

SOFTWARE REQUIREMENT SPECIFICATION
FOR
TENDER/CONTRACT MANAGEMENT
USING BLOCKCHAIN

Done By:

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Table of Contents

1. Introduction.....	3
1.1. Purpose	3
1.2. Scope	3
1.3. Contact information/SRS team members.....	3
1.4. References.....	3
2. The Overall Description	3
2.1. Product perspective	3
2.2. Product functions	4
2.3. User classes and characteristics.....	4
2.4. Operating environment	5
2.5. User environment.....	5
2.6. Design/implementation constraints	5
3. External Interface Requirements	5
3.1. User interfaces.....	5
3.2. Hardware interfaces	6
3.3. Software interfaces	7
3.4. Communication protocols and interfaces	7
4. System Features	7
5. Other Non-functional Requirements.....	8
5.1. Performance requirements	8
5.2. Safety requirements.....	8
5.3. Security requirements	8
5.4. Software quality attributes	8
5.5. User documentation.....	9
6. Other requirements	9
Appendix A: Terminology/Glossary/Definitions list	9

1. Introduction

The software TENDERBC is to be developed for Tender/Contract Management. A tender refers to a formal agreement between admin and companies that are bidding for the tender under which a project will be carried out. These terms can include details about the scope of work, deliverables, timelines, and any other relevant specifications. Through TENDERBC, companies interact with a user-friendly interface that enables them to access their biddings and perform various transactions.

1.1. Purpose

This SRS defines the External Interface, Performance, and Software System Attributes requirements of TENDERBC. This document is intended for the following group of people: -

- ✓ Developers for maintenance and new releases of the software.
- ✓ Management of the bank.
- ✓ Documentation writers.
- ✓ Testers.

1.2. Scope

This document applies to the Tender/Contract Management software TENDERBC. This software allows the administrator to add Tenders/Contracts and facilitates companies to submit their bid proposals. After the tender end-time, the admin can evaluate the biddings and accept one of them. No changes can be made once the tender is uploaded or the bid is submitted.

The software takes input of the login information and validates admin or companies. Tender documents and required information will be given as input by admin to add a tender. Companies can bid on a tender by providing the required information and documents as input. Output for companies will be whether the bid request is accepted or not by admin. This comprises an interactive display that lets the companies and admin select the desirable function that they want to perform.

References

The references for the above software are as follows:

- i. www.google.co.in
- ii. www.wikipedia.com
- iii. "Blockchain Technology and Its Applications in E-Governance Services."
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- v. "Ethereum: A Secure Decentralized Generalized Transaction Ledger," by Gavin Wood. Yellow paper for the Ethereum project 151.2014 (2014): 1-32.
- vi. "Formal verification of smart contracts: Short paper," in Proceedings of the 2016 ACM Workshop on Programming Languages and Analysis for Security. ACM, 2016, pp. 91–96. K. Bhargavan, A. DelignatLavaud, C. Fournet, A. Gollamudi, G. Gonthier, N. Kobeissi, N. Kulatova, A. Rastogi, T. Sibut-Pinote, N. Swamy.

2. The Overall Description

2.1. Product perspective

- ✓ Blockchain Security: Utilizes blockchain technology to ensure secure and transparent tender management.
- ✓ Document Encryption: Encrypts and stores tender documents and transactions for enhanced security.
- ✓ De-centralized Platform: Provides a de-centralized platform for managing tender documents and bid proposals.
- ✓ Administrative Tools: Offers administrative functionalities for reviewing applications and approving tenders.
- ✓ Immutable Ledger: Records all tender-related transactions in an immutable ledger to prevent tampering.
- ✓ Real-time Monitoring: Enables real-time monitoring of tender progress and bid submissions for users.
- ✓ Vendor Participation: Allows qualified vendors to participate in open tenders through the system.
- ✓ Transparent Process: Ensures transparency by recording all updates and changes in the blockchain.

- ✓ **Efficient Tendering:** Streamlines the tendering process to minimize errors and delays.

2.2. Product functions

The major functions that TENDERBC performs are described as follows:

- ✓ **Creating Tenders:** The admin, typically a representative of the organization or entity issuing tenders, has the authority to create new tender opportunities. This involves inputting details such as the tender description, requirements, deadline, and any other relevant information into the system.
- ✓ **Bidding on Tenders:** Registered companies or vendors can access the system to view available tenders and submit their bids accordingly. This process involves preparing and submitting proposals outlining how they intend to fulfill the requirements specified in the tender document.
- ✓ **Hiding Bid Details and Storing in the Blockchain:** To maintain fairness and confidentiality, bid details such as bid amounts, company identities, and other sensitive information are encrypted and stored securely on the blockchain. This ensures that only authorized parties can access the information and prevents tampering or unauthorized access.
- ✓ **Showing Tender Status:** Companies interested in bidding for a tender can view its status, including details such as tender ID, description, cost, starting date, ending date, tender submission date, and current status (e.g., open, closed, under evaluation). This transparency allows bidders to make informed decisions about participating in the tender process.
- ✓ **Search Functionality:** The system provides a search bar that allows companies to easily search for specific tenders based on keywords, tender IDs, descriptions, or other relevant criteria. This feature enhances user experience and efficiency by quickly locating relevant tender opportunities.
- ✓ **Admin Selection of Final Bidder:** After the tender submission deadline has passed, the admin is responsible for selecting the final bidder from among the submitted bids. This selection process may consider factors such as bidder experience, proposed cost, compliance with tender requirements, and any other relevant criteria specified in the tender document. The admin's decision is crucial in determining which bidder will be awarded the contract.

2.3. User classes and characteristics

There are different kind of users that will be interacting with the system. The intended user of the software are as follows:

Bidder:

Bidder refers to a registered company or vendor interested in participating in tender opportunities. They interact with the system to find relevant tenders, submit bids, and track the status of their submissions.

Bidders can browse through available tenders, view tender details such as descriptions, deadlines, and submission requirements. They then fill out the necessary details and submit their bids electronically through the system.

Bidders have restricted access to certain functionalities such as viewing tender details, submitting bids, and monitoring the status of their submissions. They typically do not have access to administrative functions.

Admin:

The admin is a designated user responsible for managing the tendering process within the system. They have elevated privileges to create and publish tenders, monitor bid submissions, and select the final bidder based on predefined criteria.

Admins can create new tenders by providing detailed information such as tender descriptions, requirements, deadlines, and any other relevant information. They also review and evaluate submitted bids, considering factors such as bidder experience, proposed cost, and compliance with tender requirements. Finally, they select the winning bidder and finalize the contract award.

Admins have full access to the system's administrative functionalities, including creating and managing tenders, reviewing bid submissions, and selecting the final bidder. They have the authority to make decisions and modifications within the system to ensure smooth operation of the tendering process.

2.4. Operating environment

The system operates within a digital environment, utilizing modern technology infrastructure to facilitate its functionalities. It is typically deployed on cloud-based servers or on-premises servers, depending on the preferences and requirements of the organization implementing the system. The operating environment may include:

Operating Systems (OS): The system is designed to be compatible with various operating systems, including but not limited to Windows, Linux, and macOS, to ensure accessibility across different platforms.

Database Management Systems (DBMS): The system relies on a robust database management system, such as MySQL, PostgreSQL, or MongoDB, to store and manage tender-related data securely.

Web Servers: Web servers, such as Apache HTTP Server or Nginx, are utilized to host and serve the system's web-based interface, allowing users to access the application via their web browsers.

Blockchain Technology: The system leverages blockchain technology, which may require integration with specific blockchain platforms (namely, Hyperledger Fabric), for secure and immutable transaction management.

2.5. User environment

Web Browsers: Users access the system's web-based interface using modern web browsers such as Google Chrome, Mozilla Firefox, Safari, or Microsoft Edge. The interface is designed to be responsive and user-friendly across different browsers and screen sizes.

Internet Connectivity: Users require stable internet connectivity to access and interact with the system. This ensures seamless communication between the user's device and the system's servers hosted either on the cloud or on-premises.

User Authentication: The system may incorporate user authentication mechanisms, such as username/password authentication or multi-factor authentication (MFA), to verify the identity of users accessing the platform and ensure secure access to sensitive information.

Security Measures: Users are expected to adhere to security best practices, including maintaining the confidentiality of their login credentials, following data protection guidelines, and reporting any suspicious activities or security incidents to the system administrators.

2.6. Design/implementation constraints

The major constraints that the project has are as follows:

- ✓ Hide the bidding details using blockchain

3. External Interface Requirements

3.1. User interfaces

The user interfaces of the blockchain tender/contract management system are designed to provide intuitive navigation and efficient access to key functionalities for both administrators and bidding companies.

Registration/Login: Upon accessing the system, users are presented with the option to either register as a company or log in. Only companies are permitted to register, and they must provide various details including username, email, mobile number, password, and years of experience. Upon login, users are prompted to specify whether they are an admin or a bidding company and enter their username and password for authentication.

Admin Homepage: Upon successful login as an admin, users are redirected to the admin homepage.

The admin homepage features options such as:

- ✓ Generate Tender: Allows the admin to create new tender opportunities by inputting relevant details.

- ✓ View Tender: Provides access to a list of all available tenders for review and management.
- ✓ View Allocated Tenders: Displays tenders that have been allocated or assigned to specific bidding companies.
- ✓ Biddings: Facilitates the review and management of bids submitted by companies for various tenders.
- ✓ Confirm Biddings: Enables the admin to confirm or finalize bidding selections for each tender.
- ✓ Logout: Allows the admin to securely log out of the system.

Company Homepage: Upon successful login as a bidding company, users are redirected to the company homepage. The company homepage features options such as:

- ✓ Tenders: Displays a list of available tenders for companies to review and bid on.
- ✓ My Biddings: Provides access to a summary of bids submitted by the company for different tenders.
- ✓ Bidding History: Shows a record of all previous bidding activity conducted by the company.
- ✓ Search Bar: Allows companies to search for specific tenders based on keywords or criteria.
- ✓ Logout: Allows the company to securely log out of the system.

Bidding Page: When a company taps on a specific tender from the homepage, they are redirected to the bidding page dedicated to that particular tender. The bidding page prompts the company to fill in the necessary details required for submitting their bid.

The required fields typically include:

- ✓ Name: The name of the company or the representative submitting the bid.
- ✓ Mobile Number: Contact number of the company or the representative.
- ✓ Email: Email address for correspondence regarding the bid.
- ✓ Price: Proposed price or cost for fulfilling the tender requirements.
- ✓ Quantity: Quantity of goods or services being offered as part of the bid.
- ✓ Description: Additional details or specifications related to the bid, such as product features, delivery terms, or any special considerations.

Each field may have validation checks to ensure the accuracy and completeness of the information provided by the company.

The bidding page may also include options for attaching supporting documents or additional files relevant to the bid, such as product catalogs, certifications, or previous work samples.

Once all required information is entered, the company can submit their bid through the bidding page. After submission, the bid is recorded and stored securely within the system, ready for review and evaluation by the admin responsible for managing the tender process.

3.2. Hardware interfaces

The hardware requirements specified for the blockchain tender/contract management system are designed to ensure optimal performance and compatibility with typical computing environments. The system can operate effectively on hardware configurations meeting the following specifications:

- ✓ Processor Name: Dual Core processor, capable of handling multitasking and processing tasks efficiently.
- ✓ Processor Speed: Clock speed of 3.2 GHz, providing sufficient processing power for smooth operation of the system.
- ✓ RAM: Minimum of 4 GB of RAM, allowing for adequate memory allocation to support system operations and concurrent user interactions.
- ✓ Hard Disk Capacity: 80 GB of hard disk capacity, providing ample storage space for the system software, databases, and related files.
- ✓ Display Device: A monitor with a screen size ranging from 14 inches to 19 inches, ensuring comfortable viewing and interaction with the system's user interface.
- ✓ Keyboard Type: Compatibility with both PS2 and USB keyboard types, allowing users to input data and navigate the system using their preferred keyboard interface.

- ✓ **Mouse Type:** Support for both PS2 and USB mouse types, facilitating intuitive navigation and interaction with graphical elements within the system's user interface.

3.3. Software interfaces

The software requirements outlined for the blockchain tender/contract management system dictate the technological environment necessary for its development, deployment, and operation. The system relies on a combination of widely used technologies and programming languages to deliver its functionalities effectively:

- ✓ **Technology Implemented:** The Django framework serves as the foundation for building the frontend components and interfaces of the blockchain tender/contract management system. Its component-based architecture and virtual DOM enable efficient rendering and state management, facilitating a seamless user experience. Also, Hyperledger Fabric is employed as the underlying blockchain framework for implementing the decentralized ledger functionality of the system. Its modular architecture, permissioned network, and support for smart contracts make it suitable for enterprise-grade blockchain applications.
- ✓ **Language Used:** Python Django is utilized as the backend framework for developing the business logic, data processing, and API endpoints of the system. Its clean and pragmatic design, along with built-in security features, streamlines backend development and integration with other components.
- ✓ **Database:** MySQL is employed as the backend database management system for storing and managing tender-related data securely. Its reliability, performance, and compatibility with Django ORM (Object-Relational Mapping) simplify data handling and ensure data integrity within the system.
- ✓ **Server Hosting:** A dedicated server infrastructure is provisioned for hosting the backend components of the system. This server environment provides the necessary resources and security measures to ensure the availability and performance of the application.
- ✓ **User Interface Design:** The user interface is designed using a combination of HTML, CSS, and JavaScript within the Django framework. HTML provides the structure and semantics of the UI elements, CSS handles the styling and layout, while JavaScript enables dynamic interactions and asynchronous data fetching, enhancing the overall user experience.
- ✓ **Web Browser:** The system is optimized for compatibility with modern web browsers, including Mozilla Firefox, Google Chrome, and Microsoft Edge. This ensures consistent and reliable performance across different browsing environments, enhancing accessibility and usability for end-users.

3.4. Communication protocols and interfaces

To ensure secure and reliable communication between the client and server components of the blockchain tender/contract management system, several protocols are utilized:

- ✓ **RESTful API:** A RESTful API (Representational State Transfer) is utilized to enable communication between the frontend and backend components of the system. This API follows the principles of REST, allowing for stateless communication over HTTP, with endpoints defined for various operations such as retrieving tender data, submitting contract transactions, and managing user authentication.
- ✓ **WebSockets:** WebSockets are employed to establish a persistent, bidirectional communication channel between the client-side application and the server. This enables real-time updates and notifications to be pushed from the server to connected clients, enhancing the responsiveness and interactivity of the user interface.
- ✓ **Hyperledger Fabric SDK:** The Hyperledger Fabric SDK is utilized to interact with the underlying blockchain network and smart contracts. It provides a set of APIs and communication protocols for submitting transactions, querying ledger data, and managing identity and access control within the blockchain network.
- ✓ **Database Connectivity:** The system utilizes database connectivity protocols such as JDBC (Java Database Connectivity) or ORM (Object-Relational Mapping) frameworks to establish connections with the MySQL backend database. This allows for efficient data retrieval, storage, and manipulation within the application.

4. System Features

- ✓ **Tender Creation:** The system allows administrators to create new tenders, providing comprehensive details such as the scope of work, requirements, deadlines, and any additional instructions. This feature empowers administrators to initiate and manage tender processes effectively.

- ✓ **Bid Submission:** Bidders have the capability to submit their bids for the listed tenders through the system. They can input their proposal details, pricing, and any other relevant information required by the tender document.
- ✓ **Decentralized Storage:** All bidder submissions are securely stored in a decentralized storage system, leveraging blockchain technology. This ensures data integrity, immutability, and resilience against tampering or unauthorized access.
- ✓ **Immutable Submissions:** Once submitted, bidders cannot alter or modify their tender submissions. This feature guarantees the integrity and authenticity of the submitted bids, maintaining the fairness and transparency of the tendering process.
- ✓ **Privacy:** Bidders' submission details are kept confidential, and they cannot view each other's submissions. This ensures fairness and prevents bias during the evaluation process.
- ✓ **Confidentiality:** Organizations responsible for issuing tenders cannot access or view bid submissions until the designated submission period ends. This preserves the confidentiality of the bidding process and prevents premature access to sensitive information.
- ✓ **Bid Evaluation:** Organizations gain access to all bid submissions after the submission period concludes. They can review and evaluate the bids based on predefined criteria, such as price, quality, compliance with requirements, and vendor reputation.
- ✓ **Criteria-Based Selection:** Organizations have the flexibility to define specific criteria for evaluating and selecting bids. This feature allows for a structured and objective assessment process, ensuring that bids are chosen based on merit and alignment with the organization's objectives.

5. Other Non-functional Requirements

5.1. Performance requirements

- ✓ **Speed:** The system must exhibit reasonable speed, capable of handling simultaneous access by multiple officers. This ensures efficient operation even during peak usage periods.
- ✓ **Ease of Understanding:** The system should be designed with a user-friendly interface and intuitive navigation, making it easy for all staff and users to comprehend and utilize effectively.
- ✓ **Accessibility:** The system must be accessible to all types of users, including administrators, officers, and bidders, regardless of their technical proficiency or background.
- ✓ **Availability:** The system should be available 24/7, ensuring uninterrupted access for users to perform tender-related tasks and access essential information.

5.2. Safety requirements

- ✓ **Security:** Robust security measures should be implemented to protect sensitive information, such as tender documents and vendor details, from unauthorized access or data breaches. Strong encryption, secure authentication mechanisms, and access controls should be in place to safeguard data integrity and confidentiality.
- ✓ **Reliability:** The system should be reliable and consistently perform its intended functions without errors or failures. It should ensure accurate handling and processing of tender documents, bids, and vendor information.

5.3. Security requirements

- ✓ **Authentication:** Access to the system is restricted to individuals with valid usernames and passwords. This ensures that only authorized personnel can log in and access sensitive information, enhancing security.
- ✓ **Administrator Privileges:** Only administrators have the authority to log in and make updates to tender files or enterprise information. This restriction helps prevent unauthorized modifications and ensures the integrity of data within the system.

5.4. Software quality attributes

- ✓ **Usability:** The system should be intuitive and user-friendly, allowing users to navigate easily and perform tasks without extensive training. Clear and intuitive interfaces, informative error messages, and helpful documentation contribute to usability.

- ✓ **Performance:** The system should be responsive and performant, providing quick response times for tasks such as document uploads, bid submissions, and report generation. Efficient resource utilization and optimization of database queries contribute to improved performance.
- ✓ **Availability:** The system should be highly available, with minimal downtime and disruptions to users. Redundancy, failover mechanisms, and proactive monitoring help ensure continuous availability of critical system components.
- ✓ **Maintainability:** The system should be designed for ease of maintenance and future enhancements. Clean, well-documented code, modular architecture, and adherence to coding standards facilitate ongoing maintenance and updates.

5.5. User documentation

1) Registration and Login Page:

Users are greeted with a registration and login page upon accessing the system. Admins cannot register, while companies can either log in with existing credentials or register as new users.

2) Different Home Pages for Admin and Company Users:

Upon successful login, admins are redirected to their dedicated homepage, while company users are directed to their respective homepage.

3) Admin's Home Page:

- a. The admin's homepage prominently features a "Create Tender" button and a "View Past Tenders" button at the top.
- b. The "Create Tender" button allows admins to initiate new tender processes, while the "View Past Tenders" button enables them to access details of previously conducted tenders.
- c. Additionally, the homepage displays a list of ongoing tenders, each accompanied by a dedicated button for accessing detailed tender information.

4) Bidding Process for Admin:

- a. After the expiration of a tender, admins can view bidding details and evaluate bids submitted by companies.
- b. Admins have the authority to review bid details and select the winning bid among the submissions.

5) Company's Home Page:

- a. The company's homepage features a top navigation bar with options such as "Home page", "My Biddings", and a dropdown menu containing "Profile" and "Logout" options.
- b. Additionally, the homepage includes a search bar for browsing available tenders and a list of ongoing tenders. Each tender entry provides a dedicated button for viewing details and placing bids.

6) Bidding Process for Companies:

- a. Company users can bid for specific tenders by clicking on the dedicated button associated with each tender, which redirects them to the bidding page.
- b. On the bidding page, users are required to fill out a form with relevant information and submit their bid for the selected tender.

6. Other requirements

Appendix A: Terminology/Glossary/Definitions list

Tender	A formal agreement between parties outlining terms, conditions, and obligations for the provision of goods or services.
Bid	An offer or proposal submitted in response to a request, typically specifying the price and terms for providing goods or services.
Blockchain	A decentralized, distributed ledger technology that records transactions across multiple computers in a way that is secure, transparent, and resistant to modification.
SRS	Software Requirement Specifications.
Admin	a person or entity responsible for managing and overseeing the operations, policies, and procedures within an organization or system.
Bidder	An individual or entity that submits a bid or proposal in response to a request for goods or services.

DBMS	Data Base Management System
OS	Operating System
HTML	Hyper Text Markup Language
AJAX	Asynchronous JavaScript and XML
FTP	File Transfer Protocol
TCP/IP	Transmission Control Protocol/Internet Protocol
HTTPS	Hypertext Transfer Protocol Secure
MFA	Multi Factor Authentication