to the Bank or may send them back to the Supplier by rejecting if found any discrepancies. Then finally, the Bank (CAD) Maker & Authorizer will approve /reject the invoices as per the due diligence. (Please see ***annexure Figure B: Supplier initiated Invoice Submission Sub-process***, Page no ##)

In case of Two parties are integrated into the platform (Buyer Initiated Model):

To validate the invoices, by logging into the platform, the Buyer will upload and validate the invoices along with the required documents and forward to the Bank, then finally the Bank (CAD) Maker & Authorizer will approve /reject the invoices as per the due diligence. (Please see ***annexure Figure C: Buyer initiated Invoice Submission Sub-process***, Page no ##)

In case of Two parties are integrated into the platform (Bank Initiated Model):

To validate the invoices, by logging into the platform Bank will upload the collected invoices along with the required documents on behalf of the Suppliers and forward them to the Buyer, then finally the Bank (CAD) Maker & Authorizer will approve /reject the invoices as per the due diligence. (Please see ***annexure Figure D: Bank initiated Invoice Submission Sub-process***, Page no ##)

3 **Fund Requisition & Disbursement**

Once the invoice is approved by both Buyer and Bank, Supplier will be able to initiate fund requisition only against the approved invoice list from his tray. However, the Supplier can request for fund on the basis of net fund availability. The Bank will approve the fund requisition and disburse the same. This might be done in the following forms-

In case of three parties are integrated into the platform (Supplier Initiated Model):

To initiate a disbursement request, by logging into the platform, Supplier will request for funds only against validated invoices from his available sales ledger and forward them to the Bank for disbursement, the Bank (CAD) will disburse the requested amount only against validated invoices from his available sales ledger and net available limit. (Please see ***annexure Figure E: Supplier initiated Fund Request Sub-process,*** Page no ##)

In case of Two parties are integrated into the platform (Buyer Initiated Model):

To initiate disbursement request: Upon getting a fund request letter from the Supplier, the Bank (CAD) will disburse the requested amount only against validated invoices from his available sales ledger and net available limit. (Please see ***annexure Figure F: Buyer initiated Fund Request Sub-process,*** Page no ##)

In case of Two parties are integrated into the platform (Bank Initiated Model):

To initiate a disbursement request, upon getting a fund request letter from Supplier Bank (CAD) will disburse the requested amount only against validated invoices from his available sales ledger and net available limit. (Please see ***annexure Figure G: Bank initiated Fund Request Sub-process***, Page no ##)

4 **Collection**

Against the approved invoice supplier will get the finance from the bank. On or before maturity, Bank will realize the collection from the supplier's assignment account. After adjusting the due amount residual will be transferred to Supplier's CASA Account. Collection can be done through Five different modes. (Please see **annexure Figure H: Collection Sub-process**, Page no ##)

Against the approved invoice supplier got the finance from the bank. Bank will get the collection from the supplier. Collection can be done in four different ways

1. Cheque
2. Cash
3. EFTN and,
4. RTGS
5. Pay order

Collection is segregated in two ways

1. Collection with allocation

Collection with allocation is the case where it is known against which invoices collection has been realized, in this case, outstanding will be adjusted & invoices can be fully or partially settled.

2. Collection without allocation

Collection without allocation is the case where it is not known against which invoices collection has been realized, in this case, outstanding will be adjusted but invoices will not be washed out from the live invoice tray until getting invoice details from the Buyer.

Once the invoice is allocated for collection, the invoice can be settled then under the Settlement part of the Collection.

7.2. Factoring Offline

Factoring Finance Offline process is a process where neither Buyer nor Supplier will be integrated into the platform, Only Bank will make necessary input of the Buyer validated invoices (in this case, invoice will be validated by the Buyer through physical placement/email). In order to make disbursement, SCF RM/service Manager will place customer request to CAD via mail, then CAD will disburse, through platform, the requested amount only against validated invoices from his available sales ledger and net available limit.

Finally bank will get the collection amount from the supplier to initiate the settlement.

Here system will be integrated with buyers ERP. If the buyer's ERP system provides an API (Application Programming Interface) or other integration methods. APIs allow systems to communicate and exchange data securely. Identify the integration points and functionalities available through the API.

The system utilizes machine learning techniques to extract data from buyer invoices. By leveraging the power of machine learning techniques, the system can automatically identify and extract relevant information from invoices. *(Please see **annexure Figure : Factoring Finance Offline, Page no** ##)*

Steps in the Financing Process for Suppliers and Buyers:

1 **Supplier and Buyer limit setup**

After setting up the Supplier’s Mother Limit in the CBS as per Sanction Terms, Limit will be updated further into the SCF Platform by inputting and fetching available data from CBS, During the limit set up process both Supplier and Buyer are specified for a specific credit limit. A supplier can have multiple buyers and bank will do the limit setup for both supplier and buyer accordingly.

2 **Invoice**

Supplier will submit invoices along with necessary documents to PBL assigned official, then invoice will be placed to the Buyer physically/email for validation, subsequently Buyer validated invoices will be placed to the CAD by SCF RM/Service Manager via mail, then CAD will make necessary entry into the SCF Platform.

3 **Fund Requisition**

SCF RM/service Manager will place customer request to CAD via mail, then CAD will disburse, through platform, the requested amount only against validated invoices from his available sales ledger and net available limit.

4 **Collection**

Against the approved invoice supplier will get the finance by the bank. On or before maturity, Bank will realize the collection from the supplier’s assignment account. After adjusting, the due amount residual will be transferred to Supplier’s CASA Account. Collection can be done through Five different modes

1. Cheque
2. Cash
3. EFTN and,
4. RTGS
5. Pay order

Collection is segregated in two ways

1. Collection with allocation

Collection with allocation is the case where it is known that against which invoices collection have been realized, in this case, outstanding will be adjusted & invoices can be fully or partially settled.

2. Collection without allocation

Collection without allocation is the case where it is not known against which invoices collection have been realized, in this case, outstanding will be adjusted but invoices will not be washed out from the live invoice tray until get invoice details form the Buyer. Once invoice is allocated for collection, invoice can be settled then under Settlement part of Collection.

7.3. Distributor Online

Distributor Financing Online process is a process where three (03) parties (Dealer, Anchor and Bank) will be into the SCF Platform, In this case dealer might create purchase order and financing request either from the SCF platform or directly from Anchor's own platform. However in some cases only two parties (i.e. Dealer and Bank) might be integrated into the platform, related parties might be integrated/connected through Web Base Solution or ERP Integration based on the requirement.

The system utilizes machine learning techniques to extract data from anchor's Purchase Order. By leveraging the power of machine learning techniques, the system can automatically identify and extract relevant information from Purchase Order. *(Please see **annexure Figure : Distributor Finance Online, Page no ##**)*

1 **Limit Setup**

After setting up the Dealer's Mother Limit in the CBS as per Sanction Terms, Limit will be updated further into the SCF Platform by inputting and fetching available data from CBS, During the limit set up process, a particular dealer might have multiple limits against the multiple Anchor and limit will be set accordingly. (Please see **annexure Figure : (A) Limit Setup Sub process**, Page no ##)

2 **Purchase Order and Fund Request**

In three party integrated (Dealer, Anchor, and Bank) system

Distributor may create purchase order and Fund Request from either SCF platform or from Anchor's own platform which will be accepted and forwarded by the Anchor to the Bank and then based on eligibility of the fund, Bank (CAD) will disburse the requested amount from dealer's Loan (OD) A/C to designated collection account of the Anchor. (Please see **annexure Figure : (B) Tri-party model Fund Request Sub process**, Page no ##)

In case where only two parties (Dealer and Bank) are integrated

Dealer will create purchase order and fund request directly to the Bank, after then based on eligibility of the fund, Bank (CAD) will disburse the requested amount from dealer's Loan(OD) A/C to designated collection account of the Anchor. Against each of the disbursement/transaction, deal will be created for pre-specified credit period. (Please see **annexure Figure : (C) Bi-party model Fund Request Sub process**, Page no ##)

3 **Collection**

Each of the deal will be settled on FIFO basis on or before Maturity date. In this process, Dealer will make repayment directly to his Loan (OD) A/C. While any amount will be credited in Dealer's OD account, CBS will automatically notify the platform through API and subsequently Platform will allocate and settle the deals with deposited amount on FIFO basis. (Please see **annexure Figure : (D) Collection Sub process**, Page no ##)

7.4. Distributor Offline

Distributor Financing offline process is a process where only Bank will be in the platform. Dealer will place fund request through mail /hard copy to the Bank (Business Unit), then business unit will forward it to the CAD via mail. CAD will make necessary input in the platform and will initiate transfer from the platform.

Here system will be integrated with anchor's ERP. If the anchor's ERP system provides an API (Application Programming Interface) or other integration methods. APIs allow systems to communicate and exchange data securely. Identify the integration points and functionalities available through the API.

The system utilizes machine learning techniques to extract data from anchor's Purchase Order. By leveraging the power of machine learning techniques, the system can automatically identify and extract relevant information from Purchase Order. *(Please see **annexure Figure : Distributor Finance Offline, Page no** ##)*

1 Limit Setup

After setting up the Dealer’s Mother Limit in the CBS as per Sanction Terms, Limit will be updated further into the SCF Platform by inputting and fetching available data from CBS, During the limit set up process, a particular dealer might have multiple limits against the multiple Anchor and limit will be set accordingly.

2 Fund Request

Dealer will place fund request through mail /hard copy to the Bank (Business Unit), then business unit will forward it to the CAD via mail. CAD will make necessary input in the platform and will initiate transfer from the platform based on eligibility of the fund.

3 Collection

Each of the deal will be settled on FIFO basis on or before Maturity date. In this process, Dealer will make repayment directly to his Loan (OD) A/C. While any amount will be credited in Dealer’s OD account, CBS will automatically notify the platform through API and subsequently Platform will allocate and settle the deals with deposited amount on FIFO basis.

7.5. Reverse Factoring Online

In Reverse Factoring the financing solution is initiated by the Corporate Anchor (Buyer) to assist its suppliers to access fund.

Reverse Factoring Online process is a process where three (03) parties (Supplier, Buyer and Bank) will be integrated into the SCF Platform, however in some cases only two parties (i.e. Buyer and Bank) might be integrated.

1 Limit setup

After setting up the Client's (Buyer) Mother Limit in the CBS as per Sanction Terms, Limit will be updated further into the SCF Platform by inputting and fetching available data from CBS. A Buyer may have multiple suppliers and bank will set supplier wise limit into the platform as per sanction terms.

2 **Invoice Validation and Fund Request**

In case of three parties are integrated into the platform

supplier will submit/ upload invoices into the platform along with fund request and forward the Buyer, then Buyer will validate the invoice along with payment instruction and forward to the Bank (CAD)Subsequently Bank will execute the transfer from Platform as per due diligence.

In case of two parties are integrated into the platform:

Buyer will upload the invoice along with payment instruction marking the respective suppliers and forward to the Bank (CAD). Subsequently Bank will execute the transfer from Platform as per due diligence.

3 **Collection**

On or before Maturity, Invoice outstanding will be adjusted from Buyer's designated Account maintained with Prime Bank Ltd. In case of insufficient fund in designated account, Forced Loan/Demand Loan/STL will be created against the Client (Buyer).

7.6. Reverse Factoring Offline

Reverse Factoring Offline process is a process where neither Client/Buyer nor Supplier will be integrated into the platform, in this case, validated invoice will be placed by the Buyer through physical placement/email along with payment instruction favoring supplier. Subsequently Only Bank will make necessary input of the Buyer validated invoices Subsequently SCF RM/service Manager will place Buyer request to the CAD via mail, the CAD will make necessary input and initiate the transfer through platform, subject to available sales ledger and net available limit.

1 Limit setup

After setting up the Client's (Buyer) Mother Limit in the CBS as per Sanction Terms, Limit will be updated further into the SCF Platform by inputting and fetching available data from CBS. A Buyer may have multiple suppliers and bank will set supplier wise limit into the platform as per sanction terms.

2 Invoice Validation and Fund Request

In this case, validated invoice will be placed by the Buyer through physical placement/email along with payment instruction favoring his respective supplier. Subsequently SCF RM/service Manager will place it to the CAD via mail, the CAD will make necessary input and initiate the transfer through platform, subject to available sales ledger and net available limit as per due diligence.

3 Collection

On or before Maturity, Invoice outstanding will be adjusted from Buyer's designated Account maintained with Prime Bank Ltd. In case of insufficient fund in designated account, Forced Loan/Demand Loan/STL will be created against the Client (Buyer).

7.7. Purchase Order Online

Purchase Order Financing Online process is a process where three (03) parties (Supplier, Buyer and Bank) will be integrated into the SCF Platform, however in some cases only two parties (i.e. Buyer and Bank) might be integrated. In case of three parties are integrated into the platform, Supplier will upload the PO into the Platform and forward it to the Buyer end, after that Buyer will Validate the PO and forward to the Bank, subsequent Bank will accept or reject as per due diligence, After getting accepted by the Bank, Supplier will request for disbursement from the platform. Whereas In two parties integrated system, upon validation directly Buyer or Bank may submit /upload the PO into the platform on behalf of the suppliers and subsequently supplier will request for financing against the validated PO.

Steps in the Financing Process for Suppliers and Buyers:

1. **Supplier and Buyer limit setup, PO Validation, Fund Requisition & Disbursement:**

   These processes will be similar to Factoring Online Process.

2. **PO Settlement**

   In case of PO Finance tagged with Factoring Facility:

   On or before maturity, if any invoice is created on a PO against which supplier has already taken finance, that PO loan will be set off with interest along with other charges (if any) from that particular created invoice proceeds.

   In case of PO Finance not tagged with Factoring Facility:

   On or before maturity, Loan will be settled from customer’s assignment account, otherwise from customer’s own source.

   In case of a delay beyond the due date, penal interest charges are levied as per the bank’s sanction terms.

7.8. Purchase Order Offline

PO Financing offline process is a process where only Bank will be in the platform. Supplier will place fund request through mail /hard copy to the Bank (Business Unit), then business unit will forward it to the CAD via mail. CAD will make necessary input in the platform and will initiate transfer from the platform.

Steps in the Financing Process for Suppliers and Buyers:

1. **Supplier and Buyer limit setup, PO Validation, Fund Requisition & Disbursement:**

   These processes will be similar to Factoring Offline Process.

2. **PO Settlement**

   In case of PO Finance tagged with Factoring Facility:

   On or before maturity, if any invoice is created on a PO against which supplier has already taken finance, that PO loan will be set off with interest along with other charges (if any) from that particular created invoice proceeds.

   In case of PO Finance not tagged with Factoring Facility:

   On or before maturity, Loan will be settled from customer’s assignment account, otherwise from customer’s own source.

   In case of a delay beyond the due date, penal interest charges are levied as per the bank’s sanction terms.

8. Solution Writeup

8.1 Roll Out Plan

Sl. No.	Product/ Solution Name	Description		Time Frame
1	Factoring Finance	**Implementation**		5
		i	**Limit Management**	
			The system can set and manage multiple inner limits under Single Mother Limit.	
			System have the ability to set drawdown-wise limit expiry date automatically.	
			The system can block limits automatically as per sanction terms.	
		ii	**Automatic Deal Management**	
			The system has the capability to initiate bulk disbursements against multiple transactions and automatically create transaction-specific deals, and vice versa.	
			System have the ability to allocate requested settlement amount automatically on FIFO basis.	
		iii	**Drawdown, Limit Control & Fund Transfer**	
			Drawdown, Limit Setup, Interest, LPC, Processing Fee or any other charges, Expiry Date, etc. is dynamic in the Supply Chain Financing (SCF) Solution Platform and set before allowing drawdown to the spokes	
			Customer's Invoice / Purchase Order Documents are going to be available in Supply Chain Financing (SCF) Solution Platform.	
		iv	**Customer Sales Ledger Status**	
			The system has an SLB calculation module for each customer.	
		v	**Payment Realization Process**	
			Interest can be kept in the Interest Receivable Account of the Supply Chain Financing (SCF) Solution Platform at EOD	
			In case of non-adjustment within the due date penal interest charge can be imposed as well	
		vi	**Data Capture, upload, Convey & Store**	
			System is able to capture/upload the image/scanned copy of the invoices, delivery challan ,others related documents and convey it to the required user ends for read, verification or reservation purposes.	
			The system is able to manage both the forward and backward flow of the data/documents.	
		vii	**Generation of Customized Report**	

			The system is able to generate and download customized reports by the relevant stakeholders as required including but not limited to PDF/MS Excel/CSV etc.	
		viii	**Mobile Number Verification**	
			The system can send OTP (4 digits numeric value) to the mobile number for verification OTP validity must be configurable (X minute)	
		ix	The software provides the ability for multiple users to be on the system at the same time and multiple users to be in the same programs at the same time.	
		x	**Compliance**	
			The system supports compliance with international practices/rules.	
			System supports to accommodate new instructions/ regulations.	
		xi	**Workflow management**	
			System has the capability to provide configurable workflow processes for different types of activities	
			The system supports displaying all multiple steps of a workflow for each activity and guides Customers/ Users to take the next step	
		xii	**Service architecture**	
			The system can call different services/ functions/ processes for different requests generated from other banks or third-party systems.	
			Services/ functions/ processes can be changed, updated, or removed without hampering other services/ functions/ processes listed or included in the system	
		CBS Integration		7
		i	The platform has an integration facility with CBS to avoid repetitive manual input.	
		ii	System can track invoice/deal wise due date and will initiate Auto collection instruction (if require) from designated account or will collect and for will collect /capture data from CBS through API to adjust the deal	
		iii	SCF Platform will track invoice/deal-wise due date and will initiate Auto collection instruction (if require) from the designated account or will collect and /or will collect /capture data from CBS through API to adjust the deal.	
		iv	The system should be capable of reading and fetching data generated from CBS via API and updating accordingly into the platform in pursuit of creating limits and settling the deal.	
		UAT		1
		i	UAT environment is going to be installed	

		Go Live		1
		Training		1
		i	Training for Factoring Finance is going to be provided	
2	**Distributor Finance**	**Implementation**		5
		i	**Limit Management**	
			The system can set and manage multiple inner limits under Single Mother Limit.	
			System have the ability to set drawdown-wise limit expiry date automatically.	
			System have the capability to block limits automatically as per sanction terms.	
		ii	**Automatic Deal Management**	
			System have the ability to initiate bulk disbursement against multiple transaction and create transaction wise deal automatically and or vice versa.	
			The system has the ability to allocate the requested settlement amount automatically on a FIFO basis.	
		iii	**Drawdown, Limit Control & Fund Transfer**	
			Drawdown, Limit Setup, Interest, LPC, Processing Fee or any other charges, Expiry Date, etc. is dynamic in SCF Platform and set before allowing drawdown to the spokes	
			The customer's Invoice / Purchase Order Documents are going to be available on the SCF Platform.	
		iv	**Customer Sales Ledger Status**	
			The system has a SLB calculation module for each customer.	
		v	**Payment Realization Process**	
			Interest can be kept in the Interest Receivable Account of the SCF Platform at EOD	
			In case of non-adjustment within the due date penal interest charge can be imposed as well	
		vi	**Data Capture, upload ,Convey & Store**	
			System is able to capture/upload the image/scanned copy of the invoices, delivery challan ,others related documents and convey it to the required user ends for read, verification or reservation purposes.	
			System is able to manage both the forward and backward flow of the data/documents.	
		vii	**Generation of Customized Report**	

			System is able to generate and download customized reports by the relevant stakeholders as required including but not limited to PDF/MS Excel/CSV etc.	
		viii	**Mobile Number Verification**	
			System is able to send OTP (4 digits numeric value) to the mobile number for verification OTP validity must be configurable (X minute)	
		ix	The software provides the ability for multiple users to be on the system at the same time and multiple users to be in the same programs at the same time.	
		x	**Compliance**	
			The system supports compliance with international practices/rules.	
			System supports to accommodate new instructions/ regulations.	
		xi	**Workflow management**	
			System has the capability to provide configurable workflow processes for different types of activities	
			The system supports displaying all multiple steps of a workflow for each activity and guides Customers/ Users to take the next step	
		xii	**Service architecture**	
			The system has the capability to call different services/ functions/ processes for different requests generated from other banks or third-party systems.	
			Services/ functions/ processes can be changed, updated, or removed without hampering other services/ functions/ processes listed or included in the system	
		CBS Integration		7
		i	The platform has an integration facility with CBS to avoid repetitive manual input.	
		ii	The system can track invoice/deal-wise due date and will initiate Auto collection instruction (if require) from the designated account or will collect and will collect /capture data from CBS through API to adjust the deal	
		iii	Supply Chain Financing (SCF) Solution Platform will track invoice/deal-wise due date and will initiate Auto collection instruction (if require) from the designated account or will collect and /or will collect /capture data from CBS through API to adjust the deal.	
		iv	The system should be capable of reading and fetching data generated from CBS via API and updating accordingly into the platform in pursuit of creating limits and settling the deal.	
		UAT		1
		i	UAT environment is going to be installed	

		Go Live		1
		Training		1
		i	Training for Distributor Finance is going to be provided	
3	**Reverse Factoring Finance**	**Implementation**		5
		i	**Limit Management**	
			System is able to set and manage multiple inner limits under Single Mother Limit.	
			System have the ability to set drawdown wise limit expiry date automatically.	
			Systems can block limits automatically as per sanction terms.	
		ii	**Automatic Deal Management**	
			System have the ability to initiate bulk disbursement against multiple transaction and create transaction wise deal automatically and or vice versa.	
			System have the ability to allocate requested settlement amount automatically on FIFO basis.	
		iii	**Drawdown, Limit Control & Fund Transfer**	
			Drawdown, Limit Setup, Interest, LPC, Processing Fee or any other charges, Expiry Date etc. is dynamic in SCF Platform and set before allowing drawdown to the spokes	
			Customer's Invoice / Purchase Order Documents is going to be available in SCF Platform.	
		iv	**Customer Sales Ledger Status**	
			System has a SLB calculation module for each customer.	
		v	**Payment Realization Process**	
			Interest can be kept in Interest Receivable Account of SCF Platform at EOD	
			In case of non-adjustment within due date penal interest charge can be imposed as well	
		vi	**Data Capture, upload ,Convey & Store**	
			System is able to capture/upload the image/scanned copy of the invoices, delivery challan ,others related documents and convey it to the required user ends for read, verification or reservation purposes.	
			System is able to manage both the forward and backward flow of the data/documents.	
		vii	**Generation of Customized Report**	
			System is able to generate and download customized reports by the relevant stakeholders as required including but not limited to PDF/MS Excel/CSV etc.	
		viii	**Mobile Number Verification**	

			System is able to send OTP (4 digits numeric value) to the mobile number for verification OTP validity must be configurable (X minute)	
		ix	The software provides the ability for multiple users to be on the system at the same time and multiple users to be in the same programs at the same time.	
		x	**Compliance**	
			System supports compliance with the international practices/rules.	
			System supports to accommodate new instructions/ regulations.	
		xi	**Workflow management**	
			System has capability to provide configurable workflow processes for different type of activities	
			System supports to display all multiple steps of workflow for each activity and guide Customers/ Users to take the next step	
		xii	**Service architecture**	
			System has capability to call different services/ functions/ processes for different request generated from other Bank or third-party systems.	
			Services/ functions/ processes can be changed, updated or removed without hampering other services/ functions/ processes listed or included in the system	
		CBS Integration		7
		i	Platform have the integration facility with CBS to avoid repetitive manual input.	
		ii	System can track invoice/deal wise due date and will initiate Auto collection instruction (if require) from designated account or will collect and for will collect /capture data from CBS through API to adjust the deal	
		iii	SCF Platform will track invoice/deal wise due date and will initiate Auto collection instruction (if require) from designated account or will collect and /or will collect /capture data from CBS through API to adjust the deal.	
		iv	System should be capable of reading and fetching data generated from CBS via API and update accordingly into the platform in pursuit of creating limit and settling the deal.	
		UAT		1
		i	UAT environment is going to be installed	
		Go Live		1
		Training		1
		i	Training for Reverse Factoring Finance is going to be provided	

4	**Purchase Order Finance**	**Implementation**		5
		i	**Limit Management**	
			System is able to set and manage multiple inner limits under Single Mother Limit.	
			System have the ability to set drawdown wise limit expiry date automatically.	
			System have the capability to block limit automatically as per sanction terms.	
		ii	**Automatic Deal Management**	
			System have the ability to initiate bulk disbursement against multiple transaction and create transaction wise deal automatically and or vice versa.	
			System have the ability to allocate requested settlement amount automatically on FIFO basis.	
		iii	**Drawdown, Limit Control & Fund Transfer**	
			Drawdown, Limit Setup, Interest, LPC, Processing Fee or any other charges, Expiry Date etc. is dynamic in SCF Platform and set before allowing drawdown to the spokes	
			Customer's Invoice / Purchase Order Documents is going to be available in SCF Platform.	
		iv	**Customer Sales Ledger Status**	
			System has a SLB calculation module for each customer.	
		v	**Payment Realization Process**	
			Interest can be kept in Interest Receivable Account of SCF Platform at EOD	
			In case of non-adjustment within due date penal interest charge can be imposed as well	
		vi	**Data Capture, upload ,Convey & Store**	
			System is able to capture/upload the image/scanned copy of the invoices, delivery challan ,others related documents and convey it to the required user ends for read, verification or reservation purposes.	
			System is able to manage both the forward and backward flow of the data/documents.	
		vii	**Generation of Customized Report**	
			System is able to generate and download customized reports by the relevant stakeholders as required including but not limited to PDF/MS Excel/CSV etc.	
		viii	**Mobile Number Verification**	
			System is able to send OTP (4 digits numeric value) to the mobile number for verification OTP validity must be configurable (X minute)	

		ix	The software provides the ability for multiple users to be on the system at the same time and multiple users to be in the same programs at the same time.	
		x	**Compliance**	
			System supports compliance with the international practices/rules.	
			System supports to accommodate new instructions/ regulations.	
		xi	**Workflow management**	
			System has capability to provide configurable workflow processes for different type of activities	
			System supports to display all multiple steps of workflow for each activity and guide Customers/ Users to take the next step	
		xii	**Service architecture**	
			System has capability to call different services/ functions/ processes for different request generated from other Bank or third-party systems.	
			Services/ functions/ processes can be changed, updated or removed without hampering other services/ functions/ processes listed or included in the system	
		CBS Integration		7
		i	Platform have the integration facility with CBS to avoid repetitive manual input.	
		ii	System can track invoice/deal wise due date and will initiate Auto collection instruction (if require) from designated account or will collect and for will collect /capture data from CBS through API to adjust the deal	
		iii	SCF Platform will track invoice/deal wise due date and will initiate Auto collection instruction (if require) from designated account or will collect and /or will collect /capture data from CBS through API to adjust the deal.	
		iv	System should be capable of reading and fetching data generated from CBS via API and update accordingly into the platform in pursuit of creating limit and settling the deal.	
		UAT		1
		i	UAT environment is going to be installed	
		Go Live		1
		Training		1
		i	Training for Purchase Order Finance is going to be provided	

8.2. Gantt Chart

#	Activity	Duration	D1	D2	D3	D4	D5	D6	D7	D8	D9	D10	D11	D12	D13	D14	D15	D16	D17	D18	D19	D20	D21	D22	D23	D24	D25	D26	D27	D28	D29	D30	D31	D32	D33	D34	D35	D36	D37	D38	D39	D40	D41	D42	D43	D44	D45	D46	D47	D48	D49	D50	D51	D52	D53	D54	D55	D56	D57	D58	D59	D60	Remarks -
1	**Factoring Finance**																																																														
1.1	Implementatipon	5																																																													
1.2	CBS integration	7																																																													
1.3	UAT	1																																																													
1.4	Go Live	1																																																													
1.5	Training	1																																																													
2	**Distributor Finance**																																																														
2.1	Implementatipon	5																																																													
2.2	CBS integration	7																																																													
2.3	UAT	1																																																													
2.4	Go Live	1																																																													
2.5	Training	1																																																													
3	**Reverse Factoring Finance**																																																														
3.1	Implementatipon	5																																																													
3.2	CBS integration	7																																																													
3.3	UAT	1																																																													
3.4	Go Live	1																																																													
3.5	Training	1																																																													
4	**Purchase Order Finance**																																																														
4.1	Implementatipon	5																																																													
4.2	CBS integration	7																																																													
4.3	UAT	1																																																													
4.4	Go Live	1																																																													
4.5	Training	1																																																													

8.3. BoQ of Hardware

Server Specification: For DC (Without HA)

SL	Server Purpose	Location	Server Name	Server Type	Processor	Memory	Storage	Network Interface	OS	Remarks
1	Application Server	DMZ	Server 1	Rackmount	Intel Xeon Silver 3rd Gen or above; 8 cores, 16 threads or above; 2.0 GHz or above	16GB RAM	2 x 500GB SSD SATA RAID 1	1 x 10GbE	CentOS 7/Red Hat 8	
2	Database Server	MZ	Server 3	Rackmount	Intel Xeon Silver 3rd Gen or above; 8 cores, 16 threads or above; 2.0 GHz or above	16GB RAM	2 x 2 TB SSD SATA RAID 1	1 x 10GbE	CentOS 7/Red Hat 8	

Server Specification: For DC (With HA)

SL	Server Purpose	Location	Server Name	Server Type	Processor	Memory	Storage	Network Interface	OS	Remarks
1	Application Server	DMZ	Server 1	Rackmount	Intel Xeon Silver 3rd Gen or above; 16 cores, 32 threads or above; 2.4 GHz or above	32GB RAM	2 x 500GB SSD SATA RAID 1	1 x 10GbE	CentOS 7/Red Hat 8	
2	Application Server	DMZ	Server 2	Rackmount	Intel Xeon Silver 3rd Gen or above; 32 cores, 64 threads or above; 2.4 GHz or above	64GB RAM	2 x 500GB SSD SATA RAID 1	1 x 10GbE	CentOS 7/Red Hat 8	
3	Database Server	MZ	Server 3	Rackmount	Intel Xeon Silver 3rd Gen or above; 32 cores, 64 threads or above; 2.4 GHz or above	64GB RAM	2 x 2 TB SSD SATA RAID 1	1 x 10GbE	CentOS 7/Red Hat 8	Database (Primary)
4	Database Server	MZ	Server 4	Rackmount	Intel Xeon Silver 3rd Gen or above; 16 cores, 32 threads or above; 2.4 GHz or above	32GB RAM	2 x 2 TB SSD SATA RAID 1	1 x 10GbE	CentOS 7/Red Hat 8	Database (Secondary)
5	CBS Connector Server	MZ	Server 5	Rackmount	Intel Xeon Silver 3rd Gen or above; 8 cores, 16 threads or above; 2.4 GHz or above	16GB RAM	1 x 500 GB HDD 7,200 RPM SATA	1 x 10GbE	CentOS 7	

6	Storage Server (NAS)	MZ	Server 6	Rackmount	Intel Xeon Silver or above; 4 cores, 8 threads or above; 1.90 GHz or above	16GB RAM	3 x 4 TB HDD 7,200 RPM SATA RAID 5	2 x 10GbE	CentOS 7	NAS

Server Specification: For DR

SL	Server Purpose	Location	Server Name	Server Type	Processor	Memory	Storage	Network Interface	OS	Remarks
1	Application Server	DMZ	Server 2	Rackmount	Intel Xeon Silver 3rd Gen or above; 8 cores, 16 threads or above; 2.0 GHz or above	16GB RAM	2 x 500GB SSD SATA RAID 1	1 x 10GbE	CentOS 7/Red Hat 8	
2	Database Server	MZ	Server 2	Rackmount	Intel Xeon Silver 3rd Gen or above; 8 cores, 16 threads or above; 2.0 GHz or above	16GB RAM	2 x 2 TB SSD SATA RAID 1	1 x 10GbE	CentOS 7/Red Hat 8	

Server Specification: For Test Environment

SL	Server Purpose	Location	Server Name	Server Type	Processor	Memory	Storage	Network Interface	OS	Remarks
1	Test Server	DMZ	Server 1	Rackmount	Intel Xeon Silver 3rd Gen or above; 8 cores, 16 threads or above; 2.0 GHz or above	16GB RAM	2 x 500GB SSD SATA RAID 1	1 x 10GbE	CentOS 7/Red Hat 8	

8.4. Required Software for Implementing the Solution

BoQ of Software Framework and Library

Framework/Library	Version
PostgreSQL	v14.7
Docker	v23.0
Node.js	v18.15
Express.js	v4.18.2
React	v18.0
Nginx	v1.22
Tailwind CSS	v3.3.3

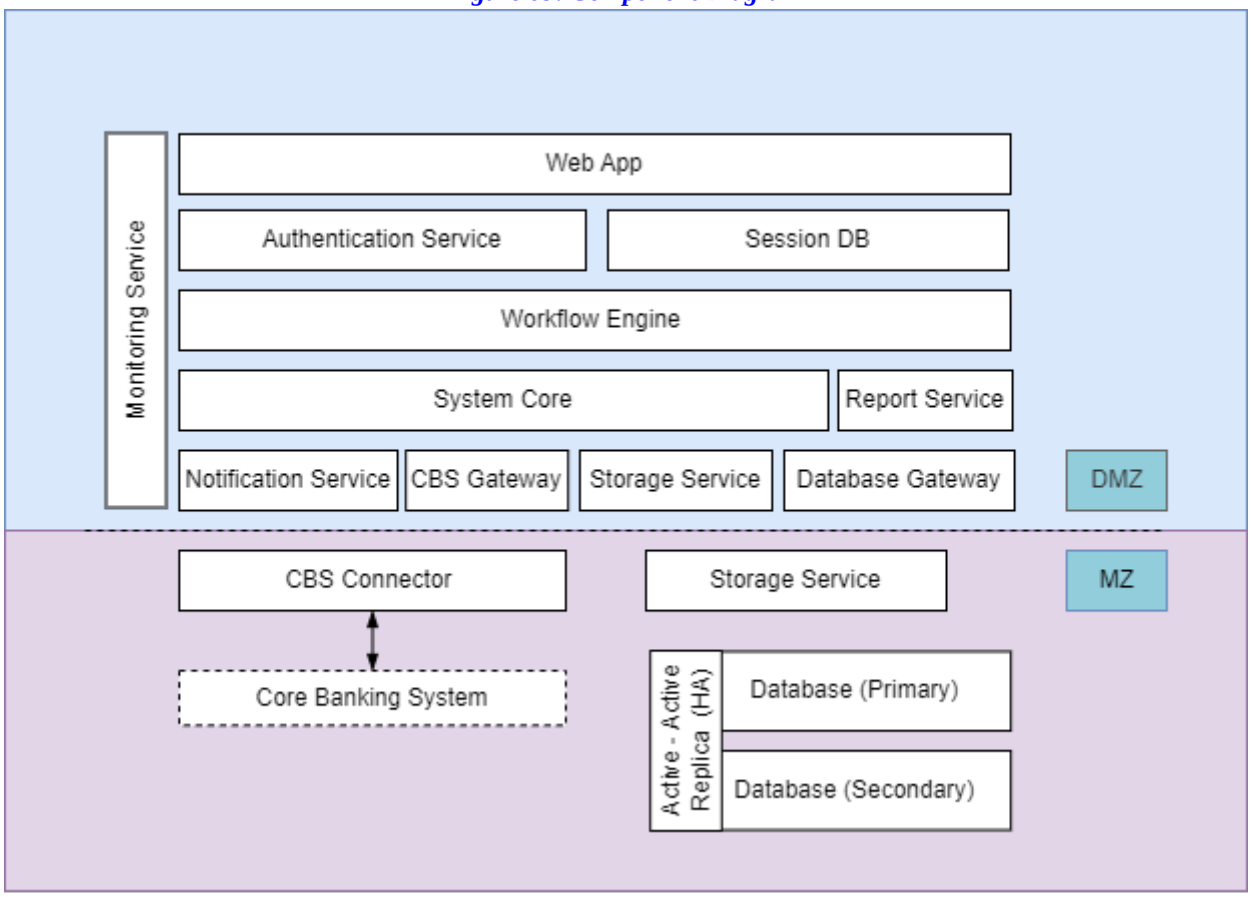
8.5. Software Design Document

This section describes the Chapter of BORNALI

8.5.1. Component Diagram

The system consists of several components that work together to provide a comprehensive and efficient user experience. The system is designed to be secure, efficient, and user-friendly. The various components work together seamlessly. The system is continuously monitored and updated to ensure that it meets the highest standards of security and performance.

Figure 09: Component Diagram



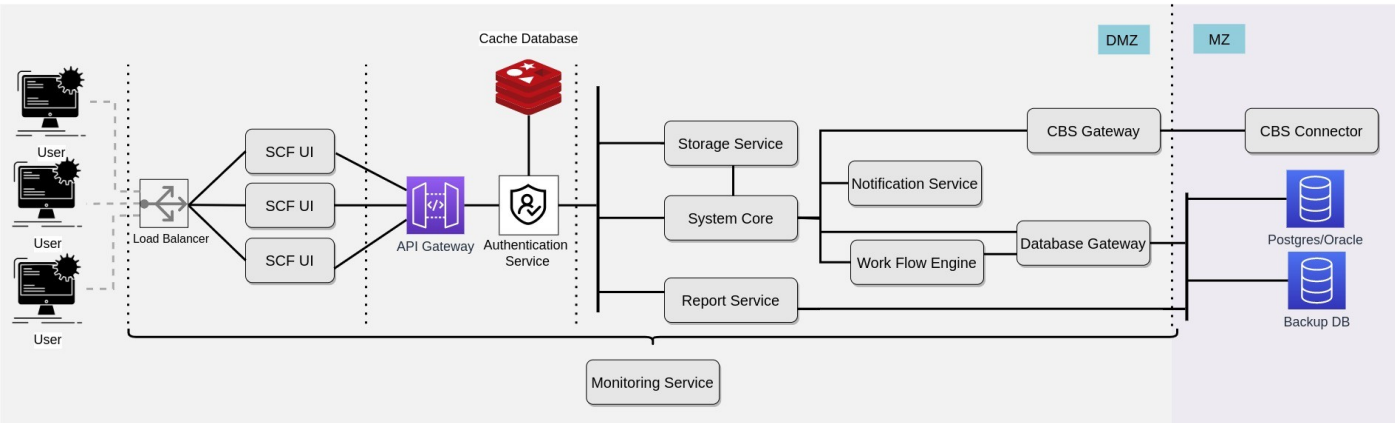
No.	Component Name	Description
1	Web App	It is the primary interface for users to interact with the system. It provides users with access to all of the features and functions of the system.
2	Authentication Service	It is responsible for managing user authentication and security. It uses industry-standard authentication protocols to ensure that user data is protected and secure.
3	Session DB	It stores session information for users, allowing them to easily log in and out of the system. This improves performance and provides a better user experience.
4	Workflow Engine	This system will automate and manage the execution of business processes. It provides a platform for designing, executing, and monitoring workflows, which are a series of tasks or steps that are completed in a precise order to achieve a specific outcome.
5	System Core	The core system handles all the data processing tasks. The core system communicates with several other components to provide users a seamless experience. It communicates with the CBS when data synchronization is required.
6	Report Service	It generates reports based on user data, providing valuable insights and analytics.
7	Notification Service	It sends notifications to users and management, alerting them to important updates and changes in the system.

8	CBS Gateway	It provides a secure connection to the Core Banking System, allowing the Core System to securely manage all the financial information.
9	Storage Service	It provides storage solutions for user data, allowing users to upload and store large amounts of data securely.
10	Database Gateway	It provides a secure connection to the system's databases, ensuring that user data is protected and secure.
11	CBS Connector	It provides integration between the core banking system and the CBS Gateway. It enables the exchange of information between the core banking system and the Core System.
12	Database (Primary)	The central data repository for the system. It provides high level of performance, reliability, and scalability.
13	Database (Secondary)	A replica of the primary database. Any changes made to primary are automatically propagated to the replica in real-time, ensuring that all copies of the database remain synchronized.
14	Monitoring Service	It tracks system performance and alerts administrators to any issues or potential problems. It ensures that the system is always running smoothly and efficiently.

8.5.2. System Architecture

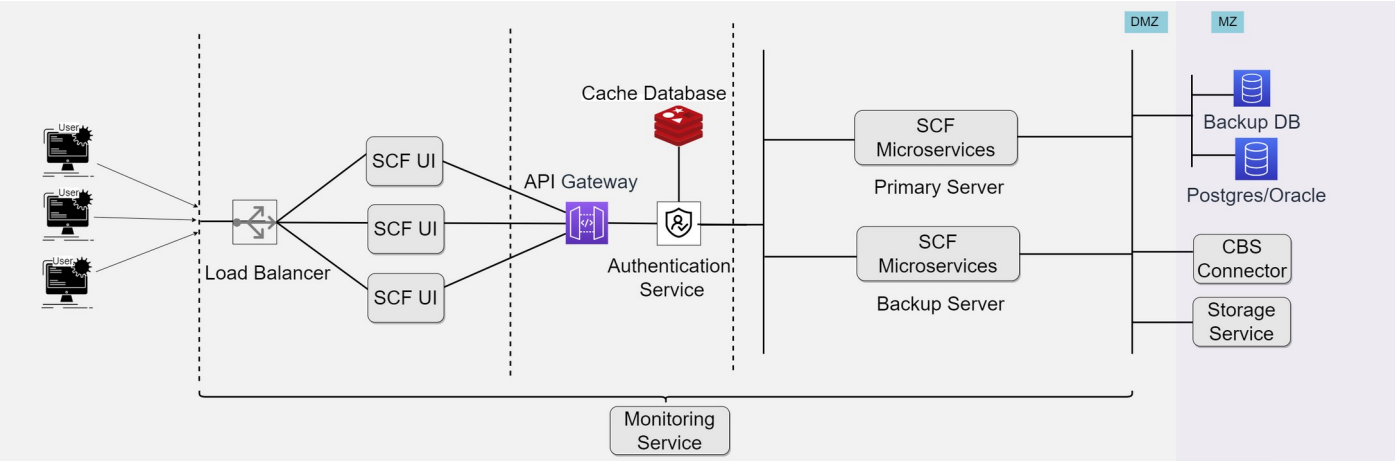
The following diagram represents the application's architecture without considering high-availability features. It shows the various components and how they interact with each other. This diagram clearly shows the system's data flows between the different services.

Figure 10: BORNALI System Architecture



BORNALI microservices are deployed on two different servers when HA is required. The HA architecture is provided below:

Figure 10: BORNALI System Architecture With High Availability



In this table, various services have been described that make up the BORNALI system architecture. They serve different functions, such as handling authentication and session data, managing workflows and business processes, generating reports and notifications, communicating with databases, monitoring the health and performance of the system, etc. Together, these services work to support the overall functionality of the application.

No.	Service	Description
1	Load Balancer	Distributes network traffic across multiple frontend instances.
2	SCF UI	Communicates with API gateway.

3	API Gateway	Connects the UI with Report Service, System Core, Storage Service, and Authentication Service.
4	Authentication Service	Connected with Cache Database and API Gateway.
5	Session DB	Connected to Authentication Service.
6	Workflow Engine	Communicates with System Core, Database Gateway.
7	System Core	Connected to Workflow Engine, Notification Service, Database Gateway, CBS Gateway, Storage Service.
8	Report Service	Connected to both Primary and Secondary Databases.
9	Notification Service	Communicates with System Core.
10	CBS Gateway	Connects the System Core to CBS Connector.
11	Storage Service	Stores user files.
12	Database Gateway	Connects the Workflow Engine and System Core to the Databases.
13	CBS Connector	Connects the CBS Gateway to the Core Banking System.
14	Database (Primary)	Connected to Database Gateway.
15	Database (Secondary)	Connected to Database Gateway.
16	Monitoring Service	Monitors all the System Components in the DMZ.

8.5.3. Deployment Diagram

This diagram is like a map that shows how our system is configured and how different parts of it communicate with each other. It includes things like the physical or virtual resources that the system uses, such as computers or servers, as well as the software or hardware modules that make up the system. The diagram also shows the network connections and the communication protocols between different parts of the system.

Figure 11: Proposed Deployment Diagram without HA

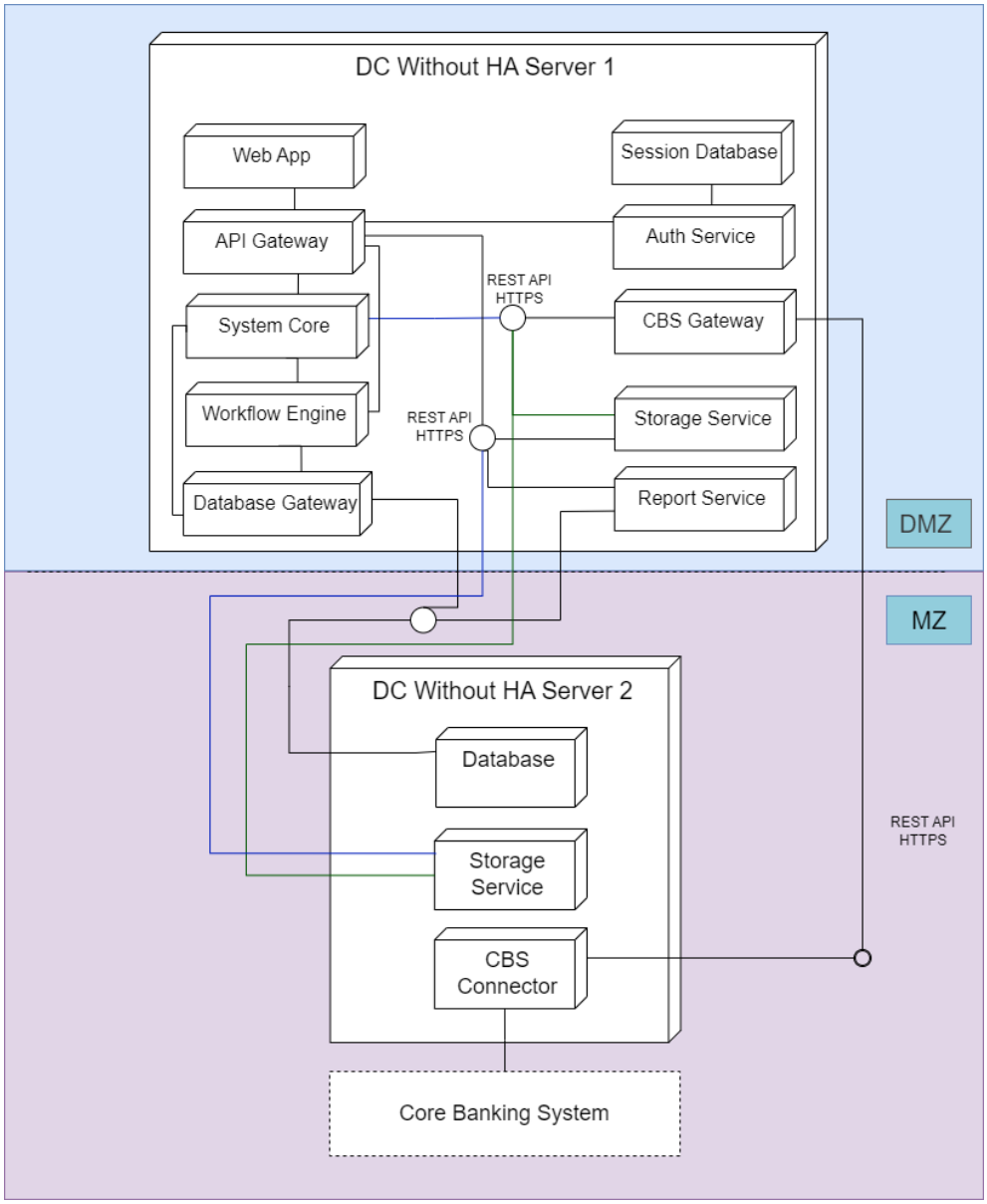


Figure 12: Proposed Deployment Diagram With HA

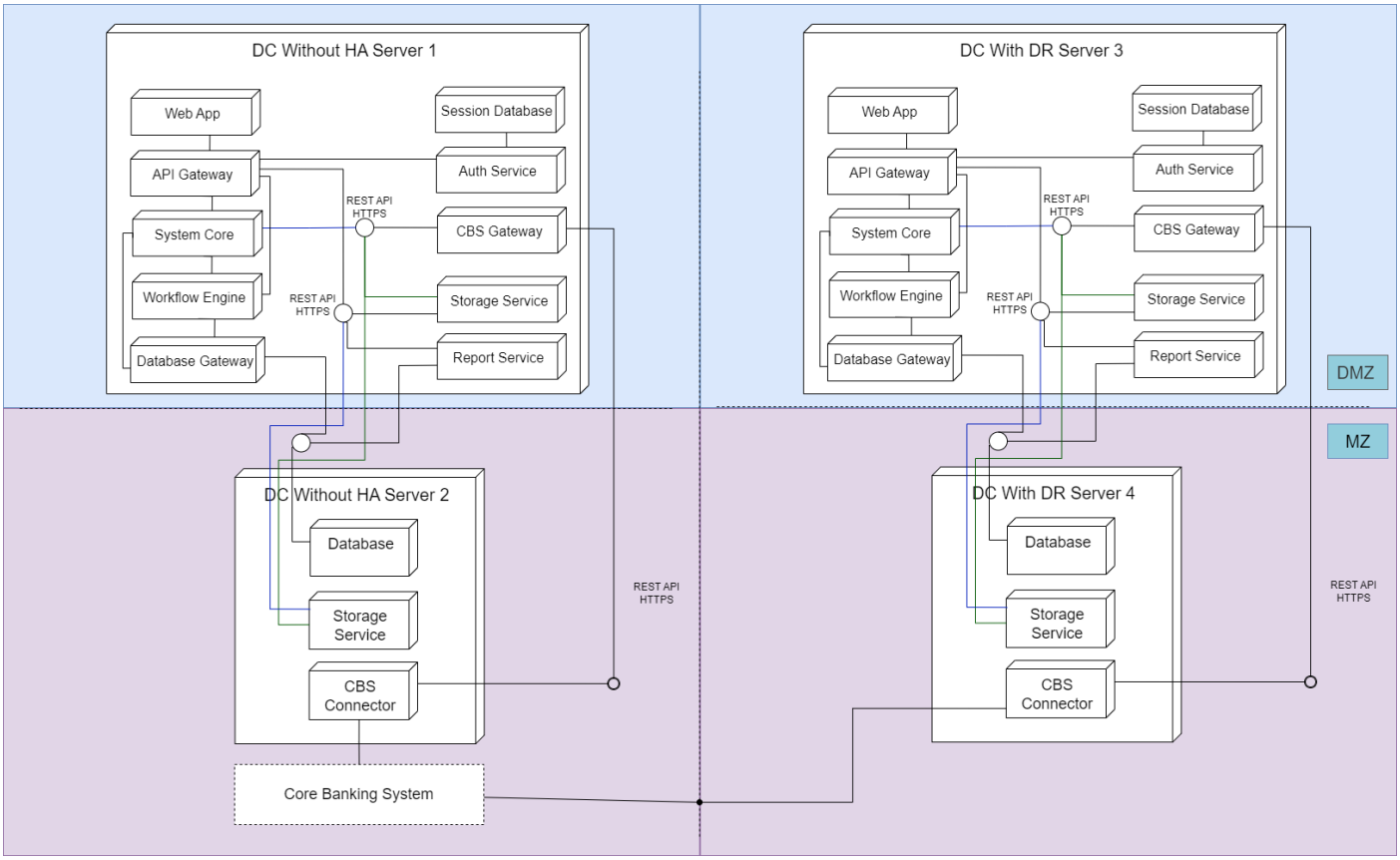
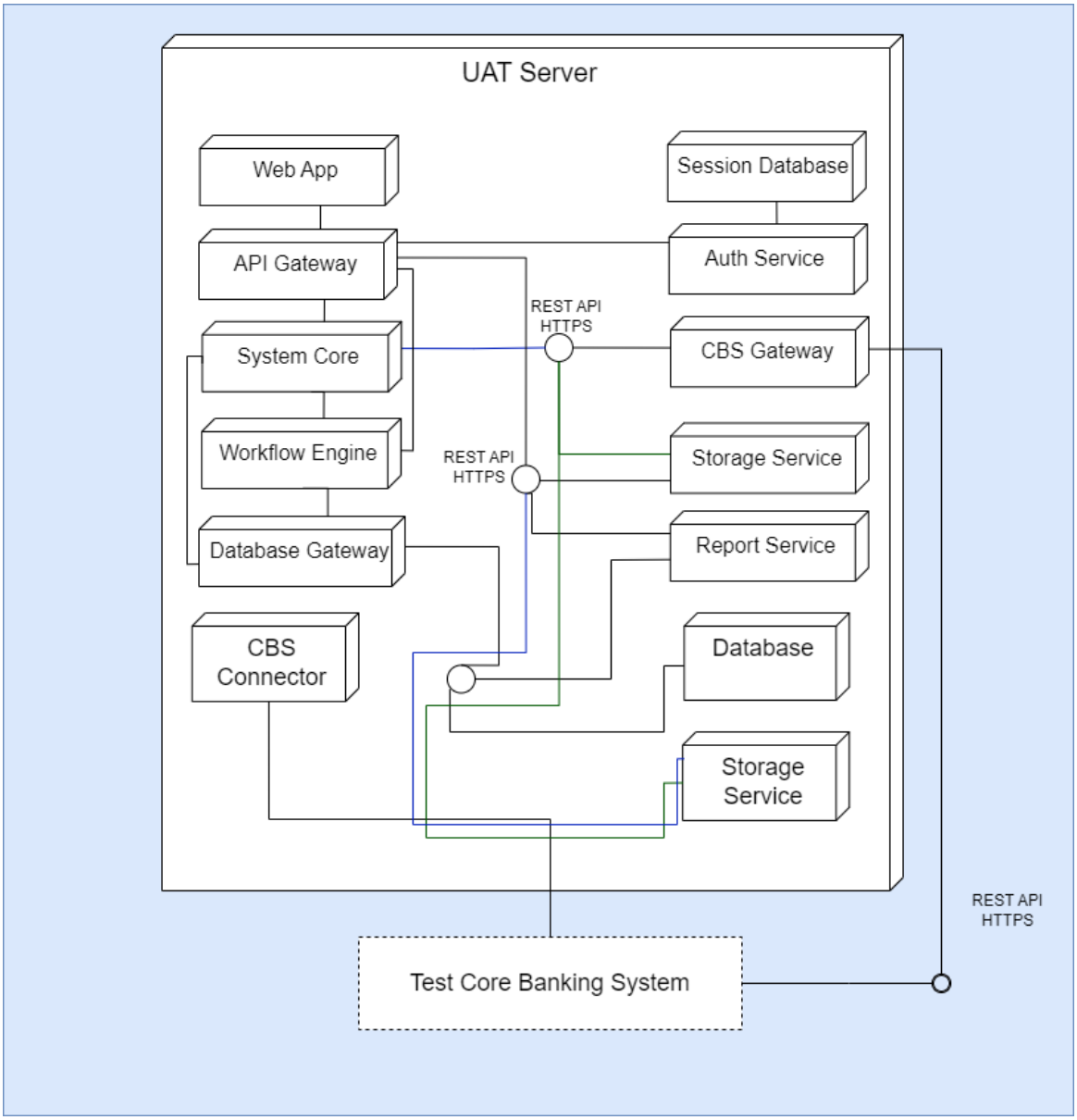


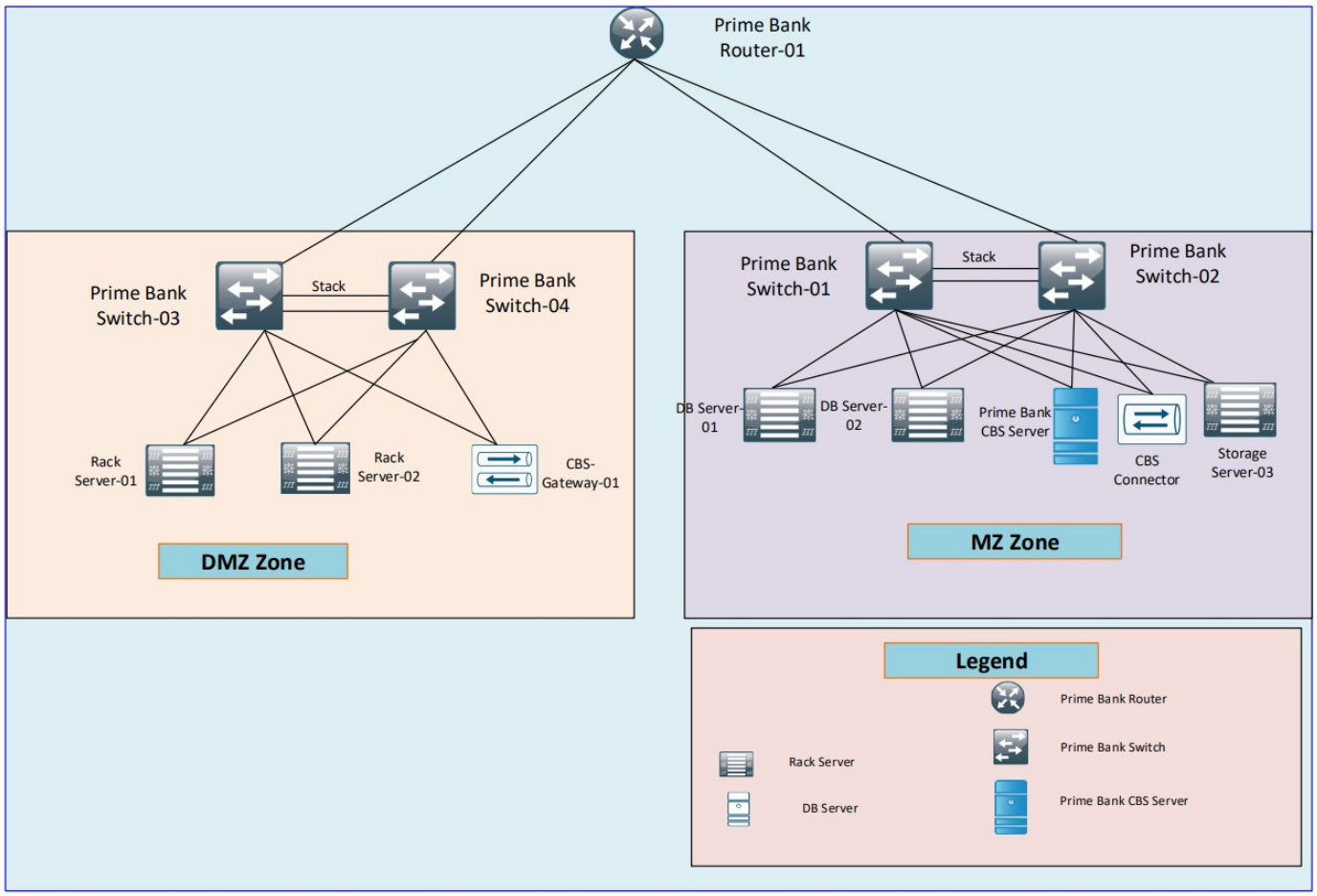
Figure 13: Proposed Deployment Diagram UAT



8.5.4. Network Diagram

The following diagram is a visual representation of how different devices in a computer network are connected and communicate. It helps us understand how information travels between devices like computers, switches, routers, and other network devices. It gives us a clear picture of how the different devices and components work together to make the network function properly.

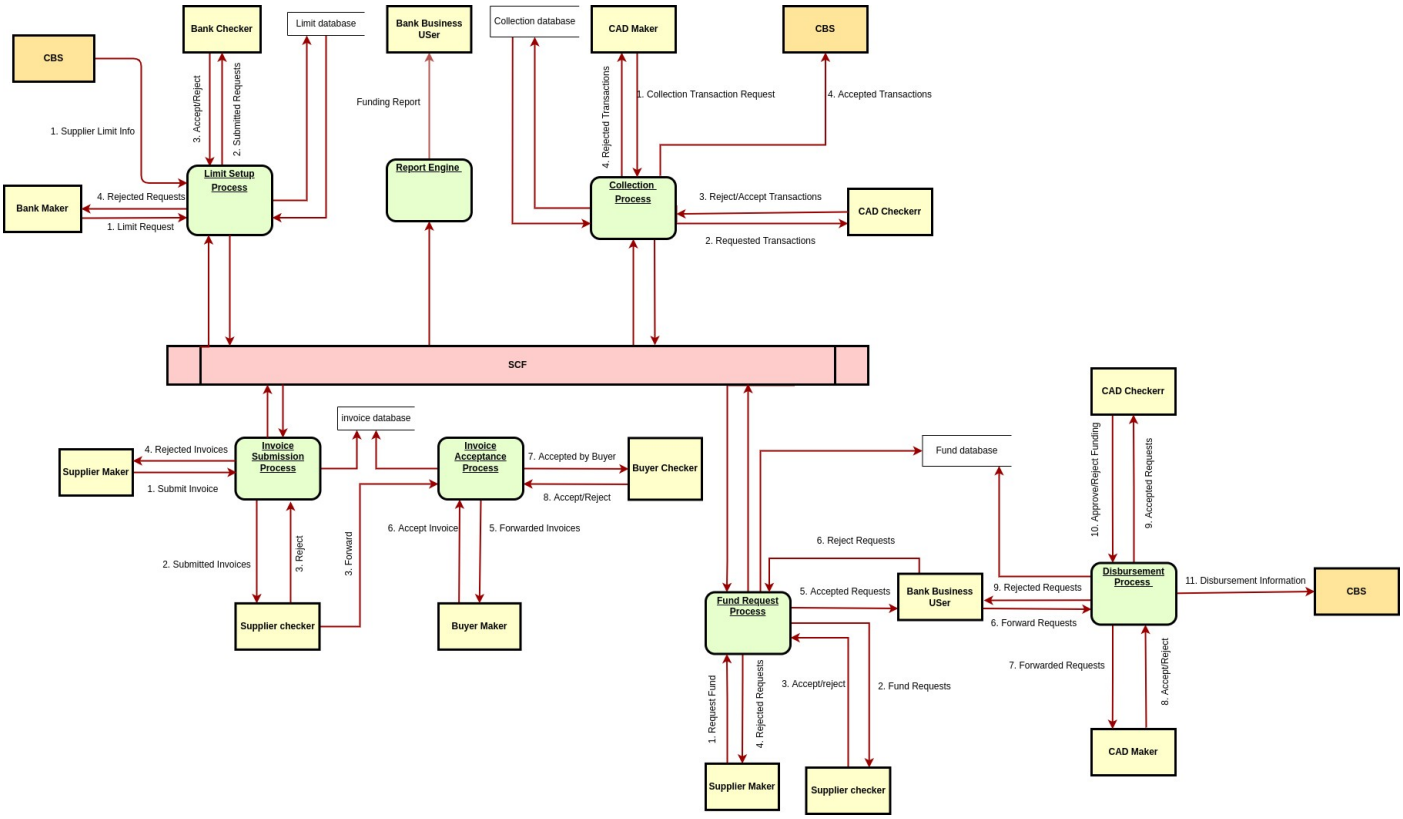
Figure 14: Proposed Network Architecture



8.5.5. Data Flow Diagram

Data flow diagram visually represents the flow of data and information within the **Supply Chain Financing (SCF) Solution.** It illustrates how data moves between different entities, such as suppliers, buyers, and banks. It helps identify data inputs, processing, and outputs, facilitating a clear understanding of the data flow in the Supply Chain Financing (SCF) Solution.

Figure 15: Data Flow Diagram



8.6. Engineering

8.6.1 Build-deployment-staging-process

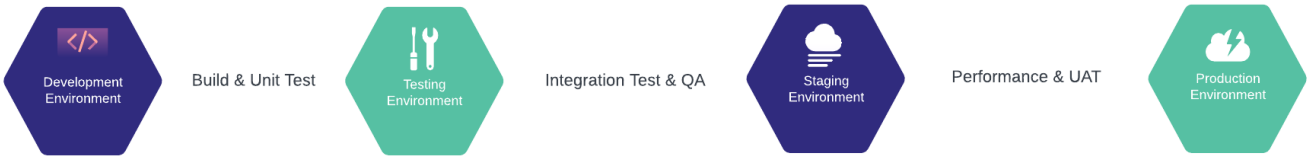
Building, deploying, and staging form the crux of the software development lifecycle, ensuring that the developed software is constructed, delivered, and configured for testing efficiently. This process plays a pivotal role in our Supply Chain Financing(SCF) Solution, enabling us to manage the software seamlessly from development to production.

Build Process

The build process involves converting source code files into standalone software artifact(s) that can be run on a system. In the context of our SCF system, the build process includes compiling the source code, running tests, checking for coding standard violations, and generating documentation.

For the back-end, which is primarily Java-based, we use Maven as our build tool. Maven helps manage dependencies, compile the source code, run tests, and package the compiled code into a JAR file.

Figure 16: Build Process



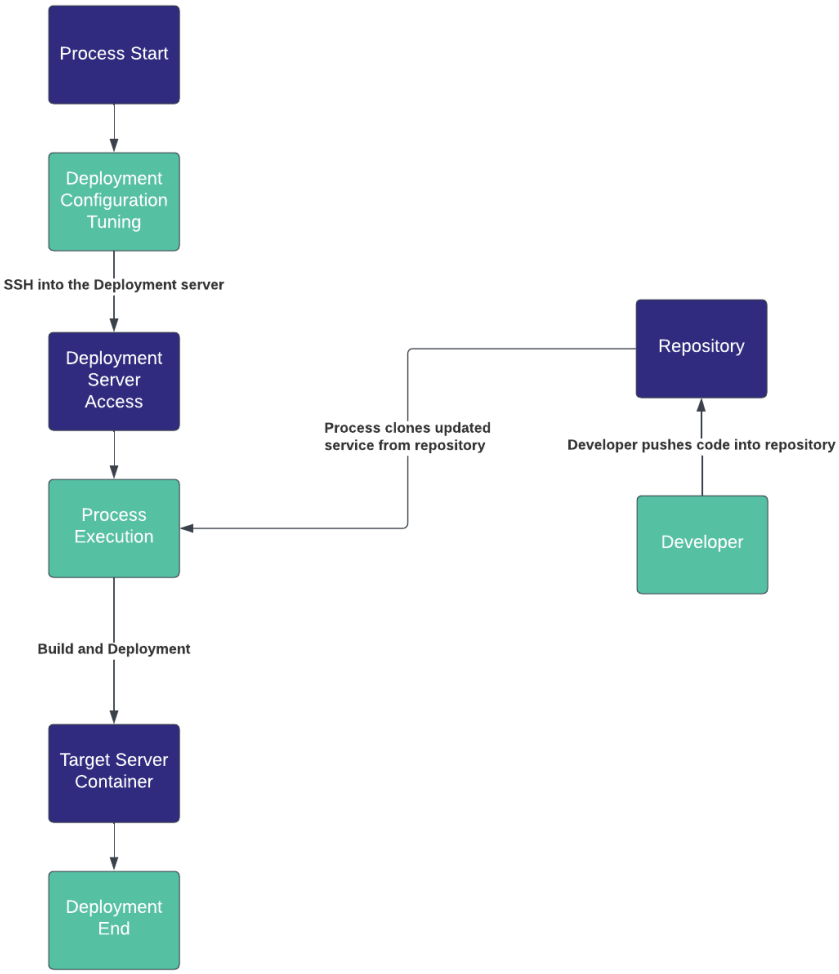
Continuous Integration (CI)

Continuous Integration is an integral part of our build process. We use a CI server (like Jenkins) that monitors our code repository for changes. Whenever changes are pushed, the CI server triggers the build process and provides feedback to the developers. This practice ensures that errors are detected and corrected as early as possible.

Deployment Process

The deployment process refers to all the activities that make a software system available for use. Our deployment process is designed to be repeatable and reliable, reducing the chances of deployment failures and increasing the speed of deployment activities.

Figure 17: Deployment Process



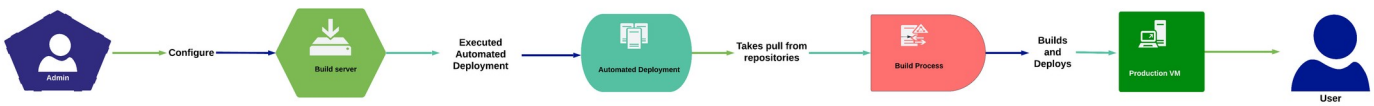
Automated Deployment

We use an automated deployment script for efficiency and consistency. This script is run inside an Admin Server in the same network as the other servers. It connects to a specific data source (Google Sheet in our case) to read the necessary configuration parameters, including information like which services to deploy, where to deploy, and database connections. Then, it executes the stages of the deployment pipeline, deploying all required services in one go. This automated deployment script is effectively a CI/CD tool used in both development and live servers.

Continuous Deployment (CD)

Continuous Deployment extends Continuous Integration by automatically deploying all changes that pass the automated testing phase. This practice allows us to reduce the lead time in getting changes to production and enables faster feedback.

Figure 18: Continuous Deployment (CD)



Staging Process

The staging process, often considered a pre-production phase, involves deploying the application to an environment that mirrors the production environment closely. This environment, known as the staging environment, is used to simulate the behavior of the application in production.

Staging Environment

Our staging environment is a replica of the production environment. It has the same hardware, software, databases, and configurations. The aim is to create a setting where we can test the application in a production-like situation before it's released to the actual production environment.

Testing in Staging

Once deployed in the staging environment, the application undergoes various tests including integration tests, performance tests, and security tests. Importantly, we also conduct User Acceptance Testing (UAT) in this environment. The goal of UAT is to verify if the system is working for the users as designed and expected.

Release

Upon successful testing in the staging environment, the application is deemed ready for production. The release process involves a final deployment to the production environment, where it's made available to end-users. This transition from staging to production is meticulously managed to ensure minimal downtime and maintain a seamless user experience.

By following this robust build, deployment, and staging process, we ensure that our SCF solution is reliable, robust, and ready to handle real-world scenarios.

8.7. Installation

The installation process for software DC (Data Center), DR (Disaster Recovery), High Availability, and UAT (User Acceptance Testing) involves a series of steps:

•	**Software DC Installation:**	Procure and set up hardware components for the primary data center, including servers, networking equipment, and storage devices.
		Install and configure the operating system on the servers.
		Deploy the software applications on the servers, following vendor guidelines and best practices.
		Set up the necessary databases and configure integration with other systems if required.
		Conduct thorough testing to ensure proper functionality and performance.
•	**Software DR Installation:**	Establish a secondary data center at a different location to serve as the disaster recovery site.
		Replicate data from the primary data center to the DR site using data replication technologies.
		Set up hardware and software components at the DR site to mirror the primary data center's configuration.
		Conduct regular data backups to the DR site for quick recovery in case of a disaster.
		Periodically test the disaster recovery process to verify its effectiveness.
•	**High Availability Configuration:**	Implement redundancy and failover mechanisms to ensure continuous operation in case of hardware or software failures.
		Set up load balancers and clustering to distribute the workload across multiple servers for optimal performance.
		Configure automated failover processes to switch to backup systems seamlessly in case of a failure.
		Monitor the health and performance of the system to detect and address any issues
•	**User Acceptance Testing (UAT) installation**	Set up a controlled testing environment with the necessary hardware and software to conduct UAT for the application.
		Create a comprehensive test plan with specific test scenarios and use cases that reflect real-world user interactions and business processes.
		Conduct UAT by having actual end-users interact with the application, verifying its functionality, user-friendliness, and adherence to business requirements.
		Record and document any discrepancies, defects, or issues encountered during UAT, providing clear descriptions and steps to reproduce the problems.
		Collaborate with stakeholders to address and resolve identified issues. Make necessary improvements to ensure the application meets user expectations before its final deployment.

These processes are critical to ensure reliable, fault-tolerant, and well-tested software deployment, supporting business continuity and smooth operations.

•	**System Requirements Check:**	Before proceeding with the installation, ensure that the target system meets all the specified hardware and software requirements for running the SCF Solution.
•	**Software Download:**	Obtain the SCF Solution software package from the vendor or designated source, ensuring it is the latest version compatible with the intended operating environment.
•	**Pre-Installation Preparation:**	Backup all relevant data and configuration settings to ensure a safe installation process and to have a recovery option in case of any issues.

•	**Installation Wizard:**	Launch the installation wizard or setup program provided by the SCF Solution. Follow the on-screen instructions to configure the installation settings, such as the installation directory, database setup, and integration options.
•	**Database Setup:**	If the SCF Solution requires a database, set up the database server and provide the necessary credentials during the installation process.
•	**Configuration:**	Customize the SCF Solution to fit the specific requirements of Prime Bank Ltd., such as configuring user roles, permissions, and integration with existing systems.
•	**Testing:**	Conduct thorough testing of the installed SCF Solution to ensure all features and functionalities are working as expected and that data is being processed accurately.
•	**User Training:**	Train the relevant personnel on how to use the SCF Solution effectively to maximize its benefits and ensure smooth operations.
•	**Post-Installation Support:**	After installation, monitor the SCF Solution's performance and provide ongoing support to address any issues that may arise.

Building, deploying, and staging form the crux of the software development lifecycle, ensuring that the developed software is constructed, delivered, and configured for testing efficiently. This process plays a pivotal role in our Supply Chain Financing (SCF) Solution, enabling us to manage the software seamlessly from development to production.

8.8. Commissioning

Supply Chain Financing (SCF) Solution software commissioning is the process of officially bringing the SCF software into operation and ensuring that it functions as intended. The commissioning process involves several key steps:

•	**Initial Setup:**	Prepare the necessary hardware and infrastructure to host the SCF software. This includes configuring servers, networking equipment, and storage systems.
•	**Software Installation:**	Deploy the SCF software on the designated servers, following vendor guidelines and best practices. Ensure that all required components are installed and integrated properly.
•	**Configuration:**	Customize the SCF software settings and parameters to align with the organization's specific requirements and workflows. This may involve defining user roles, access controls, and other system configurations.
•	**Data Migration:**	If applicable, migrate existing data from legacy systems to the SCF software. Ensure that data is transferred accurately and without loss.
•	**Integration:**	Integrate the SCF software with other systems or databases that are part of the organization's supply chain finance processes.
•	**User Training:**	Provide training to end-users, including finance teams, suppliers, buyers, and administrators, to ensure they can effectively use the SCF software and understand its features.
•	**Testing:**	Conduct thorough testing of the SCF software to verify its functionality, security, and performance. This includes functional testing, load testing, and security testing.
•	**User Acceptance Testing (UAT):**	Involve key stakeholders in UAT to validate that the SCF software meets their expectations and works as intended.
•	**Go-Live:**	Once testing and UAT are successful, officially launch the SCF software for production use.
•	**Monitoring and Support:**	Implement monitoring tools and processes to track the performance and health of the SCF software. Provide ongoing support and maintenance to address any issues that may arise.

By following these steps, Prime Bank Ltd. can ensure a successful commissioning of their Supply Chain Financing (SCF) Solution software, enabling efficient management of working capital and enhancing collaboration between suppliers and buyers.

8.9. Testing

Quality refers to the degree to which a project and its deliverables meet the defined requirements. Ensuring customer satisfaction is a significant factor in quality management. Typically, we adopt the following stages in our quality management policy:

Figure 22: Quality Management Policy

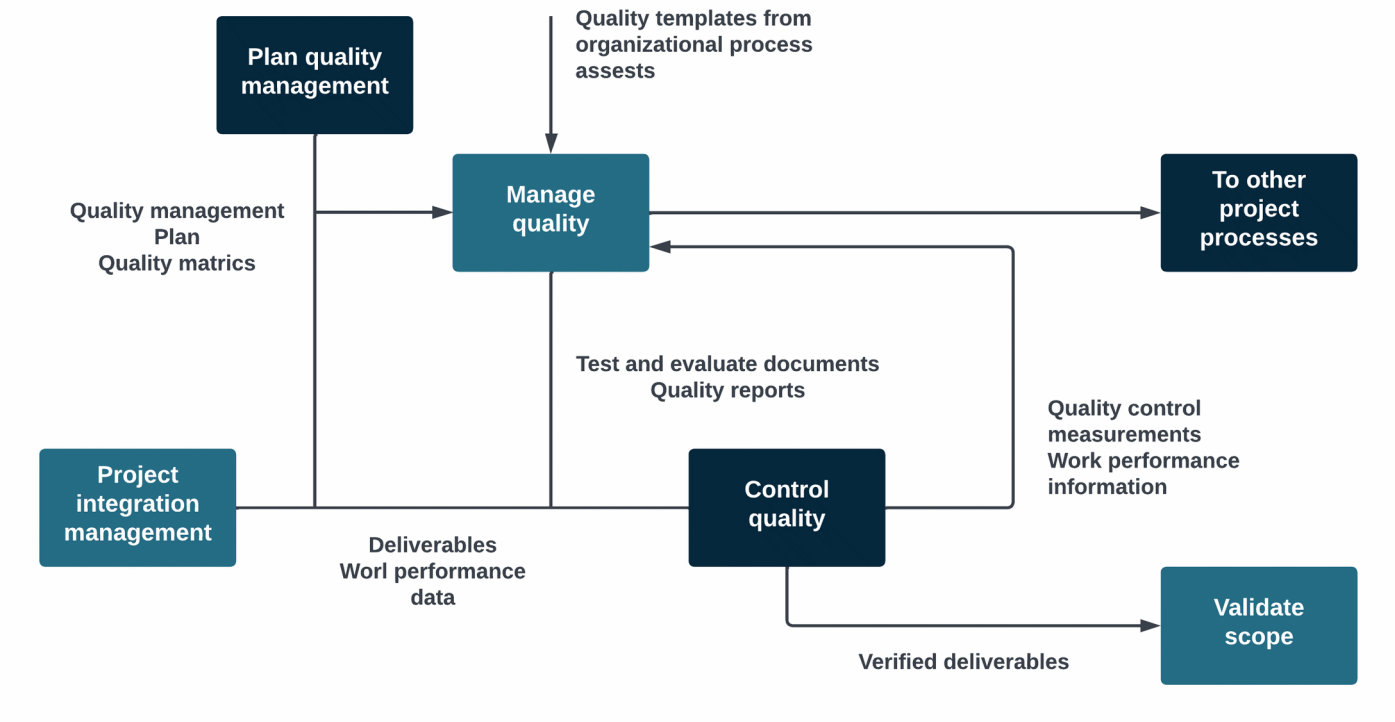
- **Creating a Quality-Aware Culture:** The first step is to instill a culture that prioritizes the creation of quality products. This involves all stakeholders, from the project team to the end customer.
- **Incorporating Quality into Planning and Design:** We ensure that quality considerations are integral to the project planning and design phases. This enables us to establish a robust framework that supports the delivery of quality products.
- **Implementing Quality Assurance:** Our approach includes quality assurance methods to scrutinize and rectify any issues during the process of creating deliverables. This proactive approach allows us to maintain the highest standards at every stage of production.
- **Detecting and Correcting Defects:** Before deliverables are sent to the customer, we meticulously identify and rectify any defects. This preventive measure ensures that our products meet the expected standards and customer requirements.
- **Maintaining Quality Throughout the Project Life Cycle:** We implement quality control throughout the project life cycle, using two main strategies: prevention and inspection.

  • **Prevention:** Our aim is to prevent errors from entering the process in the first place. This proactive approach minimizes the likelihood of quality issues arising down the line.

  • **Inspection:** To ensure that no errors reach the customer, we employ thorough inspection processes. These may include single activity inspection or final product inspection, reviews, peer reviews, audits, and verification of defect repairs. This rigorous inspection process ensures that the products we deliver are of the highest possible quality. •

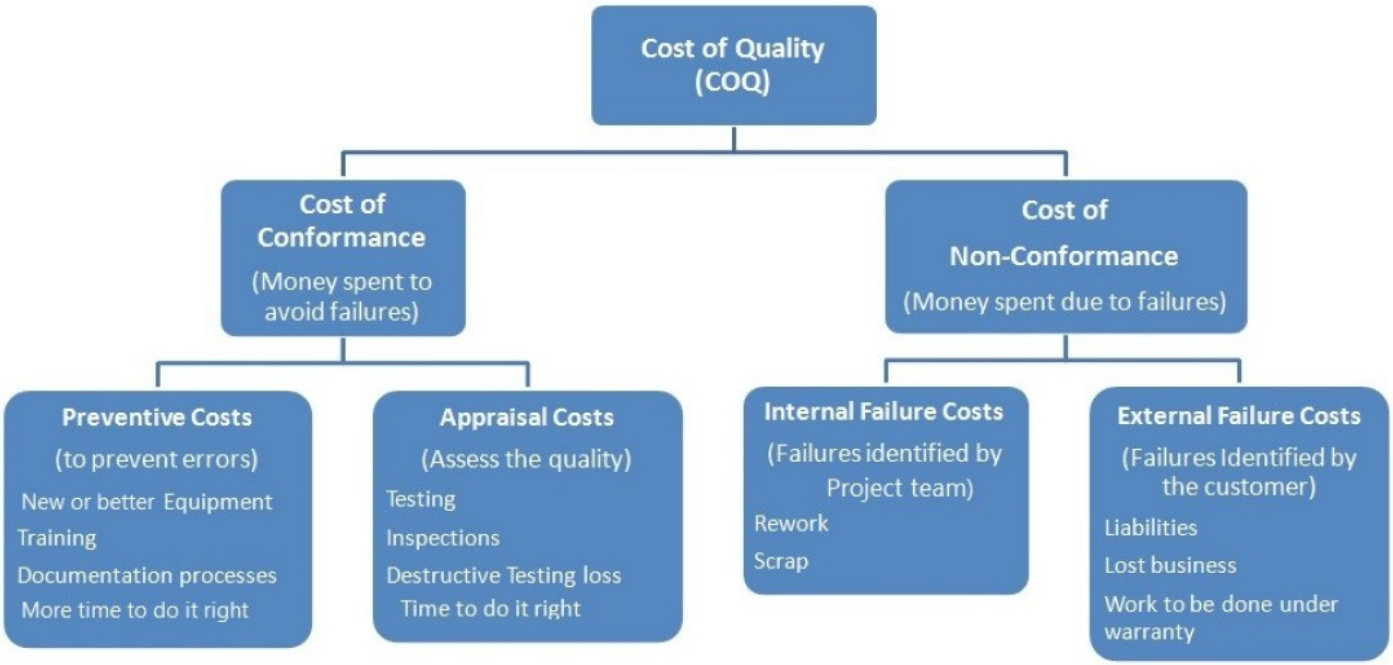
The following diagram provides an overview of the significant inputs and outputs associated with the Project Quality Management processes and the interrelationships between these processes.

Figure 23: Quality Management Process-interrelations



We prioritize the principle that prevention is more cost-effective than detection. As such, we firmly stand by the idea of embedding quality into the process from the very beginning rather than detecting quality issues later through inspections. Understanding and meeting quality requirements offers a multitude of advantages, including less rework, enhanced productivity, and reduced costs. Further, it leads to increased satisfaction among stakeholders and a boost in overall profitability. In the broader economic perspective, a Cost-Benefit Analysis often reveals that the expense associated with Non Conformance - errors that lead to rework or repair - is typically higher than the cost of Conformance, which involves investing in prevention of errors and appraising the products or services to ensure quality. With this understanding, our commitment lies in incorporating quality assurance at every stage of the project implementation process, ensuring we uphold quality standards while optimizing cost efficiency.

Figure 24: Cost Quality



In our projects, we adhere to several quality management concepts and guidelines. Specifically, we incorporate the following:

- Capability Maturity Model Integration (CMMI): This model is designed to enhance the overall quality of software through its lifecycle, from design and development to project management and deployment.
- ISO-9001: Implementing this standard leads to numerous benefits, including improved customer satisfaction and loyalty, heightened employee motivation and productivity, and more efficient resource utilization.
- Plan-Do-Check-Act (PDCA): This continuous improvement cycle enables us to make incremental enhancements, test their impact, and refine our processes accordingly before implementing larger-scale changes.

Figure 25: Standard

Our Project Quality Management approach encompasses the following processes:

Plan Quality Management: In this step, the project manager identifies the quality-related requirements and/or standards for the project. They will outline how the team will maintain these standards throughout the project's duration.

Manage Quality: During this process, the project manager and the team ensure that the established procedures and processes are adhered to, thereby promoting high quality in all project operations.

Control Quality: In this phase, the project manager and the team ensure that the project's deliverables meet the predetermined standards for correctness and quality. The outcome of the Control Quality process is the verification of deliverables.

Quality Reports: These reports provide essential information about the project's quality status. They include, but are not limited to:

- Status and progress reports related to quality
- Recommendations for improving quality
- Corrective actions that need to be taken to meet the project's quality expectations

Software Testing Approach

Software testing is a critical component of the software development life cycle. In our process, we ensure to rigorously follow all necessary testing steps with the objective of delivering stable, bug-free software. We understand and acknowledge the following benefits of comprehensive testing:

- **User Trust:** Thorough testing ensures the delivery of a reliable and trustworthy software solution to the user.
- **Security:** Our testing methods help to create a software solution that is free from vulnerabilities.
- **Risk Mitigation:** Testing allows us to preemptively identify and eliminate potential problems and risks.
- **Future Troubleshooting:** Proactive testing can save considerable effort and resources that might otherwise be spent on troubleshooting later.

There are a myriad of testing methodologies used in the software development process. The aim of employing these methodologies is to ensure the software's successful operation across multiple environments and platforms. These methodologies can generally be categorized into functional and non-functional testing. The following sections describe the functional testing approach that our team predominantly employs:

Unit Testing

Unit testing is the initial level of testing that is primarily executed by the developers. This process focuses on the functionality of individual software components at the code level, ensuring each one works as intended.

Integration Testing

Following the successful unit tests, these individual units are integrated to form modules or components tailored for specific tasks. We perform integration testing to confirm these interconnected units work harmoniously, demonstrating the desired functionality as a group.

System Testing

System testing is a comprehensive method applied to evaluate the fully integrated system against the specified requirements. Conducted by a distinct testing team, it validates end-to-end software functionality before its production deployment.

Acceptance Testing

This final stage of functional testing evaluates if the software meets the original requirements and business criteria. By verifying the software's compliance with end-user needs, acceptance testing paves the way for delivery. Our team facilitates this test, conducted by users, and subsequently receives the User Acceptance Certificate (UAT).

Performance Testing

Performance testing, a non-functional testing technique, assesses the application's behavior under various conditions, highlighting its responsiveness and stability in real-world scenarios. We employ several performance testing techniques:

- **Load testing:** is the process of simulating increasing demand or traffic on software, application, or website to verify whether the system can handle the amount of load it was designed to handle.
- Stress testing: Building upon load testing, stress testing probes the software's response at or beyond its peak load, helping determine its failure point.

Security Testing

Considering the escalating concern over cyber-attacks and data security, we employ security testing to ensure system data is robustly protected. We purposefully try to find loopholes and security issues in the system by using multiple testing method. This non-functional testing technique focuses on safeguarding against unauthorized access and potential data loss, utilizing different tests that verify six fundamental security principles:

- Integrity
- Confidentiality
- Authentication
- Authorization
- Availability
- Non-repudiation

Beyond these functional and non-functional tests, we conduct the following:

Usability Testing

Usability testing is a testing method that measures an application’s ease-of-use from the end-user perspective and is often performed during the system or acceptance testing stages. Our goal is to determine whether or not the visible design and aesthetics of the software meet the intended requirements and satisfaction of users.

Regression Testing

Regression Testing is a type of testing that is done to verify that a code change in the software does not impact the existing functionality of the product. We are committed to make sure the product and software deliverables works fine with new functionality, bug fixes or any change in the existing feature. Previously executed test cases will be re-executed in order to verify the impact of change.

Compatibility Testing

Compatibility testing is used to find how an application or piece of software will work in different environments. We will do check that the delivered software module and components are compatible with multiple operating systems, platforms, browsers, or resolution configurations which are specified by client.

Code Quality and Security Testing Tools

Our comprehensive approach to software development incorporates a wide range of tools for code scanning, code quality assessment, security analysis, and stress testing. The following are some of the key tools that our team utilizes:

SonarQube & SonarLint

SonarQube is a code scanning platform used for continuous inspection of code quality. It performs automatic reviews of code to detect bugs, code smells, and security vulnerabilities. It is a state-of-the-art Static Application Security Testing (SAST) tool. SonarQube provides a detailed report of the identified issues, helping our developers maintain high-quality code standards throughout the project. Complementing SonarQube, SonarLint is an IDE extension that helps developers write cleaner code. As a local companion to SonarQube, it provides on-the-fly feedback on bugs and quality issues right in the IDE, enabling developers to address issues during the coding process itself.

OWASP ZAP (Zed Attack Proxy)

As one of the world's most popular security tools, OWASP ZAP is employed to automatically find security vulnerabilities in web applications during the development and testing phase. It is a widely used Dynamic Application Security Testing (DAST) tool used by security teams for manual penetration testing. It supports automated scanners and a set of tools that allow testers to discover security vulnerabilities.

Burp Suite & Dastardly

Burp Suite is another DAST tool used to identify vulnerabilities in web applications. It acts as a proxy between the client and the server, enabling the tester to intercept, review, and modify all the data sent and received from the client to the server and vice versa. We also use Burp Suite Dastardly in our CI pipeline to automatically flag security vulnerabilities.

Jest

Jest is a JavaScript testing framework that is used for testing both backend and frontend components of our projects. Its simplicity and versatility allow us to test all JavaScript code, including React applications and Node.js services. Jest's real-time feedback and easy-to-understand syntax make it an excellent tool for maintaining code quality throughout the project's life cycle.

Cypress

Cypress is a next-generation front-end testing tool built for the modern web. It is used for end-to-end testing, ensuring that the application behaves as expected in real-world scenarios. Cypress enables us to write tests that mimic user behavior and verify that the entire flow of the application, from the frontend to the backend, works seamlessly.

JMeter

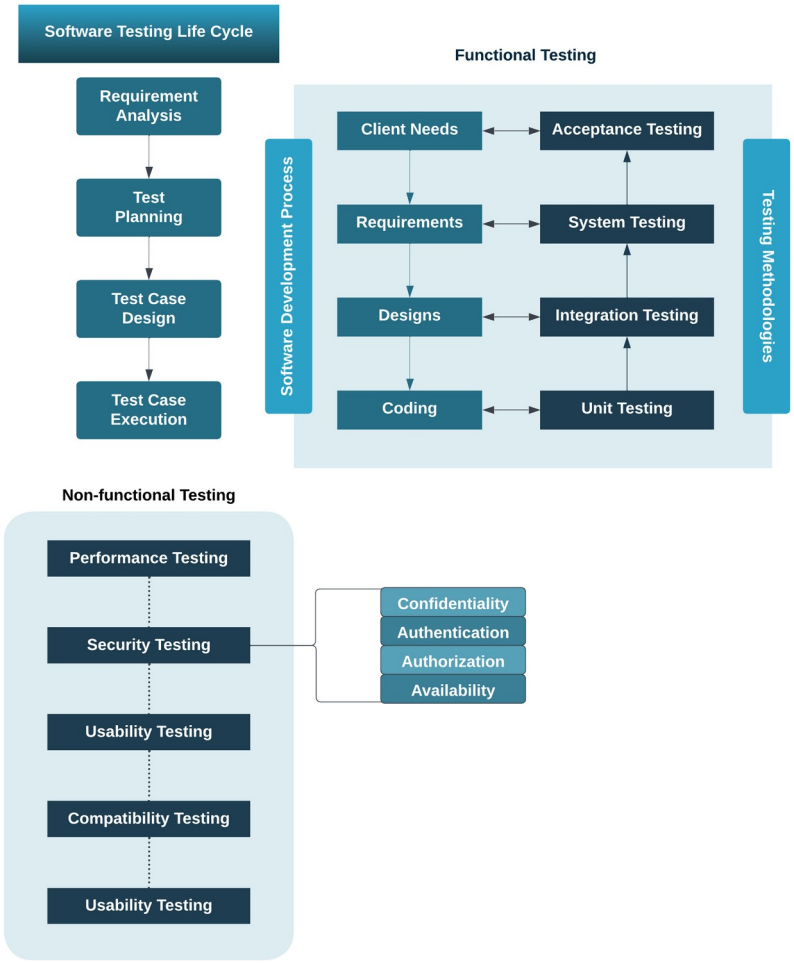
Apache JMeter is a load testing tool used to analyze and measure the performance of our applications. JMeter simulates heavy loads on servers, networks, or objects to test their strength or analyze overall performance under different load types. It is particularly useful in stress testing, helping us identify the points of failure under extreme load conditions.

Metasploit

Metasploit is a platform for developing, testing, and executing exploits against machines. It provides information about security vulnerabilities and aids in penetration testing and IDS signature development. This tool helps our team ensure that our applications are robust and secure before deployment.

The following Figure depicts the steps involved in testing a software module.

Figure 26: Cost Functional Testing


Software Testing Life Cycle
Requirement Analysis
Test Planning
Test Case Design
Test Case Execution
Functional Testing
Software Development Process
Client Needs
Requirements
Designs
Coding
Acceptance Testing
System Testing
Integration Testing
Unit Testing
Testing Methodologies
Non-functional Testing
Performance Testing
Security Testing
Usability Testing
Compatibility Testing
Usability Testing
Confidentiality
Authentication
Authorization
Availability

8.9.1. Inspection for Functional Testing

Functional Testing

Functional testing plays a critical role in the software testing process. As the name suggests, this type of testing focuses on validating the functional aspects of an application. It examines the various functionalities of the software and confirms that the system behaves as expected when provided with specific inputs, ensuring that the requirements are appropriately satisfied. During functional testing, each function of the software application is tested by providing appropriate input, verifying the output, and comparing the actual results with the expected results. This process involves checking of user interface, APIs, databases, client/server communication, and other functionalities of the application to ensure they are operating as expected. Functional testing aims to answer the question, "Can the user accomplish their tasks using the software?" This testing process not only verifies the accuracy of output given a certain input but also checks the error conditions handling and if the software responds correctly to the input, behaves as expected when faced with edge cases, and ensures that the software is sufficiently usable. Functional testing is of utmost importance in the testing lifecycle as it directly interacts with the software as the end users would. By simulating user interaction and inputs, it ensures that the software is ready for deployment and use in a real-world scenario. Through functional testing, we aim to deliver a robust, reliable, and user-friendly application that meets the needs of our clients and provides an intuitive and satisfactory experience for the end users.

Test Acceptance Criteria:

Understanding and outlining clear test acceptance criteria is a crucial part of the software testing process. These guidelines help ensure that testing is thorough and consistent, leading to a high-quality software product. Here's an outline of our key test acceptance criteria:

1. **Documentation Accessibility:** Before initiating the test design phase, we must have access to the approved Functional Specification document and Use Case documents. These are crucial references that inform our test plans and ensure our tests align with the software's intended functions.
2. **Test Case Approval:** Test cases must be formally approved and signed off before we start the Test execution phase. This ensures that our testing processes are in line with expected outcomes and that all stakeholders are on the same page.
3. **Development Completion:** Testing will commence when development is completed, and all units of the software are tested with a pass status. The development team should share the results with the Testing team to prevent redundancy and ensure efficiency.
4. **Test Environment Readiness:** A prerequisite for starting the tests is that the test environment must have the application installed, configured, and in a ready-to-use state.

Sign-Off Criteria

Our sign-off criteria require formal approval of the following elements

- Functional Specification document.
- Use Case documents.
- Test Cases.

Testing Readiness Indicators

- Development of the application is completed, and all units have been tested.
- The application is deployed and ready for testing in the Test environment.
- We have access to data that closely mimics production data to comprehensively test all functionalities of the application.

By adhering to these rigorous acceptance criteria, we aim to ensure a robust and thorough testing process that leads to a high-quality, reliable software product.

Test Deliverables

#	Deliverable Name	Author	Reviewer
1	Test Strategy Document	Test Lead	Project Manager/Business Analyst

2	Functional Test Scenarios	Test Team	Business Analyst (for approval)
3	Defect Logging	Test Team	Test Lead/Development Lead
4	Status Reports (Daily/Weekly)	Test Team/Test Lead	Project Manager
5	Test Closure Summary	Test Lead	Project Manager

Projected Milestones

The milestone list provided here is an initial projection, and while every effort will be made to adhere to it, there are circumstances that may necessitate adjustments. These include:

- System Environment Readiness: Unforeseen challenges or complications in preparing the system environment could affect our timeline. These could arise from technical issues, software compatibility problems, or infrastructure-related setbacks.
- Scope Changes: The timeline could also change if there are revisions, additions, or reductions to the project scope. Any change in the agreed-upon deliverables, functionalities, or features could impact the milestones.
- Emerging Dependencies: The timeline may be influenced by dependencies that were not initially apparent. This could include reliance on third-party tools, other ongoing projects, or key personnel.
- Quality Assurance: While our goal is to maintain the schedule, our primary commitment is to the quality of the final product. If more time is needed to ensure the highest quality standards, this may impact the timeline.

Please note that in the event of any changes to the projected milestones, we will provide timely updates to all stakeholders. Open communication and transparency are crucial to our project management approach, and we're committed to ensuring that all parties involved are kept informed of any significant project developments.

In accordance with the technical specifications of the system, we will arrange a functional testing inspection for the Bank's representative if awarded the project. This procedure is part of our commitment to transparency and quality assurance. Further, we will provide an extensive inspection report to the client for additional clarity and understanding. This report will include a detailed functional/performance inspection form. The form will be completed based on the specified requirements and technical specifications outlined in the project scope. The purpose of the inspection form is to thoroughly evaluate the system's functionality and performance against the predetermined criteria. This methodical approach helps ensure that every aspect of the project aligns with the Bank's expectations, further emphasizing our dedication to meeting our clients' needs. The report and the accompanying inspection form will offer insights into the system's capabilities, thereby facilitating informed decisions and fostering trust between us and our clients.

Contents of the inspection form:

The contents of the inspection form are designed to provide a comprehensive overview of the tested features. This form will include the following elements:

- **Inspection Item:** This field will enumerate the specific aspect of the system under scrutiny in the inspection. It can include individual functions, performance metrics, or other features, as defined by the project's technical specifications.
- **Description:** In this section, we will provide a detailed account of the inspection item. This can include its role within the system, the way it operates, and its intended outcomes. This description aims to provide a thorough understanding of the element in question.
- **Acceptable Condition:** Here, we will outline the criteria that the inspection item needs to meet to be considered satisfactory. These criteria will be established based on the project's technical specifications and the bank's requirements. This section provides a clear benchmark against which the system's features will be assessed.

- **Inspection Result:** This final section will indicate whether the inspection item met the acceptable conditions. It will be marked as either 'Acceptable' or 'Not acceptable'. If an item is deemed 'Not acceptable', additional information will be provided detailing the issues found and suggesting possible remediation actions.

By structuring our inspection form in this manner, we aim to ensure transparency and maintain rigorous quality control standards. This process ensures all functional and performance aspects of the system are evaluated objectively and thoroughly, contributing to the reliability and effectiveness of the system.

8.9.2. System Performance Monitoring

Transactional data and reporting are vital components of any system. To enhance the effectiveness of PostgreSQL Database maintenance, SSCL's technical team proposes the following monitoring plan:

Procedure

1. If required and consented by PBL, obtain database server console access for maintenance purposes.
2. Continuously monitor the Database System to ensure optimal performance.
3. Keep track of Database Service Status to detect any issues or disruptions in service.
4. Regularly examine Database logs to identify errors, warnings, or unusual activities.
5. Generate Backup Reports to verify that backups are running as scheduled and being stored in the designated location.
6. Conduct ongoing Database Monitoring to assess performance, usage, and potential bottlenecks.
7. Monitor the growth status of the Database to plan for capacity expansion and optimize resource utilization.

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6. Conduct ongoing Database Monitoring to assess performance, usage, and potential bottlenecks.
7. Monitor the growth status of the Database to plan for capacity expansion and optimize resource utilization.

8.9.2.2. Physical Server Monitoring

The following monitoring procedure outlines the steps to be taken by SSCL's technical team to ensure the proper functioning and performance of the deployed software:

Procedure

1. If required and consented by PBL, ensure physical access to the Data Center, NOC area, and other relevant equipment.
2. If required and consented by PBL, obtain server console or server web console access for maintenance purposes.
3. Log in to the server management console.
4. Monitor the server processor from the management console and record the CPU load average in the designated table.
5. Verify that all RAM is healthy and check the RAM utilization of the server.
6. Assess the disk health status and disk usage of the server.
7. Examine the physical NIC status in the network section of the server.
8. Confirm that all power supplies are operational.
9. Ensure that all cooling fans are functioning properly.
10. Monitor the performance and response times of critical software services and components.
11. Check the server logs for any errors, warnings, or unusual activities.
12. Verify that backup processes are running as scheduled and that backups are being stored in the designated location.
13. Monitor network traffic and bandwidth usage to identify any bottlenecks or potential security threats.
14. Periodically review server and application security settings to maintain compliance with industry best practices and regulatory requirements.
15. Conduct regular vulnerability assessments and apply security patches as needed to protect against potential threats.

8.9.2.3 Hardware Health Check Maintenance

Monitor the temperature, storage capacity, I/O summary report, alarm and warning report based on priority.

Procedure

1. If required and consented by PBL, physical access into Data Center, NOC area and other Equipment.
2. If required and consented by PBL, then obtain server console or server web console access for maintenance
3. Log in to the management console of the server
4. Check the Temperature of the hardware and input the data in the table.
5. Prepare the I/O summary report with an interval of 3-4 hours.
6. Check the daily basis storage capacity of the hardware and disk health status.
7. Check the alarm hardware and set the priority of the alarm.
8. Check the warning of hardware and set the priority of the alarm.
9. Check the issue from the console
10. Check the issue from GUI
11. If any issue is found, raise a support ticket in the support portal.
12. After a ticket is risen assign the concerned engineer to diagnose and troubleshoot the issue.

8.10. Integration

In the context of Supply Chain Financing (SCF) Solution, application integration capabilities refer to the ability of the SCF system to seamlessly connect and interact with other external software applications and systems. It involves exchanging data, sharing information, and enabling smooth workflows between the SCF platform and various third-party systems, such as financial institutions, ERP systems, accounting software, and payment gateways.

•	**Data Synchronization**	Integrating the SCF system ensures uniformity of relevant data across different platforms, eliminating the need for repeated data entries. This synchronization helps prevent data inconsistencies and errors, thus improving the accuracy of the data.
•	**Streamlined Operations**	Application integration allows automation of numerous processes, decreasing the necessity for manual interventions. By automating repetitive tasks, efficiency is improved, saving time and reducing potential human errors.
•	**Real-time Information Access**	Integration of the SCF system with other applications paves the way for real-time information accessibility. This enhancement facilitates prompt decision-making and risk management, as the information is constantly updated.
•	**Enhanced User Experience**	A well-integrated application promises a seamless and user-friendly experience. It provides consistency across various systems, making it easier for users to navigate and utilize the SCF platform efficiently.
•	**Scalability**	Application integration capabilities equip the SCF platform to extend its reach and accommodate new partners, clients, and functionalities, thereby ensuring scalability. As business grows, the integrated systems can be expanded or modified to meet changing requirements.
•	**Secure Data Exchange**	Integration also means secure data exchange between the SCF platform and other systems. This security is crucial in maintaining data integrity and privacy, which are paramount in today's digital world.
•	**Cost and Time Efficiency**	By ensuring smooth data flow and reducing manual work, integration can lead to significant cost and time savings. This can lead to improved productivity and better financial performance.

Overall, robust application integration capabilities transform the SCF platform into a cohesive ecosystem. It enables smooth transactions, seamless data flow, and effective collaboration amongst various stakeholders in the SCF process. It fosters an environment of improved efficiency, accuracy, and productivity, thus making the SCF solution more robust and reliable.

8.10.2. Service Integration Capability

Server integration capabilities in Supply Chain Financing (SCF) refer to the capacity of the SCF platform to connect and interact with various server-based systems, applications, and databases. These integration capabilities are vital for seamless data exchange, automated processes, and efficient collaboration between different servers and stakeholders. Here are the key points:

Vendor ERP Integration

•	SCF platforms with server integration capabilities can securely exchange data with other servers, ensuring accurate and up-to-date information is available to all relevant parties.
•	SCF systems use APIs to enable smooth communication and integration with external servers and applications.
•	Integration capabilities allow SCF servers to interact with a diverse range of servers, including financial institutions CBS(Core Banking System), communication gateway and more.
•	SCF platforms with server integration can automate workflows between servers, streamlining processes and reducing manual interventions.
•	Integration capabilities enable SCF systems to receive real-time updates from connected servers, enhancing decision-making and responsiveness.
•	**The PBL Security Baseline, such as PCI-DSS**, shall be followed by SCF platforms to maintain strong security while allowing server interactions and safeguarding sensitive data.
•	Integration capabilities support the scalability of SCF systems by accommodating new server connections and expanding services.
•	Integration fosters seamless collaboration among multiple servers and stakeholders, ensuring a smooth and efficient SCF ecosystem.
•	Server integration allows SCF platforms to work harmoniously with different servers and applications, facilitating data flow and process coordination.
•	Efficient server integration enhances the user experience by providing a unified and cohesive platform for all SCF stakeholders.

Email:

•	Support for email server integration to send automated notifications and alerts.
•	Capability to parse incoming emails for processing or triggering actions.
•	Integration with email APIs for programmatically sending and receiving emails.

SMS :

•	Handling incoming SMS messages to trigger specific actions or responses.
•	Support for SMS APIs to programmatically send and receive text messages.

CBS :

•	Integration with CRM systems to enhance customer service and relationship management.
•	Ability to integrate with legacy banking systems for a smooth transition and coexistence.
•	Ability to integrate with legacy banking systems for a smooth transition and coexistence.

8.11. Training and Technology Transfer Plan

To ensure the successful implementation of this product, it is crucial to provide comprehensive training to various user groups. This includes individuals from senior management, the supervisory management team, and end users. Adequate training ensures that all stakeholders can effectively utilize and benefit from the system.

Modules of SCF platform : Four

Training Duration (Days) : Four

Day 1: Purchase Order Financing Module

1. Overview of Purchase order financing module
2. Introduction to the modules of the system
3. Explanation of how a purchase order is raised by a buyer and how a seller interacts with it (Manual or auto financing)
4. Clarification on how sellers receive funds
5. Clarification on how partial payments or delays are handled

Day 2: Reverse Factoring Module

1. Overview of reverse factoring modules
2. Explanation of reverse factoring and the interaction between the financial institution, buyer and seller
3. Explanation of how the financial institution sends the invoices to sellers alongside any interest calculations
4. Clarification on how the buyer interacts with the financial institution while paying the invoice.
5. Clarification on how delays are handled

Day 3: Factoring Module

1. Overview of factoring modules
2. Explanation of factoring and the interaction between the financial institution, buyer and seller
3. Explanation of how the seller sends invoices to the financial institution
4. Clarification on how full payments are handled
5. Clarification on how partial payments and delays are handled

Day 4: Dealer/Distributor Financing

1. Overview of distributor financing modules.
2. Explanation on how distributors (buyers) benefit from distributor financing
3. Explanation on how sellers choose to handle the order
4. Clarification on how sellers receive their amounts based on the sanctioned terms
5. Clarification on how partial payments and delays are handled

Schedule	
Day 1 to Day 4:	9:00 AM - 5:00 PM (including lunch break and two 15-minute breaks)

8.12. Onsite Support

Two-Months Onsite Support: We are obligated to provide onsite support for a duration of two months after the completion of the project. This means that our technical team or representatives must be physically present at the project location to address any post-implementation issues, provide training if necessary, and ensure a smooth transition to the operational phase.

•	**Requirement:**	Two months of onsite support after project completion.
•	**Support Duration:**	The onsite support period spans two months after the date of completion project.
•	**Support Responsibilities:**	During onsite support, the team will address any issues and ensure a smooth post-implementation phase.
•	**Training:**	Training should be provided during the two months duration if necessary.
•	**Transition:**	Onsite support facilitates a seamless transition from project completion to full operation.

Completion Certificate: The Prime Bank Ltd. will issue a completion certificate upon the successful completion of the project. This certificate serves as formal recognition from the Bank that the project has been delivered satisfactorily, meeting all agreed-upon requirements, and has achieved its objectives.

•	**Completion Certificate:**	The Bank will issue a completion certificate to Spectrum Software and Consulting (pvt) Ltd. upon successful project delivery.
•	**Certification Signifies Success:**	The completion certificate confirms that the project meets the requirements and expectations of the Prime Bank Ltd.
•	**Project Completion Criteria:**	The completion certificate is awarded when all project objectives are achieved.
•	**Formal Recognition:**	The certificate serves as official recognition of the project's successful execution.
•	**Accountability:**	Providing support and meeting project goals is reinforced by the certificate.

9. Change Request (CR) Management

The Business Requirements Document (BRD) serves as the current scope of the project. If the bank needs to make changes within the existing scope or expand the scope, the vendor would treat those modifications as a change request. Here's a breakdown of how to understand and handle these different types of change requests:

1. **Change within Current Scope:** When the bank needs to make changes within the existing scope defined in the BRD, it means modifying or adjusting the requirements, features, or functionalities already outlined. These changes typically aim to refine or enhance the initial scope without significantly deviating from the project's original objectives. Examples may include adjusting specific requirements, refining user interface elements, or updating integration specifications. These changes are treated as requests to modify or refine the existing scope. We will do this free of cost first one year.
2. **Extension of Scope:** Sometimes, during the project execution or after the initial scope is defined, the bank may identify the need to introduce new features, functionalities, or deliverables that were not initially included in the BRD. These additions would extend the scope beyond its original boundaries. Examples may include incorporating additional modules, integrating with new systems, or introducing new user roles. In this case, you would submit a change request to extend the scope by outlining the new elements you propose to include.

Both types of change requests (changes within the current scope and scope extension) require careful consideration and evaluation. It's important to assess the impacts of these changes on various project aspects, such as timeline, budget, resources, and stakeholders. The change request process allows stakeholders to review, analyze, and approve or reject the proposed modifications or extensions based on their alignment with project objectives, feasibility, and overall impact.

- For the type of change requests within the current scope, we will do this free of cost within the first year and then a charge will be applicable.
- When a change request (scope extension) is received, the project team will evaluate the impact of the requested changes and analyze the effort required to implement them. This effort estimation helps in assessing the number of man-days or person-days needed to complete the work. The team takes into account various factors such as the complexity of the changes, the skills required, potential dependencies, and any additional resources needed.

Once the project team has confirmed the effort estimation, they will present it to the client for approval. The client then reviews the estimation and budget and provides confirmation or negotiation if necessary. Upon receiving the client's confirmation, the development team proceeds to incorporate the change request within the agreed-upon timeline and budget.

Change Request Rate: Both types of change requests (**changes within the current scope after the first year and scope extension**) will be **8000** taka per man-day.

10. Detailed Installation Procedure

If the contract is awarded, the following installation procedures will be performed:

i	All the prerequisites for solutions in Live, DR, and Test environments will be installed on premises.
ii	Full solutions in Live, DR, and Test environments will be installed and configured.
iii	Software or Hardware (if bank provides) load balancer with clustering features in live environment will be implemented.
iv	A configured solution with SSL certificate will be provided that supports only the latest TLS.
v	Security policy will be applied in each server. PBL Security Baselines like PCI-DSS will be followed.
vi	A process will be ensured that will periodically patch updates of Operating Systems and databases.
vii	A detail plan will be provided for post deployment support.
viii	**Guides**
	Installation / Implementation guide:
	An installation guide mentioning details of installation & parameter value setup for OS during product implementation will be provided.
	Detail data dictionary as per prime bank's requirement will be provided.
	Setup and configuration related detail documents will be provided.
	Service Development guide:
	A guideline for integration with new service provider with business logic implementation and validations will be provided.
	Administration guide:
	An administration guide where detail information about application logs, system logs, temporary file locations, performance monitoring scripts/commands and system maintenance guidelines will be provided. It will include high-level definition of process flows. Also, administration guides will include standard operating procedure (SOP) for system administration.

11. Audit Trail log

The audit trail log holds immense significance in the context of a **Supply Chain Financing (SCF) Solution.** With the intricate financial transactions and collaborations involved in supply chain financing, the audit trail log becomes a critical tool for maintaining transparency, trust, and security within the ecosystem. It meticulously captures every action taken by buyers, suppliers, financial institutions, and administrators, providing a comprehensive trail of financial activities and decisions. By enabling real-time monitoring and tracking of SCF operations, the audit trail log ensures that all stakeholders remain accountable for their actions, bolstering the overall integrity of the SCF Solution.

●	**Solution**	We will provide a comprehensive solution that includes a panel for monitoring service-wise audit trails. This panel should allow for easy administration and deployment of audit trails, ensuring efficient tracking of activities across the system.
●	**Standard Audit Trail Report/Module**	The system should incorporate a standard Audit Trail Report or Module for Supply Chain Financing (SCF) Solution, enabling users to access detailed logs of events and actions performed within the application. This report should display relevant information, such as timestamps, user IDs, and activities, providing a comprehensive overview of system activities.
●	**Audit Trail & User Activity Report**	The system must generate an Audit Trail Report for Supply Chain Financing (SCF) Solution encompassing user activity, providing insights into actions taken by each user. This report should facilitate effective auditing and compliance monitoring, enhancing the system's overall security and accountability.
●	**Incorporation of Audit Trail Log in Security Admin Module**	Supply Chain Financing (SCF) Solution include the integration of the Audit Trail log within the Security Admin Module. This integration ensures that authorized administrators can access and manage the Audit Trail functionalities from the Security Admin Module. By centralizing these features, administrators can efficiently monitor, configure, and analyze audit trails while maintaining a comprehensive view of security-related activities.
●	**Granular Information:**	The Supply Chain Financing (SCF) Solution audit trail log captures granular information, such as the date and time of each event, the user or entity involved, the action performed, and the source of the event.
●	**Non-Repudiation:**	Supply Chain Financing (SCF) Solution audit trail log provides non-repudiation, meaning that actions performed by users or systems can be attributed to specific individuals or entities, preventing denial of responsibility.
●	**Security Monitoring:**	Audit trail logs are crucial for real-time security monitoring, allowing administrators to detect and respond promptly to suspicious activities or potential security breaches.
●	**Forensic Analysis:**	In the event of security incidents or investigations, audit trail logs serve as valuable forensic evidence to identify the sequence of events and potential root causes.
●	**Data Integrity:**	The audit trail log can help verify the integrity of data by tracking changes and modifications made to critical records or files.
●	**Log Retention:**	Prime Bank Ltd. will define log retention policies to determine how long audit trail logs should be kept. This ensures historical data availability for analysis and compliance purposes.
●	**Integration with PBL Security System:**	Integrating with PBL Security Baseline systems allows for centralized log analysis, correlation, and alerting, enhancing overall security monitoring capabilities.
●	**Secure Storage:**	To maintain the integrity and confidentiality of audit trail logs, they should be stored securely and protected from unauthorized access or tampering.
●	**Log Review and Analysis:**	Regular review and analysis of audit trail logs are essential to identify patterns, anomalies, or potential threats, and to proactively address security risks.

By effectively leveraging audit trail logs, Prime Bank Ltd. can enhance their security posture, gain valuable insights into system activities, and meet compliance requirements more effectively.

12. UAT Documents

User acceptance testing (UAT) along with API integration with other systems is the last phase of Supply Chain Finance Solution, Grievance and Complaint Redressal System software testing process. Actual software users will test the system, Grievance and Complaint Redressal System to make sure it can meet user requirements in real-world scenarios.

The process of determining whether a system or software application satisfies the needs and expectations of the end users is known as user acceptance testing (UAT). To confirm that the system complies with the business requirements and is prepared for deployment, we will conduct UAT. The groups of stakeholders, end users, or end-user representatives who have a solid grasp of business requirements and user expectations will conduct the UAT. The system will be tested for functionality, usability, performance, security, and compatibility as part of the UAT process.

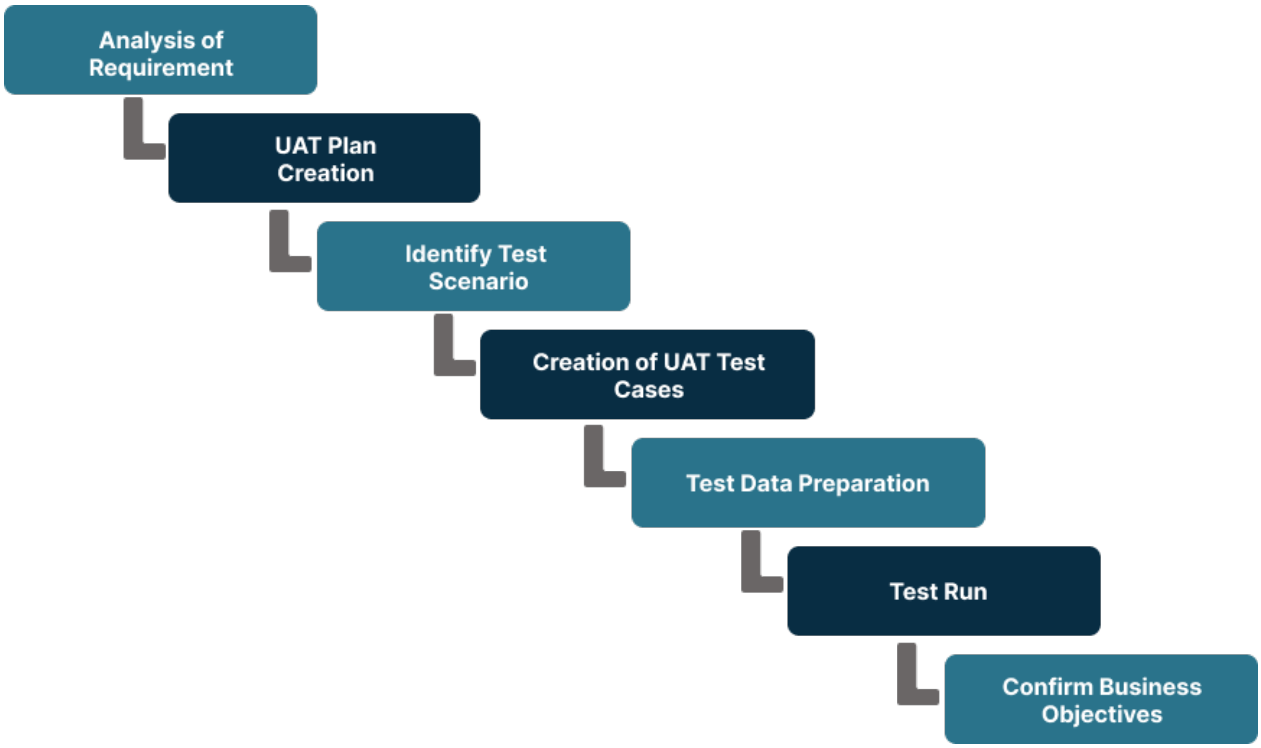
Our deployment planning will address the following criteria:

- **Pre-release Considerations:** Assumptions, dependencies, constraints, operational readiness, sanity test on database, load tests, functional tests, regression tests, data creation/conversion and artifact creation.
- **Timing of Release:** Timing of release refers to the decision-making process for determining when to release a product, service, or software to the public avoiding any kind of disruption.
- **Training:** Training refers to the process of providing individuals with knowledge, skills, and abilities needed to perform specific tasks effectively
- **Accountability:** Accountability refers to the responsibility that individuals and organizations have to be answerable for their actions, decisions, and outcomes.
- **Documentation and Release Note:** We will provide both the documentation and release notes for easily understanding the system and changes for the end users.
- **Supporting Rollbacks:** This may include measures such as version control, frequent backups, thorough testing, and clear documentation of changes made to the system
- **Notification of Deployment:** To notify the concerned person or team through sms or email after successful deployment
- **Operations and Maintenance Planning:** Operations and maintenance planning is the process of creating a comprehensive plan that outlines the activities and tasks required to operate and maintain equipment, systems, or facilities.
- **Release Planning:** Effective release planning requires regular communication, collaboration, and flexibility throughout the process.

We will execute UAT before Supply Chain Finance Solution, Grievance and Complaint Redressal System software is rolled out to the production. UAT process consists of following activities.

- Analysis of Requirements.
- Creation of UAT test plan.
- Identify Test Scenarios.
- Create UAT Test Cases.
- Preparation of Test Data.
- Run the Test cases.
- Record the Results.
- Confirm business requirements are met.

Figure 27: UAT Process



We will go through following major steps to complete User Acceptance Testing.

Involve users in User Acceptance Testing by

- selecting real end users of Supply Chain Finance Solution, Grievance and Complaint Redressal System software modules
- including users from every role and stakeholder group

Get started with User Acceptance Testing by

- creating a set of UAT test cases
- creating a set of test steps, execution conditions and expected results needs to be developed

Get User Acceptance Testing Sign off by

- fixing defects immediately
- taking UAT sign off from respective user or user group
- releasing validated software version to production

13. Hand Over Documents

Upon acceptance of our **Supply Chain Financing Solution** (SCF) product by the Prime Bank Ltd., we will provide a comprehensive handover document to ensure a smooth transition and facilitate the successful adoption and implementation of the software. The handover document will include essential information, such as user manuals and guides, detailing how to navigate and utilize various features of the software effectively. It will also contain technical documentation, including system architecture diagrams, database schemas, and API documentation, enabling Prime Bank Ltd. team to understand the underlying structure and integrations.

Additionally, the document will outline the installation and setup procedures, system requirements, and any dependencies necessary for the software's successful deployment. Furthermore, we will include a detailed troubleshooting guide and support contact information to assist the Prime Bank Ltd. in resolving any issues that may arise. Overall, the handover document aims to empower the company with the knowledge and resources needed to maximize the benefits of our Supply Chain Financing Solution(SCF).

•	Installation Procedure	The handover document will include a step-by-step installation procedure to guide the company's IT team or administrators through the process of deploying the supply chain finance software.
		For more details: Please go to - Chapter 10 (BoQ Of Detailed Installation Procedure)
•	Configuration Parameters	Configuration parameters in Supply Chain Financing Solution(SCF) refer to the settings and variables that can be adjusted or customized to tailor the SCF platform to specific business needs and requirements.
		For more details: Please go to - Chapter 4.3 (Configuration Parameters)

14. Service Level Agreement

EQUIPMENT LIST IN THE SCOPE

It has been clear that the scope is only for mentioned items in the Proposed BOQ section. Refer to Proposed BOQ for details.

PROPOSED SERVICES PERIODS

The software product FOC (Free of Charge) period will be two months. During this period, users will be able to use the software free of charge and without any restrictions. This period will be used to allow users to get to know the product. After the FOC period, users will use the product with agreement charges.

The software product FOC period of two months should include:

1. Access to the software product and associated documentation.
2. On-site training and implementation of the software product.
3. Assistance with integration of the software product into existing systems and processes.
4. Regular software updates and patches.
5. Assistance with troubleshooting and bug fixes.
6. Assistance with data migration, if required.
7. Regular communication and feedback from the customer.

SERVICES REQUIREMENTS IN THE SCOPE

1. On Call Support
2. Remote Support
3. Corrective Maintenance

PARTICULARS OF THE DELIVERABLES

1. **On-Call Support** – A technical resource pool will be available as back-office support. They will provide 24x7 On-Call Support if required On-Site as per Service Level Matrix mentioned in the proposal.

2. **Remote Support** – The same technical resource pool will be available as remote support. They will provide 24x7 remote Support over the Phone & remote login to the Device, if required and if allowed.

3. **Corrective Maintenance** – SSCL will take all reasonable steps to provide corrective maintenance for the Equipment and ensure that the equipment will operate according to the designated specifications and functions and free of malfunctions, errors, defects, or shortcomings. They will provide service within 24 hours if required and if allowed.

14.1. Service Matrix

Service Matrix will be defined through the Call Logging and Escalation Method by our support team lead			
Priority/ Severity	Response Time	Maximum Service Restoration Time Without Any Parts Replacement	Maximum Service Restoration Time
P2 (Major)	Within 12 Business Hours	12 Hours	Next 24 Hours
P3 (Minor)	Within 24 Business Hours	24 Hours	Next 36 Business Hours
P4 (Information)	Within 24 Business Hours	48 Hours	Max 10 Business Days for New requirement

14.2. Definition of Severity

DEFINITION OF SEVERITY

CRITICAL (P1)

Critical events are problems that severely affect service, capacity, and maintenance capabilities. Critical events require immediate corrective action, regardless of the time of the day or day of the week. There is a significant reduction in revenue-generating capability.

MAJOR (P2)

Major events are problems that cause conditions that seriously affect system operation, maintenance, and administration. Major events require immediate attention. The urgency is less than a critical event because of a less immediate or impending effect on system performance, end-users, operation, and revenue. A major event on the device could impact a majority of the users.

MINOR (P3)

Minor events are problems that are not viewed as critical or major. Minor events neither significantly impair the functioning of the system nor significantly affect service to end-users. These events are tolerable during system use. A minor event on the device may have an impact on one or a limited number of users.

INFORMATIONAL(P4)

Informational events are used to note data for tracking and trending purposes or issues requiring long lead items or long lead requests, even if it is used to generate a new requirement analysis.

15. Core Competency

DEFINITION OF SEVERITY

CRITICAL (P1)

Critical events are problems that severely affect service, capacity, and maintenance capabilities. Critical events require immediate corrective action, regardless of the time of the day or day of the week. There is a significant reduction in revenue-generating capability.

MAJOR (P2)

Major events are problems that cause conditions that seriously affect system operation, maintenance, and administration. Major events require immediate attention. The urgency is less than a critical event because of a less immediate or impending effect on system performance, end-users, operation, and revenue. A major event on the device could impact a majority of the users.

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Minor events are problems that are not viewed as critical or major. Minor events neither significantly impair the functioning of the system nor significantly affect service to end-users. These events are tolerable during system use. A minor event on the device may have an impact on one or a limited number of users.

INFORMATIONAL(P4)

Informational events are used to note data for tracking and trending purposes or issues requiring long lead items or long lead requests, even if it is used to generate a new requirement analysis.

19. Prerequisites

PREREQUISITES

Before SSCL's technical team can proceed with onsite support, the following requirements and components must be met or provided by the Client:

1. Clearly define roles, ownership, and establish an escalation matrix for responsibilities such as password and server management.
2. Provide SSCL both on-site and remote login access to devices for troubleshooting and maintenance purposes.
3. Allocate a suitable workspace for the on-site engineer to work, including a desk, chair, and any necessary office supplies.
4. Supply a bank laptop to SSCL with database read-write access for resolving application database issues on-premise.
5. Issue an ID card that grants physical access to the Data Center, NOC area, and other relevant equipment.
6. Client must ensure physical access to the Data Center, NOC area, and other equipment.
7. Client must provide server console or server web console access for maintenance purposes.
8. Client must assume responsibility for addressing all access network and security-related issues.

For remote support

1. Enable remote access with a VPN connection for application, storage, and database issue resolution and deployment.
2. Ensure network level connectivity through a VPN to the servers from SSCL's premises.

OUT OF SCOPE

There are a number of tasks that will be the beyond of scope of work. Non-deliverables specific to each project. These are described below:

1. SSCL is not responsible for ensuring compliance with any government regulations, including Regulatory Compliance and Lawful Interception (LI) issues.
2. In cases of client-premise deployment on the Client's Hardware, SSCL will not be responsible for hardware-related maintenance and cache cleaning.
3. If the deployment is on SSCL's Hardware at the client's premises, SSCL will not be responsible for rack maintenance, power source issues, network maintenance, or bandwidth issues.
4. SSCL will not be responsible for any third-party software integrations or modifications that are not explicitly included in the agreement.
5. Customization or development of new features or functionalities not specified in the project scope is not included.
6. Data migration from legacy systems or third-party services, unless explicitly agreed upon in the project scope, is not covered.
7. End-user training or onboarding, unless specified in the project scope, is not included.
8. SSCL is not responsible for the performance or compatibility of any third-party hardware, software, or services utilized by the Client.
9. Any costs or fees associated with third-party services, APIs, or data providers that are not explicitly included in the agreement are not covered by SSCL.

20. Project Screenshot (Annexure1)

User Screen Flow:

User screen flow is the design of user interfaces for software, with the focus on maximizing usability and the user experience. The goal of user screen flow is to make the user's interaction as simple and efficient as possible, in terms of accomplishing user goals (user-centered design).

Good user interface design facilitates finishing the task at hand without drawing unnecessary attention to itself. Graphic design and typography are utilized to support its usability, influencing how the user performs certain interactions and improving the aesthetic appeal of the design; design aesthetics may enhance or detract from the ability of users to use the functions of the interface. The design process must balance technical functionality and visual elements to create a system that is not only operational but also usable and adaptable to changing user needs.

User and task analysis:

The analysis of the potential users of the system has been done by studying how they perform the tasks that the design must support, and conducting interviews to elaborate their goals. Typical questions for this analysis are given below:

1. What would the user want the system to do?
2. How would the system fit in with the user's normal workflow or daily activities?
3. How technically savvy is the user and what similar systems does the user already use?
4. What interface look & feel styles appeal to the user?

This system design must have to meet the five characteristics of the usability:

1. **Effectiveness:**

   Effectiveness is about whether users can complete their goals with a high degree of accuracy.

2. **Efficiency:**

   Efficiency is all about speed. How fast can the user get the job done?

3. **Engagement:**

   Engagement refers to the level of engagement a system offers. Engagement is not only about looking nice; it’s also about looking right. Proper layouts, readable typography and ease of navigation all come together to deliver the right interaction for the user and make it engaging

4. **Error Tolerance:**

   To minimize errors from occurring and to ensure that a user can easily recover from an error and get back to what he or she was doing. This is error tolerance.

5. **Ease of learning:**

   The users finds themselves to be able to learn the system easily so that when they use it again, it comes as second nature. Developers need to accommodate ease of learning when releasing new functionality and features; otherwise, a familiar and happy user may quickly become frustrated with the latest release.

21. Contract Term and Renewal

This Software Contract ("Agreement") is made and entered into as of May 7, 2023 by and between Spectrum Software & Consulting Ltd., a corporation with its principal place of business at 69/1, Chandrashila Suvastu Tower, Suite- C, 7th Floor, Panthapath, Dhaka-1205 ("Licensor"), and Prime Bank Limited, a corporation with its principal place of business at Simpletree Anarkali, 89 Gulshan Ave, Dhaka 1212 ("Licensee").

Whereas, Licensor owns certain proprietary software and related documentation (collectively, the "Supply Chain Financing Management System") and desires to license the Software to Licensee, and Licensee desires to obtain a license to use the Software in accordance with the terms and conditions of this Agreement.

NOW, THEREFORE, in consideration of the mutual promises and covenants contained herein and for other good and valuable consideration, the receipt and sufficiency of which are hereby acknowledged, the parties hereto agree as follows:

1. License Grant. Subject to the terms and conditions of this Agreement, Licensor hereby grants to Licensee a non-exclusive, non-transferable license to use the Software, solely for Licensee’s internal business purposes.

2. License Fees Licensee shall pay Licensor the license fees specified in Exhibit A hereto, as amended from time to time by written agreement of the parties. All payments shall be made in BDT and are nonrefundable.

3. Term and Renewal The initial term of this Agreement shall be for a period of [Duration] (the "Initial Term") and commence on the Effective Date. This Agreement shall automatically renew for additional successive [Duration] (each a "Renewal Term") unless either party gives written notice of its intent not to renew at least [Notice Period] days prior to the expiration of the then-current term. The Initial Term and any Renewal Term(s) shall collectively be referred to as the "Term."

4. Support and Maintenance During the Term, Licensor shall provide Licensee with support and maintenance for the Software, as specified in Exhibit B hereto.

5. Intellectual Property. The Software and all intellectual property rights therein are and shall remain the exclusive property of Licensor. Licensee shall not modify, copy, distribute, or create derivative works of the Software, except as expressly authorized by Licensor in writing.

6. Confidentiality. Each party agrees to maintain the confidentiality of the other party’s confidential information, as defined in Exhibit C hereto.

7. Limitation of Liability In no event shall Licensor be liable to Licensee for any indirect, incidental, special, or consequential damages arising out of or in connection with this Agreement, even if Licensor has been advised of the possibility of such damages. Licensor’s total liability under this Agreement shall not exceed the total amount of license fees paid by Licensee to Licensor.

8. Governing Law and Jurisdiction This Agreement shall be governed by and construed in accordance with the laws of Bangladesh, without giving effect to any choice of law or conflict of law provisions. Any legal action arising out of or in connection with this Agreement shall be brought exclusively in the state or federal courts located in Bangladesh, and each party hereby consents to the jurisdiction of such courts.

9. Entire Agreement This Agreement constitutes the entire agreement between the parties with respect to the subject matter hereof and supersedes all prior and contemporaneous agreements and understandings, whether written or oral.

IN WITNESS WHEREOF, the parties hereto have executed this Agreement as of the Effective Date.

Spectrum Software and Consulting (Pvt.) Ltd.

By: _____

Name: _____

Title: _____

Prime Bank Limited

By:

_____

_____

Name:

_____

_____

22. Intellectual Property Rights

Intellectual Property Rights

The following section outlines the intellectual property rights that apply to this product.

Trademarks

All product names, logos, and designs associated with this product are trademarks or registered trademarks of the company. Any use of these trademarks without prior written permission from the company is strictly prohibited.

Patents

This product may be covered by one or more patents owned or licensed by the company. The company retains all rights to these patents, and any use of the technology described in these patents without prior written permission from the company is strictly prohibited.

Copyright

All content, including but not limited to text, graphics, images, and software, associated with this product is the property of the company or its licensors and is protected by copyright laws. Any use of this content without prior written permission from the company is strictly prohibited.

Trade Secrets

This product may contain trade secrets owned by the company. The company retains all rights to these trade secrets, and any use or disclosure of these trade secrets without prior written permission from the company is strictly prohibited.

Conclusion

The company takes intellectual property rights seriously and will take appropriate action to protect its intellectual property rights against any infringement.