

High-Level Comprehensive LoadBlock PRD

Based on the provided documents ([loadblock_mvp_design.md](#) and [pasted_content.txt](#)) and system knowledge, the following questions need to be addressed to create a robust and comprehensive Product Requirements Document (PRD) for the LoadBlock MVP:

I. Product Vision, Strategy & Goals

Long-Term Vision: What is the overall long-term vision for the LoadBlock application beyond the current MVP scope?

1. ANSWER: Long term goals include the following concepts:
 1. Integrate and leverage blockchain technology to store the BOL's, gas or meal receipts, contracts, etc.
 2. Integrate and utilize an AI Agent that can further automate BOL creation, updates to status, document uploading and other services, including user BOL's that were created outside of the application.
 3. Open up the application API to allow other services to integrate into the main application. Used for sending custom BOL's, contracts, receipts, etc to be stored as part of the blockchain and attached to a given BOL and account.
 4. Grow the user base by providing service integration to other application types like existing ELD systems and services.
 5. Possible white listing of the application in the branding of the customer/user

Target Audience & Personas:

- Can you provide more detailed personas for each user role (Shipper, Carrier, Consignee, Broker)?
 - ANSWER:
 - Shipper: A company that has products to move.
 - Carrier: A **company or individual responsible for transporting goods or cargo from one location to another (Shipper to Consignee)**
 - Consignee: The company or individual receiving the product
 - Broker: **a third-party intermediary who connects shippers (businesses needing to transport goods) with carriers (trucking companies) that can move those goods**

- **Factoring Company: a financing method where a trucking company sells its unpaid freight invoices to a third-party factoring company, typically at a small discount, in exchange for immediate cash**
- What are their primary goals, tasks, and pain points that LoadBlock aims to solve?
 - ANSWER:
 - A shipper will work with a carrier to move a product. The goal of the shipper is to move the product from point A to point B.
 - Within the application, the Shipper can create a partial BOL with FROM, TO, and shipment/product details. The shipper will then send the partially created BOL to their carrier of choice within the application.
 - The application will send notification to the carrier of choice via email and application notification alert.
 - After the carrier has filled out the application it will get sent back to the shipper for final confirmation and approval. The notification methods will be the same (email and application notification).
 - The carrier can approve or deny the BOL details. If it is confirmed, then the BOL is sent back to the carrier and the BOL is created and saved on the user account of the Shipper, Carrier and Consignee. If the carrier rejects it, notes can be added at the end of the form to indicate changes and sent back to the Carrier and the process of back and forth continues until it is approved.
 - A carrier will work to move the shipment/product by assigning a mode of transportation.
 - Within the application the carrier can either create a new BOL from the Shipper over the phone and enter the details manually or the carrier will get a notification via email and within the application that a new BOL has been created by a shipper.
 - The carrier will need to log into the application and finish filling out the BOL in order for it to be submitted and approved by the shipper. The carrier will need to fill out details such as mode of transportation, truck and trailer number, driver, estimated delivery details, etc.
 - After a BOL is completed it will get sent back to the shipper for final confirmation.
 - When the shipper confirms the details of the BOL, it will get sent back to the carrier and the PDF version of the BOL is created and logged into the database (and eventually into the blockchain) for both the Carrier, Shipper and Consignee (if the consignee has an account on the application, they will get notified, but regardless will still get an email with the PDF BOL).

- The status of the BOL is now "" and the BOL and some details show up on the dashboard of all three users.

- ANSWER: Pain Points

****Complexity and Delays in Resolving BOL Issues:**** Problems with Bills of Lading are often complex to resolve, requiring significant time and effort. This leads to delays in shipments and increased costs, directly impacting truckers' schedules and potentially their compensation. *

Source:

<https://www.freightforwarderquoteonline.com/news/bill-of-lading-problems-and-issues-to-avoid-as-their-resolution-has-many-complexities/> ****Lost or Missing BOLs:**** A lost original BOL

prevents the release of cargo. Replacing it involves a complicated process with extensive documentation and verification, causing significant delays for the trucker waiting to complete the delivery. * Source:

<https://www.freightforwarderquoteonline.com/news/bill-of-lading-problems-and-issues-to-avoid-as-their-resolution-has-many-complexities/> ****Receiver Unable to Produce Original BOL:**** If the

consignee cannot provide the original BOL upon arrival (due to various reasons like financial disputes or contract issues), the trucker cannot release the cargo. This leads to delays, potential rerouting, or holding periods. * Source:

<https://www.freightforwarderquoteonline.com/news/bill-of-lading-problems-and-issues-to-avoid-as-their-resolution-has-many-complexities/> ****Risk of Fraud and Conflicting Claims:**** Errors in

BOL generation or fraudulent activities can lead to situations where multiple parties claim the same cargo, or truckers might be pressured to release goods without proper documentation, exposing them to legal and financial risks. * Source:

<https://www.freightforwarderquoteonline.com/news/bill-of-lading-problems-and-issues-to-avoid-as-their-resolution-has-many-complexities/> ****Inaccurate BOL Information:**** Mistakes or missing

information on the BOL (e.g., incorrect addresses, weights, freight class, NMFC codes, special instructions, hazardous material details) can lead to significant problems. These include additional charges (reweigh fees, correction fees, redelivery charges), service interruptions, loss of insurance coverage, denied claims for damages/missing items, delivery to the wrong address, and even potential criminal charges if inaccuracies are intentional. The trucker often bears the brunt of delays and complications arising from these inaccuracies. * Source:

<https://www.wwex.com/shipping-resources/freight-resources/inaccurate-bill-of-lading> *

****Handling and Storage of Paperwork (Manual Processes):**** Manual paperwork, including paper logs and Bills of Lading (BOLs), represents a significant pain point for drivers. Historically, drivers had to store paperwork in the truck, then physically fax or drop it off. This process is time-consuming, prone to errors, difficult to keep track of, and adds administrative burden. *

Source:

<https://www.ttnews.com/articles/contactless-delivery-safety-precautions-accelerate-adoption-electronic-bills-lading> ****Slow Adoption / Resistance to Electronic BOLs (eBOLs):**** While eBOLs

aim to solve paperwork issues, their adoption faces hurdles. Many consignees (estimated 95% in the article) still prefer or require paper receipts. Drivers experience "app fatigue" and reluctance to download multiple apps for different shippers/receivers. Integrating various eBOL systems across different companies also presents challenges. * Source:

<https://www.ttnews.com/articles/contactless-delivery-safety-precautions-accelerate-adoption-electronic-bills-lading>

Business Goals & Success Metrics:

- What are the key business objectives for launching the MVP (e.g., user acquisition, market validation, specific feedback)?
 - ANSWER: User acquisition will be the primary business objective. Working with Carriers and independent truckers will be key. Market validation will come by the amount of users that use the system and find that it helps alleviate the pain points addressed.
- How will the success of the MVP be measured (e.g., number of users, BoLs created, task completion rates, user satisfaction scores)?
 - ANSWER: Initial MVP measurement will be user engagement via user count and BOL's created and moved through the system by going through all the status tracking. BOL's created would be an inaccurate metric due to some user just playing around with the system to see how it creates BOL's and not ever using them afterwards. It would be better to track as the BOL moves through the system due to the necessary user interaction that is needed to move from one status to another. User satisfaction would be gauged by consistent business interaction with the users and through interaction with an AI chatbot that could log issues from the users and report back to the business.

Competitive Landscape & Differentiation:

- Reference "The Competitive Landscape for LoadBlock" document

II. Detailed Functional Requirements & User Stories

A. User Management & Roles

Role-Based Access Control (RBAC):

- What specific permissions (create, read, update, delete) does each user role (Shipper, Carrier, Consignee, Broker) have for Bills of Lading, Contacts, and other potential features?
 - ANSWER: No role can delete any BOL, contract, gas receipt or any other document that has been added to the system. Once the blockchain is added, no documents will every be able to be deleted.
 - Shipper: Create, Read, Update - Update is only allowed prior to the creation of the BOL in PDF format. Once the BOL is created and added to the blockchain (or database at first) it cannot be updated at all.
 - Carrier: Create, Read, Update - Update is only allowed prior to the creation of the BOL in PDF format. Once the BOL is created and added to the blockchain (or database at first) it cannot be updated at all.

- Consignee: Read
 - Broker: Read
- Can a single user account have multiple roles? If so, how is this managed, and how does it affect their permissions?
 - ANSWER: Yes, a user can have more than one role. Typically it is possible for a carrier to also be a broker. For example, if a user is both a consignee and a carrier, then the consignee role would have the same permissions as the carrier.
 - The higher privileged user account's permissions would supercede the lower account permission.
- Is there a need for an Administrator role with capabilities to manage users, oversee all BoLs, or configure system settings? What are their specific functions?
 - ANSWER: Yes, there would be an admin role for the application owners. However, even in this role, the admin is still not able or allowed to delete any document or even update any BOL after it has been generated into a PDF.

User Onboarding & Profile Management:

- Beyond registration, are there any other profile details users should manage (e.g., company logo, notification preferences)?
 - ANSWER: Profile contact details could be updated in their user profile. Notifications would default to a popup message when the user logs in as well as default sending a generated email to the users email address. Company logo's could be updated on the users contact page.

B. Bill of Lading (BoL) Management

BoL Number Generation:

- The design states BoL numbers can be system-generated or user-provided. What is the default behavior? If system-generated, what is the desired format/pattern? If user-provided, are there specific validation rules (e.g., uniqueness, length, character set)?
 - ANSWER: BOL Numbers will be automatically generated by a set of characters and numbers. Initial example would be:
 - Shortened Shipper Name - (randomly generated number and character set)-MMDDYYYYHHMM(two digit month, two digit day, four digit year, two digit hour-in 24 hour clock, two digit minute)
 - Example: LG Electronics new BOL might look like LGE-A513U34-021620251450.pdf
 - When the blockchain is added to the system, the blockchain will add a new unique set of numbers and characters to the BOL ID in order to track it in on the chain

PDF Generation & Management (MVP Context):

- **Template & Branding:** Is there a specific template, layout, or branding elements (e.g., LoadBlock logo, company address) that must be included in the generated BoL PDFs? Can you provide these assets or mockups?
 - ANSWER: There should be a small footer on the PDF that has the loadblock company logo. Future versions might also include a header image of the carrier managing the BOL. Either way, the logos will be in .png format in a certain size and width to maintain consistency.
- **PDF Content:** Which fields from the `bills_of_lading` table are mandatory on the PDF? Is there a specific order or grouping required?
 - ANSWER: Analyze the sample given PDF for those field layouts.
- **PDF Storage (MVP):** For the MVP, PDFs are stored on the server (`pdf_file_path`). What are the requirements for securing these PDF files on the server?
 - ANSWER: The PDF's will initially be stored on an AWS S3 instance behind a security role that only the application can access.
- **PDF Versioning/Updates (MVP):** The knowledge base mentions updating PDFs on the blockchain with version history. Since the MVP uses PostgreSQL:
 - When a BoL is updated (e.g., `PUT /:bolId`), should the existing PDF be regenerated and replaced?
 - ANSWER: Since the document will only be updated one direction, and never deleted or modified, then the users and application itself can only read the PDF document in the current or past state. Based on the process, if a status update is made (for example: Accepted to En Route) then a new PDF is created from the application based on the existing PDF and that new PDF is added to the database with an updated status and timestamp attached to it.
 - The new PDF that was generated should NEVER overwrite the existing PDF. This is to maintain a consistent tracking capability of the PDF from creation to invoice payment. When the blockchain is introduced, as part of the blockchains nature, it will always add to the existing history a new PDF each time the status changes. The blockchain will never delete so that history is maintained.
 - This is one of the primary benefits of using Loadblock. At any point any user or company can look at the history of a given BOL and see what was changed and when and always have the entire history of the BOL. For example, if the Shipper wanted to know why the Broker sent two invoices for one BOL, then the Shipper can go into the application and see what changed on the BOL and reconcile that with the Broker to explain why they were "double-billed"(a very common issue with brokers and factoring companies).
 - Is there a requirement to maintain a version history of these PDFs on the server for the MVP, even without blockchain? If so, how should this be implemented?
 - ANSWER: As stated above, anytime a status on BOL changes, a new BOL is generated and appended to the database under the same BOL ID. For example: If the BOL ID is LGE-A513U34-021620251450.PDF, then

the primary key in the database should be LGE-A513U34. Under that primary key would be the first BOL PDF with LGE-A513U34-021620251450. Then after a status change, still under that primary key, there would be another BOL PDF like LGE-A513U34-021720250922. So for each new generation of the BOL PDF, the primary key would be linked to each of the BOL PDF's. So when the user is in the dashboard and wants to see the history of the BOL, they can click on the primary key name and see a list of each of the BOL PDF's with the full BOL PDF name (including the timestamp) and the status it was at that time.

BoL Status Tracking & Workflow:

- The defined statuses are 'Pending', 'Accepted', 'En Route', 'Delivered', 'Unpaid'.
 - ANSWER: Note that there were some status missing. Here is the proper status list
 - Pending - The shipper or carrier has created the initial BOL details and needs to get it approved from the carrier or shipper.
 - Approved - When both the carrier and shipper agree on the details of the shipment, they both will approve it and the first version of the BOL PDF is created and the dashboard status of both carrier and shipper shows this BOL in an approved state.
 - Accepted - The carrier has assigned the load to a trucker. Once the trucker has agreed to the load requirements, the carrier will set the status to Accepted. (Future version, there will be a change to the trucker details in the event that the original trucker cannot take the shipment and the trucker details need to be changed. This will still generate a new PDF but the trucker details will be changed on the new version while still keeping the old version the way it was originally)
 - Picked Up - The product/shipment has been picked up from the shipper. A new BOL PDF is generated with a new timestamp and the status changed from Accepted to Picked Up. In the future, the mobile version of the application will allow for signature collection which will be added to the new version of the BOL PDF
 - En Route - The product is on the move. The carrier will change this status manually after confirmation from trucker.
 - Delivered - The product is delivered to the Consignee. A new BOL PDF is generated with the timestamp details (and in the future along with the signature captured.)
 - Unpaid (maybe will change this to Invoiced) - Once the product is delivered the carrier can change the status to this after it is submitted to the broker. Again a new BOL is created with this status update and associated data is captured.

- Paid - The carrier can change this once the BOL and associated invoice is paid. A new BOL will be generated with this update and associated data.
- Who has the authority to change a BoL to each of these statuses? For example, can only a Carrier mark a BoL 'En Route', or only a Consignee (or Shipper) mark it 'Delivered'?
 - ANSWER: Here is the status change process example
 - Shipper: New BOL created and sent to carrier. Even though the BOL PDF has not been created yet, the details of the new BOL are in the database awaiting carrier details. The BOL creation page will have a status of Pending. The shipper will assign the BOL to a carrier for filling out.
 - Shipper (Pending, Approved)
 - Carrier: The carrier receives the partially completed BOL data and fills it in with all of their data, like trucker information and any other relevant data and sends the BOL back to the shipper for approval. Once it is approved and the trucker details confirmed, the carrier will set the status to Accepted.
 - Carrier (Pending, Accepted, Picked Up, En Route, Delivered, Unpaid, Paid)
 - Broker: Once the status is changed to Accepted, the Broker that the carrier works with and assigned to the BOL will get notified of the new BOL. The broker has visibility to the BOL status' but is unable to change any status at this time.
- Are there any approval workflows associated with status changes (e.g., does a Consignee need to confirm receipt before status changes to 'Delivered')?
 - ANSWER: Once the consignee confirms receipt of the product via approval signature (that will eventually be captured on the truckers phone), the carrier and shipper will get notification through both the app and email and the status will change as well.
- What are the business rules or conditions that gate status transitions (e.g., can a BoL go from 'Pending' directly to 'Delivered')?
 - ANSWER: Pending to Approval will be changed when both the Shipper and Carrier, click the approve button on the BOL details
 - ANSWER:

Notifications:

- Are users notified when a BoL status changes or when other significant events occur (e.g., new BoL assigned to them)?
 - ANSWER: Yes, via email and in app notifications.
 - ANSWER: Shippers will be notified of the following status changes
 - Pending, Approved, Accepted, En Route, Delivered, Paid
 - ANSWER: Carriers will be notified of the following status changes.

- Pending, Approved, Unpaid, Paid (Notifications will come as well for Picked Up and Delivered once the signature capture component is complete)
 - ANSWER: Brokers will be notified of the following status changes.
 - Accepted, Delivered, Unpaid, Paid
- If so, who receives these notifications, for what events, and through which channels (e.g., in-app notifications, email)?
 - ANSWER: See above for information. If still unclear ask again.

Dashboard & BoL Listing:

- What specific information should be displayed on the BoL dashboard for each role? Are there any filtering or sorting requirements for this list (e.g., by status, date, shipper)?
 - ANSWER: The Dashboard should show all active BOL status allowed for that role (see above in Notifications section for those), but only up to the last 30 days of PAID status.
 - ANSWER: Filtering should be on any of the following fields:
 - Status
 - Date
 - Shipper
 - Trucker

Search Functionality:* The AI chatbot is mentioned for searching BoLs. Beyond this, is there a requirement for a manual search/filter capability within the BoL dashboard itself? If so, what fields should be searchable (e.g., BoL number, shipper name, consignee name, status)?

- ANSWER: Search should be available on the following fields:
 - Shipper
 - Consignee
 - Trucker
 - Status
 - BOL ID

Auto-population of BoL Fields:* The document mentions auto-populating shipper/consignee/carrier details based on the logged-in user's role and contact info. How should the system handle cases where a user (e.g., a Broker) might be creating a BoL on behalf of another party not directly tied to their own contact info?

- ANSWER: For the instance where a third party might fill in the details, the BOL would still need to be sent back to the Shipper for approval. For the first MVP, the assumption is only Shippers and Carriers will create BOL's. Future versions will adjust roles and status' to allow for third party involvement.
- When auto-filling Company Name, it's stated to "auto fill with the contact info that matches that company detail." Please clarify this logic. Does it mean if a company name is typed, it searches existing contacts and auto-fills related fields?

- ANSWER: Yes that is correct, find the company name in the users contacts and auto fill in all related fields

C. Contact Management

Contact Types & Relationships:

- The **contacts** table has a **type** field (Shipper, Carrier, Consignee, Broker). How does this relate to the **users** table **role**? Can a user only create contacts of certain types, or can they manage a general address book?
 - ANSWER: This will be a general address book that can contain any role type.
- Is there a need to link contacts to specific BoLs beyond just typing their names into the BoL form (e.g., selecting from a list of existing contacts when creating a BoL)?
 - ANSWER: For the first MVP, it should be constrained to just the company name. Possibly in the future it can be first and/or last name.

D. AI Chatbot

Chatbot Scope & Functionality:

- The chatbot is for helping create new BoLs, new contacts, or search existing BoLs.
 - How should the chatbot guide users through BoL/contact creation? Will it ask questions sequentially and fill a form in the background, or redirect to the relevant form with pre-filled data?
 - ANSWER: The chatbot should open the application page to a New BOL Creation form page
 - For searching BoLs, what criteria can the user provide to the chatbot (e.g., "find BoL for company X," "show me delivered BoLs")?
 - ANSWER: The chatbot should open a popup window showing the BOL in its current/last status, if the user searches for a BOL.
 - ANSWER: The chatbot should open the dashboard if the user is looking for a status

Chatbot Technology & Integration:

- Are there any preferences for the AI chatbot technology or platform? Is this expected to be a simple rule-based bot or leverage more advanced NLP?
 - ANSWER: Initial MVP will be rule based bot
- How is the chatbot UI expected to look and integrate into the main application layout?
 - ANSWER: A small chat window in the bottom right hand corner

III. Non-Functional Requirements

Performance:

- Are there specific performance expectations for the MVP (e.g., page load times, API response times, PDF generation speed)?

Scalability (MVP Context):

- While the MVP is for local Docker deployment, are there any anticipated user load or data volume considerations for this initial version?

Security (Beyond Basics):

- The documents mention bcrypt, JWT, XSS/CSRF protection, and input validation. Are there any other specific security standards, compliance requirements (e.g., data privacy related to shipping documents), or threat models to consider for the MVP?

Usability & Accessibility:

- Beyond a "clean, professional, and user-friendly interface" using Material-UI, are there specific usability heuristics or accessibility standards (e.g., WCAG levels) that the MVP should strive to meet?

Reliability & Availability (MVP Context):

- What are the expectations for the MVP's uptime and data integrity, given it's a local Docker deployment?

IV. Technology Stack & Architecture

Database (PostgreSQL for MVP):

- The `loadblock_mvp_design.md` outlines a PostgreSQL schema. The `pasted_content.txt` mentions this is for the MVP, with future blockchain integration.
 - **Conflict:** The knowledge base (`user_2`) states: "For the LoadBlock shipping application, use IPFS blockchain stack for database implementation rather than traditional databases." This directly conflicts with the MVP design specifying PostgreSQL. **This is a critical conflict that needs resolution.** Which approach is definitive for the MVP?
 - If PostgreSQL is indeed for the MVP, are there any specific reasons for choosing it over other relational databases?

Future Blockchain Integration:

- The MVP architecture should be "designed to allow for future integration of blockchain technology" and "BoL service...data persistence logic can be swapped out or augmented with a blockchain solution later."
 - Can you provide more specific details or architectural principles on how this modularity should be achieved in the Node.js/Express.js backend?

- What specific aspects of the IPFS stack (as mentioned in knowledge [user_2](#)) are envisioned for the future (e.g., Filecoin for storage, specific smart contract platforms)?
- Knowledge [user_4](#) states: "When the status of a bill of lading changes, the system must update the PDF stored on the blockchain with the new status while preserving the state and details of the previous PDF versions." How should the MVP's PostgreSQL-based status history ([bol_status_history](#)) and PDF management be designed to facilitate a smooth transition to this blockchain-based versioning model?

PDF Generation Library ([pdfkit](#)):

- Are there any specific layout requirements or complexities for the PDF that might challenge [pdfkit](#)? Would an alternative like Puppeteer (headless Chrome for HTML-to-PDF) be considered if [pdfkit](#) proves insufficient for complex layouts?

Default User Credentials:

- The request is to use "[admin@loadblock.io](#)" and "12345678" as default credentials. Should this user be pre-seeded into the database with a specific role (e.g., an admin role, or one of the standard user roles)?

V. Deployment & Operations (MVP)

Dockerization:

- The frontend is to be served by Nginx in its Docker container. Are there any specific Nginx configurations required (e.g., for routing, caching)?

Environment Variables:

- Beyond database credentials, JWT secret, and ports, are there other configuration items that should be managed via environment variables?

VI. Edge Cases, Error Handling & Assumptions

Error Handling:

- Can you provide examples of specific error scenarios and how the system should respond (e.g., network errors, validation errors, database errors, PDF generation failures)?

Edge Cases:

- What are some potential edge cases to consider for BoL creation, status updates, or user interactions (e.g., concurrent updates, handling of very large cargo descriptions, special characters in input fields)?

Assumptions:

- Are there any unstated assumptions made in the provided documents that should be explicitly confirmed (e.g., internet connectivity is always available for the local deployment, specific browser compatibility)?

VII. Future Scope (Post-MVP)

Factoring Functionality:

- Knowledge `user_3` states factoring is a secondary/nice-to-have feature. While not for MVP, are there any design considerations in the MVP that could facilitate easier integration of factoring later?

Other Post-MVP Features:

- Are there other features planned immediately after the MVP that might influence MVP design choices (e.g., invoicing, advanced reporting, integrations with other shipping systems)?

VIII. Branding and UI/UX

LoadBlock Branding Assets:

- Can you provide the LoadBlock logo and any other branding guidelines or assets that should be used in the UI and generated PDFs?

UI Mockups/Wireframes:

- Are there any existing UI mockups or wireframes for the dashboard, BoL forms, or other key screens? If not, is there a desired look and feel beyond Material-UI components and the specified color scheme?

Addressing these questions will help ensure that the PRD is comprehensive, clear, and provides a solid foundation for the development of the LoadBlock MVP.