Trailer Management System

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INFO-C451 System Implementation

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Customer Problem Statement

Problem Statement

Every trailer that comes onto the property must be put into an open parking spot or dock door. A driver arrives at the gate with a loaded inbound trailer. The gatekeeper uses a 2-way radio to communicate with the spotters in order to identify an open parking spot or dock door. Then, the gatekeeper directs the driver where to park the trailer. In the time it takes to complete the check-in process and then drive to the designated location, another trailer may have been put in that location. Ideally, the driver would return to the gate to get new instructions on where to put the trailer. However, in most cases, the driver finds an open parking spot and parks the trailer there. The driver then leaves without saying that they put the trailer in a different parking spot, so the gatekeeper's records are incorrect.

Every trailer that leaves the property must be loaded before a driver can pick it up. When a driver arrives to pick up a load, the driver gives the load number to the gatekeeper. The gatekeeper looks up the load in the system to find which trailer is assigned to the load. (The system does not provide any indication of the status or location of the trailer.) Then, the gatekeeper radios the spotters to find the location of the trailer. The responding spotter then drives around the property to visually locate the trailer. This may take up to 15 minutes. If the trailer is in an outbound dock, the spotter relays the location to the gatekeeper. If the trailer is in a parking spot, the spotter inspects the trailer to make sure it is loaded and sealed with an outbound seal and then relays the location to the gatekeeper.

However, the designated trailer may be in one of various unready states: parked in a parking spot still loaded with its inbound load; parked in an inbound dock door still to be unloaded; parked in an inbound dock door or in a parking spot and empty. In these cases, the spotter relays the status to the gatekeeper and starts the processes to get the trailer loaded. These emergency unloads/loads create havoc for the warehouse team, who have to pause whatever they are doing. The gatekeeper informs the driver that they will have to wait for the trailer to be ready. Trucking companies charge detention fees when their drivers are held at a location for more than two hours.

The current system for staging and tracking trailers at the distribution center is manual and inefficient, resulting in a lot of wasted time searching for trailers and figuring out their status. Without visibility of the status of parking spots and dock doors, the gatekeeper is blindly directing the drivers, and spotters cannot tell whether a parking spot is already designated for another trailer. Without visibility to the status of trailers, spotters are guessing when to move trailers into and out of dock doors, and warehouse personnel are often idle while waiting for trailers to unload or load.

A new system that shows real-time status of trailers, parking spots, and dock doors to all users would allow the gatekeepers, spotters, and warehouse personnel to act independently without getting in each other's way. If a gatekeeper marked a location as occupied by an inbound trailer, a spotter would not be able to put a different trailer into the same location. Visibility of trailer status would direct spotters to trailers that need to be moved and would indicate the next action for that trailer and where it needs to go next. Warehouse operations would benefit from steady rotation of trailers, allowing continuous loading and unloading, reducing wasted time, and increasing throughput. Finally, when a driver arrives to pick up a trailer, a gatekeeper would be able to see the location and status of the trailer and immediately direct the driver there. Trailers would be loaded in a timelier manner, reducing detention fees.

Glossary of Terms

Trailer – Standard semi-trailer that is on the warehouse property. A trailer is identified by a unique number, labeled on all four sides and on the inside wall at the back of the trailer.

Load – Product to be unloaded from a trailer or loaded onto a trailer. A load is designated by a unique load number and indicator of inbound or outbound.

Dock door – Warehouse overhead door which allows access to a trailer. A dock door is identified by a unique number painted on the outside and inside of the door.

Parking spot – Designated spot in the warehouse parking lot, where a trailer can be parked. A parking spot is identified by a unique number painted on the pavement.

Spotter – Employee who moves trailers around on the warehouse property. A spotter is identified by a unique employee ID.

Gatekeeper – Employee at the property gate, who checks trailers in and out. A gatekeeper is identified by a unique employee ID.

Driver – Non-employee who delivers or picks up a trailer. Drivers are not tracked in the system.

System Requirements

Functional Requirements

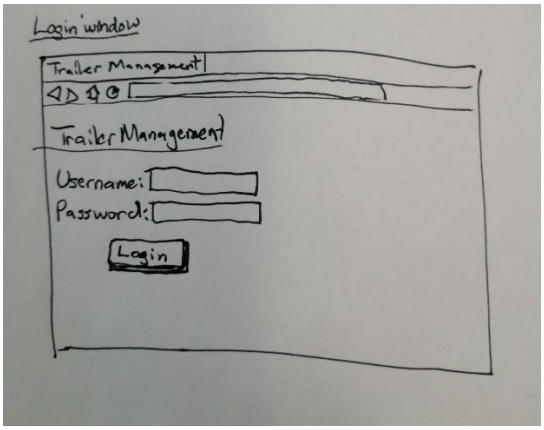
No.	Priority Weight	Description
FREQ-1	High	Users must log in to the program
FREQ-2	High	Only admin can add or delete user, parking spot, dock door
FREQ-3	High	A trailer may not have multiple locations or statuses
FREQ-4	High	A dock door or parking spot may not have multiple trailers assigned
FREQ-5	High	All users can view all trailer records
FREQ-6	High	Only gatekeepers can add or delete trailer records
FREQ-7	Med	Only spotters can update trailer location
FREQ-8	Med	Only warehouse personnel can update trailer status
FREQ-9	Med	Only warehouse personnel can update trailer load
FREQ-10	Med	Users can search for a record using any field
FREQ-11	Low	Records dynamically color-coded per trailer location and status

Nonfunctional Requirements

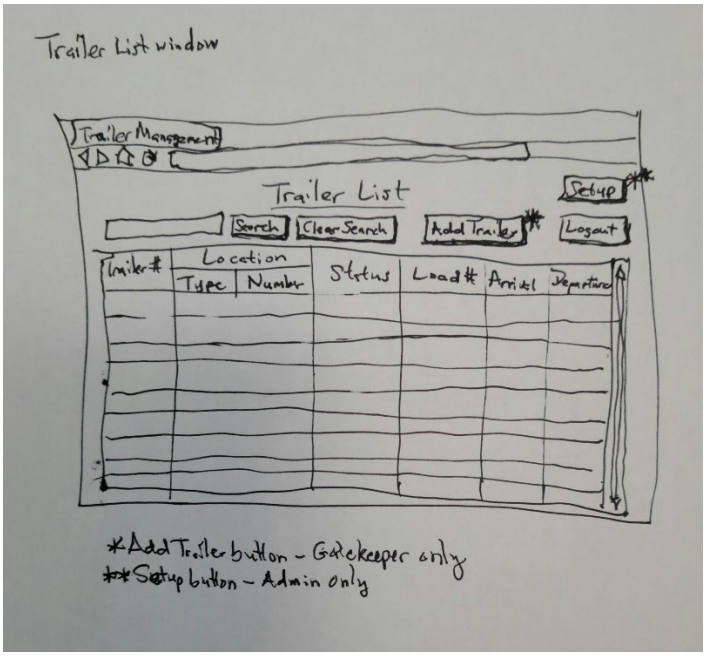
No.	Priority Weight	Description
NREQ-1	High	Minimum of 15 simultaneous users
NREQ-2	High	Search speed high, even when maximum records are populated
NREQ-3	High	Program documentation and user guides
NREQ-4	Med	Field selection and data entry compatible with touchscreen

User Interface Requirements

1. Login window:
    a. Fields for username and password
    b. Login button
        i. Clicking Login button after entering valid credentials opens the Trailer List window

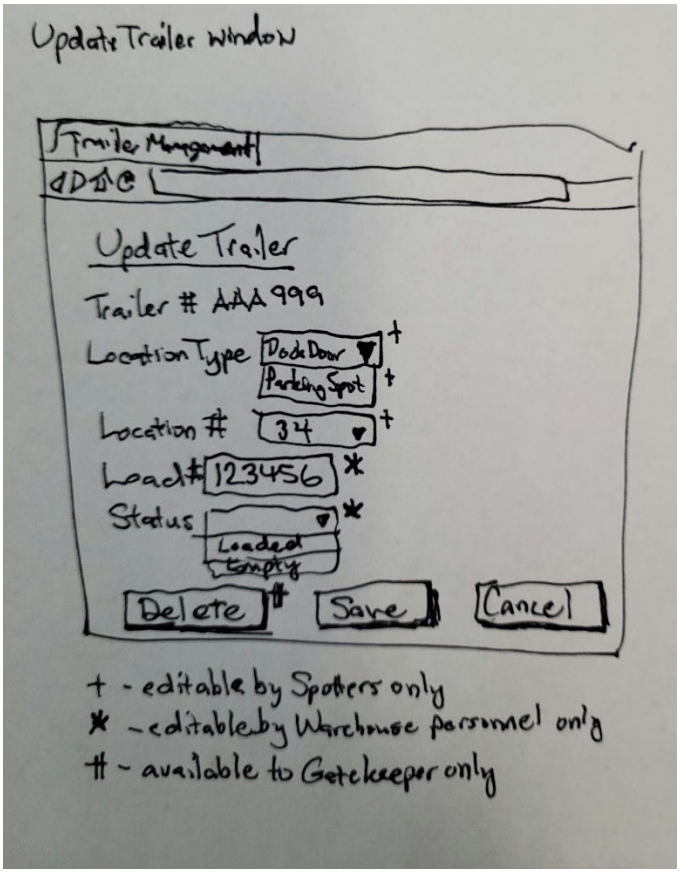


2. Trailer List window:
    a. Lists all trailer records in table view
        i. Clicking on a trailer record opens the Update Trailer window
    b. Search field and button
        i. Enter search string into Search field
        ii. Clicking Search button searches all table fields for search string and filters table to show only matching records
    c. Clear Search button
        i. Clicking Clear Search button reloads the Trailer List window to show all records
    d. Add Trailer button (Gatekeeper only)
        i. Clicking Add Trailer button opens Add Trailer window
    e. Setup button (admin user only)
        i. Clicking Setup button opens Setup Options window
    f. Logout button
        i. Clicking Logout button closes Records List window and opens Login window

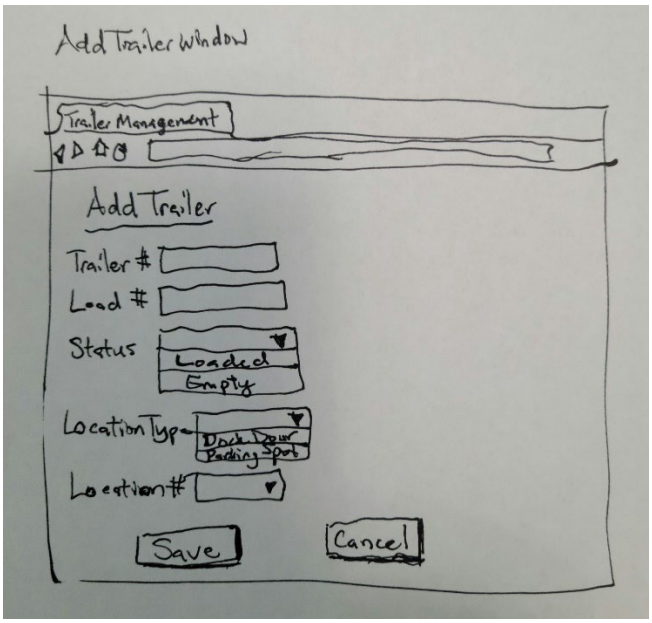


3. Update Trailer window:
    a. User can edit fields according to their role permissions
        i. Gatekeeper – Add or delete entire record
        ii. Warehouse personnel – Update Status, Load
        iii. Spotter – Update Location
    b. Delete button (gatekeeper only)
        i. Clicking Delete button opens verification window
        ii. Clicking Yes in verification window deletes record, closes Update Trailer window, and reloads Trailer List window
        iii. Clicking No in verification window closes verification window

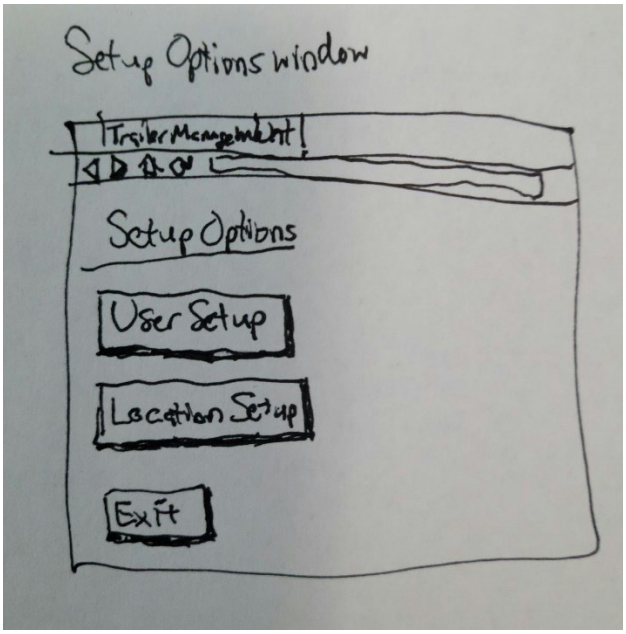
c. Save button
    i. Clicking Save button commits changes, closes Update Trailer window, and reloads Trailer List window
d. Cancel button
    i. Clicking Cancel button discards changes, closes Update Trailer window, and returns to Trailer List window



4. Add Trailer window:
    a. Empty form for entering new trailer record
    b. Save button
        i. Clicking Save button checks required fields for data
            1. If required data is complete, adds record to database, closes Add Trailer window, and reloads Trailer List window
            2. If required data is incomplete, opens alert window and highlights required fields
    c. Cancel button
        i. Clicking Cancel button discards changes and returns to Trailer List window

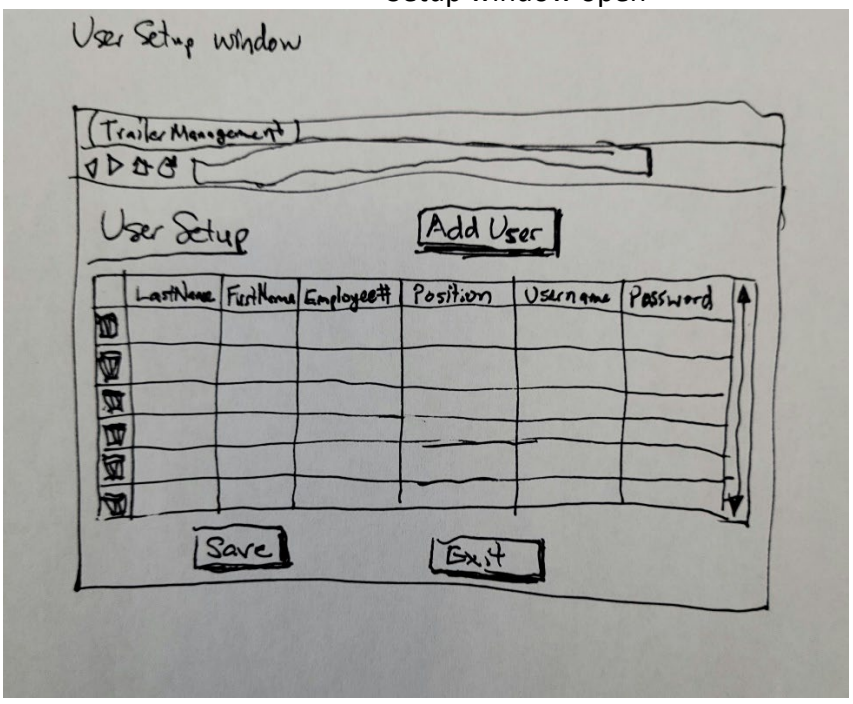


5. Setup Options window
    a. User button
        i. Clicking User button opens User Setup window
    b. Location button
        i. Clicking Location button opens Location Setup window
    c. Exit button
        i. Clicking Exit button closes Setup window and returns to Trailer List window



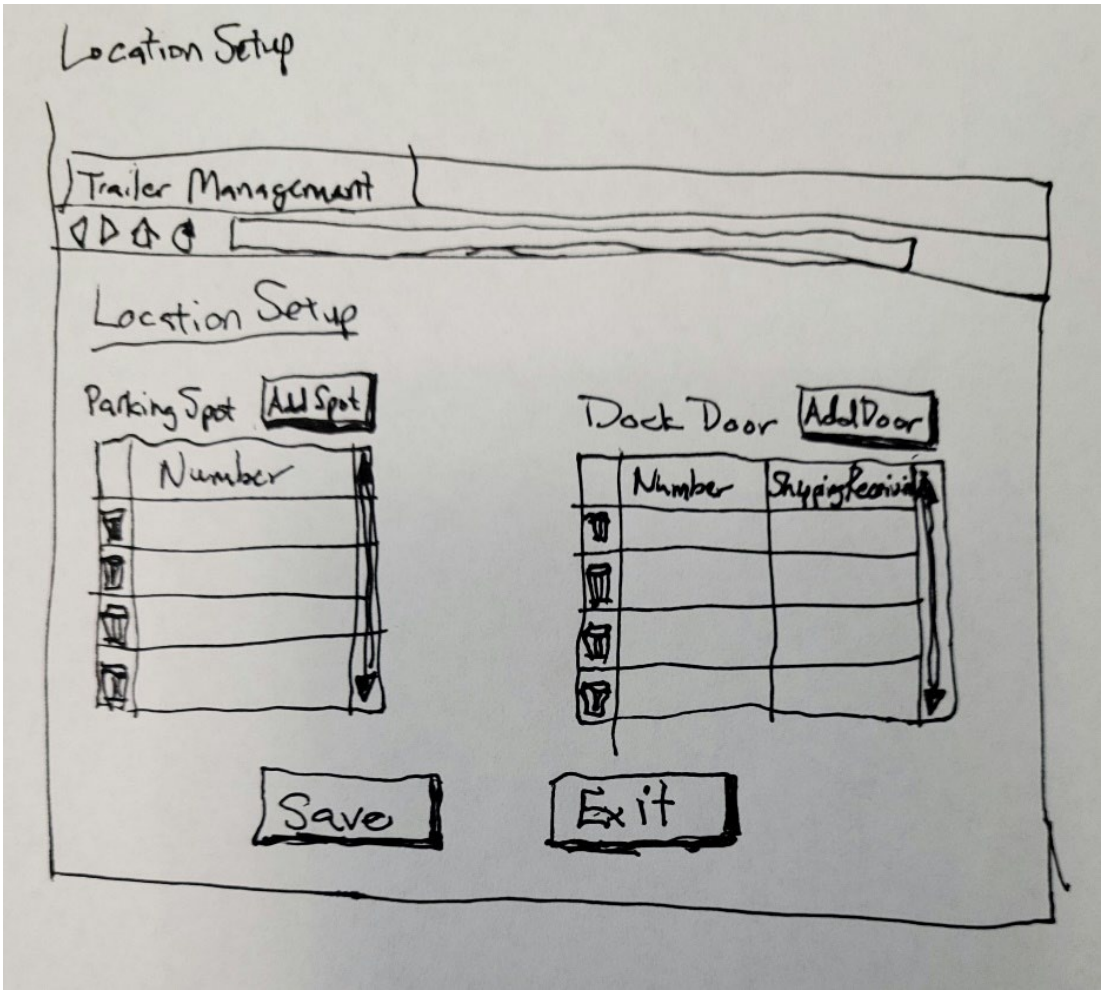
6. User Setup window

a. Lists all user records in table view
b. Trashcan button beside each record
    i. Clicking Trashcan button opens verification window
    ii. Clicking Yes in verification window logs out selected user, deletes user record, and reloads User Setup window
    iii. Clicking No in verification window closes verification window
c. All fields are editable in this window
d. Add User button
    i. Clicking Add User button creates new row in table view
e. Save button
    i. Clicking Save button checks required fields for data
        1. If required data is complete, commits changes and reloads User Setup window
        2. If required data is incomplete, opens alert window and highlights required fields
f. Exit button
    i. Clicking Exit button checks for unsaved changes
        1. If no changes found, closes User Setup window
        2. If changes found, verification window tells user unsaved changes will be discarded
            a. Clicking Yes discards unsaved changes and closes User Setup window
            b. Clicking No closes verification window and leaves User Setup window open



7. Location Setup window

a. Lists all Dock Door and Parking Spot records in two tables
b. Trashcan button beside each record
    i. Clicking Trashcan button opens verification window
    ii. Clicking Yes in verification window checks for Trailer record with same location
        1. If no Trailer record found with selected location, deletes location record, and reloads Location Setup window
        2. If Trailer record found with selected location, opens alert window informing user that location is in use and cannot be deleted, and reloads Location Setup window
    iii. Clicking No in verification window closes verification window
c. All fields are editable in this window
d. Add Dock Door button
    i. Clicking Add Dock Door button creates new row in Dock Door table view
e. Add Parking Spot button
    i. Clicking Add Parking Spot button creates new row in Parking Spot table view
f. Save button
    i. Clicking Save button checks required fields in both tables for data
        1. If required data is complete, commits changes and reloads Location Setup window
        2. If required data is incomplete, opens alert window and highlights required fields
g. Exit button
    i. Clicking Exit button checks for unsaved changes
        1. If no changes found, closes Location Setup window
        2. If changes found, verification window tells user unsaved changes will be discarded
            a. Clicking Yes discards unsaved changes and closes Location Setup window
            b. Clicking No closes verification window and leaves Location Setup window open


Location Setup
Trailer Management
Location Setup
Parking Spot
Add Spot
Number
Dock Door
Add Door
Number
Save
Exit

Functional Requirements Specification

Stakeholders

- VP of Logistics - Sponsor
- Warehouse Manager – Project Lead
- Warehouse Supervisor – Admin
- Warehouse Personnel (Loader/Unloader) – User
- Spotter – User
- Gatekeeper – User

Actors and Goals

Primary actors

- **Gatekeeper** will create, edit, and delete trailer records, assign drop-off parking spots, and look up pick-up parking spots.
- **Spotter** will move trailers between parking spots and dock doors and record those movements.
- **Warehouse operator** will update the status of trailers in dock doors as they are loaded and unloaded.

Secondary actors

- **Admin** will create, edit, and delete parking locations and create, edit, delete user accounts.
- **System** will indicate status of parking spots and dock doors and display data and status of the trailers on the premises.

Use Cases (Implementation time in engineering workdays)

Admin (total: 13 days)

- Login/Logout: To login/logout to/from admin account (1)
- Add parking spot: To add a parking spot (2)
- Add dock door: To add a dock door (1)
- Edit dock door: To change the status of a dock door (active or inactive) (1)
- Edit parking spot: To change the status of a parking spot (active or inactive) (1)
- View parking locations: To see details of parking spots and dock doors including status and occupancy (2)
- Add user: To add a gatekeeper, spotter, or warehouse operator (2)
- Edit user: To change user details and passwords (1)
- Delete user: To remove a user from the system (1)
- View users: To see details of all users, like name, job title, username, password (1)

Gatekeeper (total: 8 days)

- Login/Logout: To login/logout to/from gatekeeper account (1)
- Add trailer: To add a trailer record (2)
- Delete trailer: To remove a trailer record (1)

- View trailers: To see details of trailers including status and location (2)
- View parking locations: To see details of parking spots and dock doors including status and occupancy (2)

Spotter (total: 6 days)

- Login/Logout: To login/logout to/from spotter account (1)
- Edit trailer: To change trailer location (1)
- View trailers: To see details of trailers including status and location (2)
- View parking locations: To see details of parking spots and dock doors including status and occupancy (2)

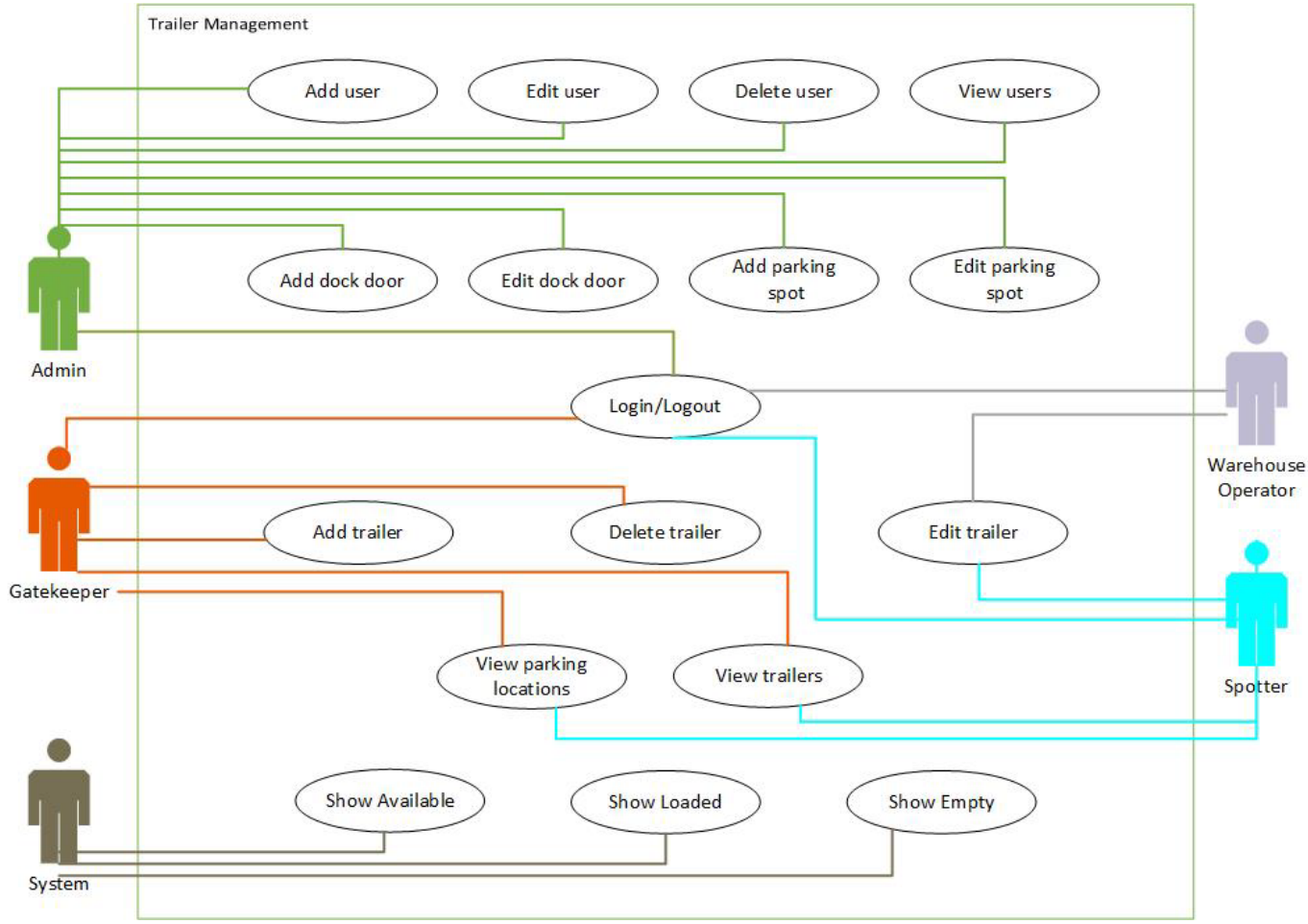
Warehouse operator (total: 2 days)

- Login/Logout: To login/logout to/from operator account (1)
- Edit trailer: To maintain trailer status (loaded or empty) (1)

System (total: 7 days)

- Show available: To show details of available parking spots and dock doors (3)
- Show loaded: To show trailers that are loaded (2)
- Show empty: To show trailers that are empty (2)

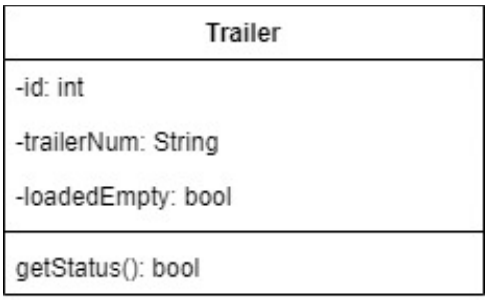
Use Case Diagram



Class Diagram

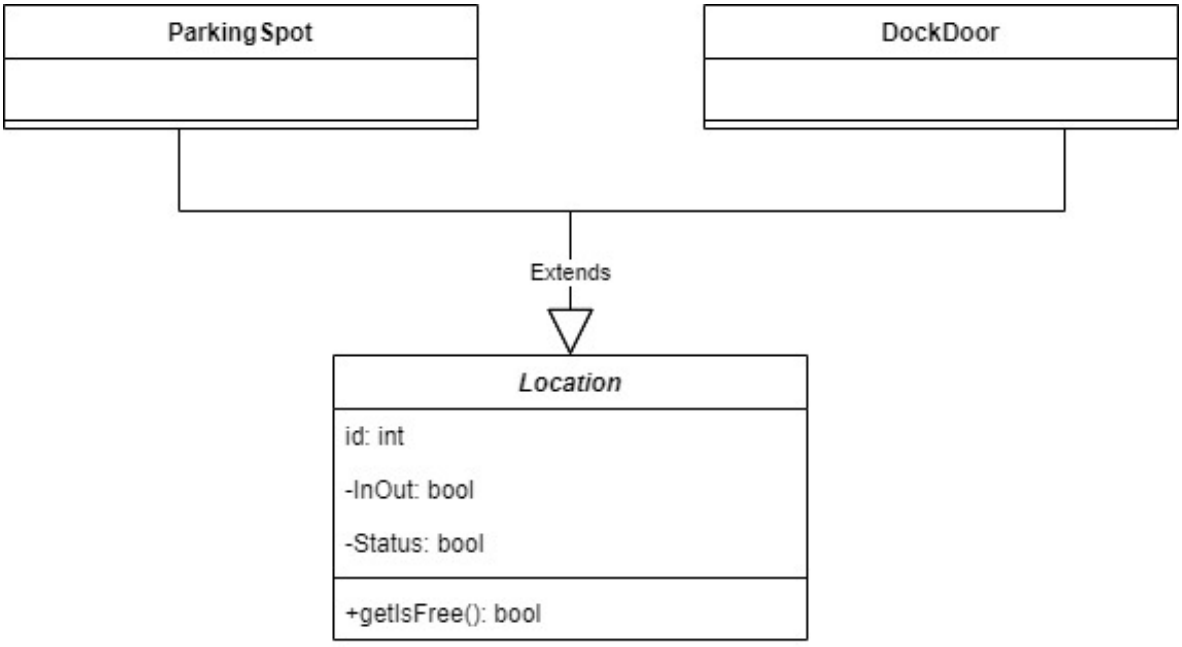
Trailer

This class can be used to get the load status of a trailer, which will be either loaded or empty.



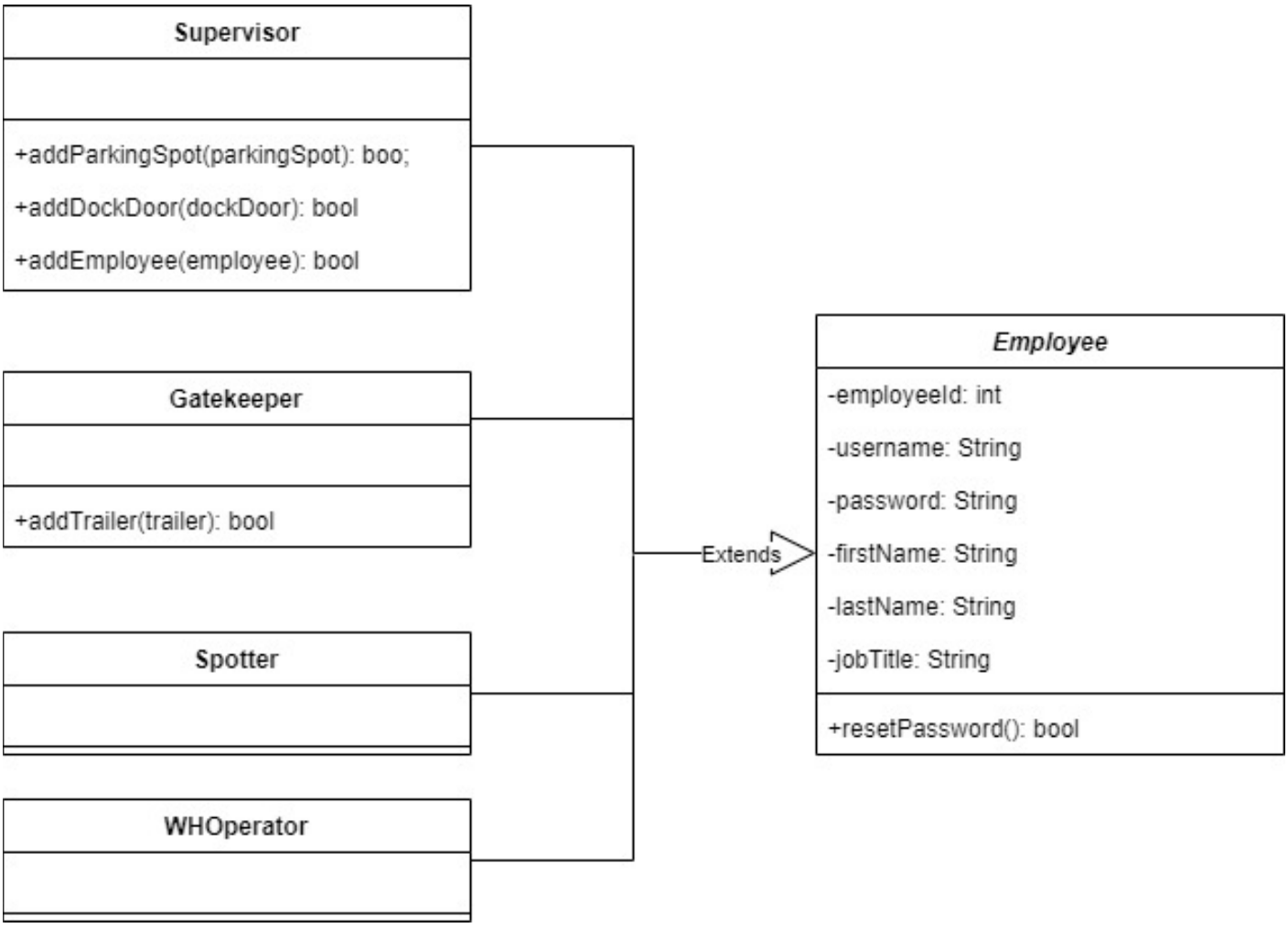
Location

This class is an abstract containing the two types of locations, which are Parking Spot and Dock Door. Dock doors need to be separate from parking spots because the warehouse operators will interact only with trailers that are in dock doors.



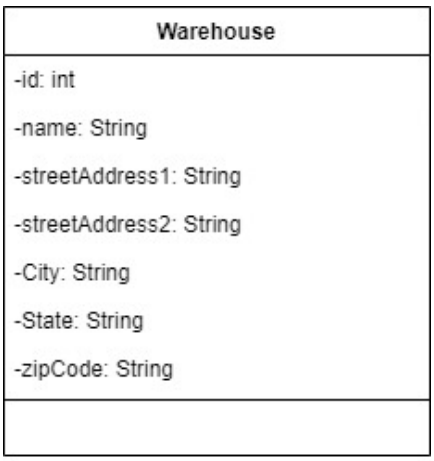
Employee

This class is another abstract, which splits out into the four types of employees in the system



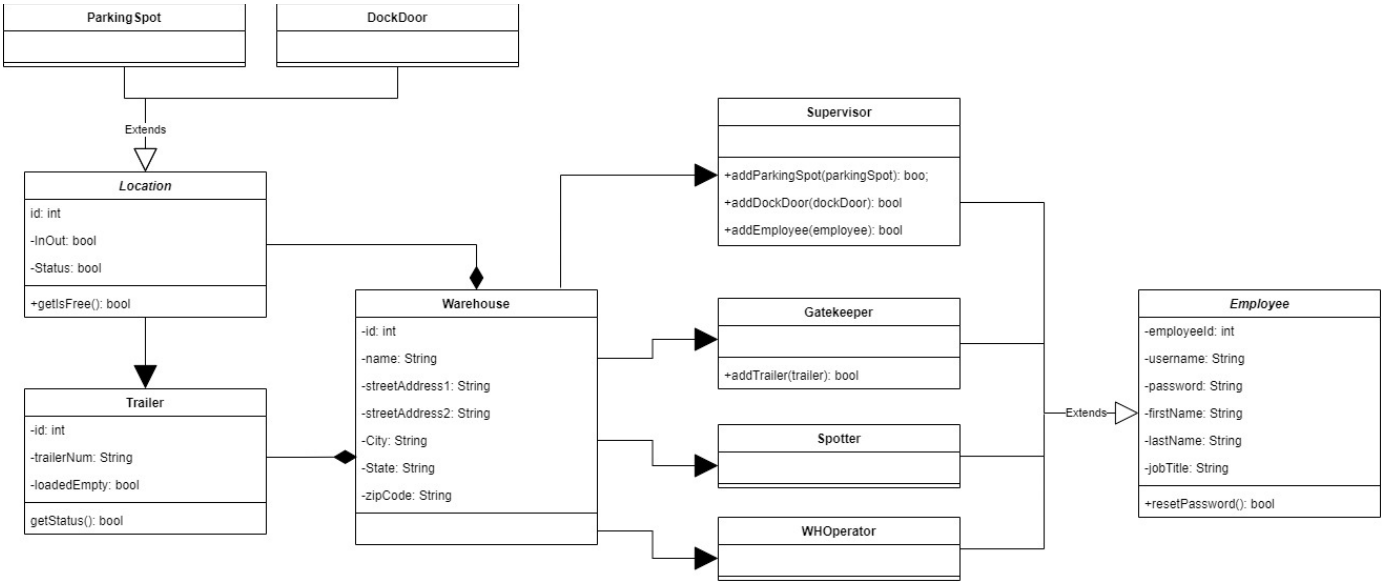
Warehouse

This class is the main class that everything else feeds into. If we wanted to scale up the scope of the project, multiple warehouses could come into play.



Trailer Management System

This is the whole class diagram for the system.

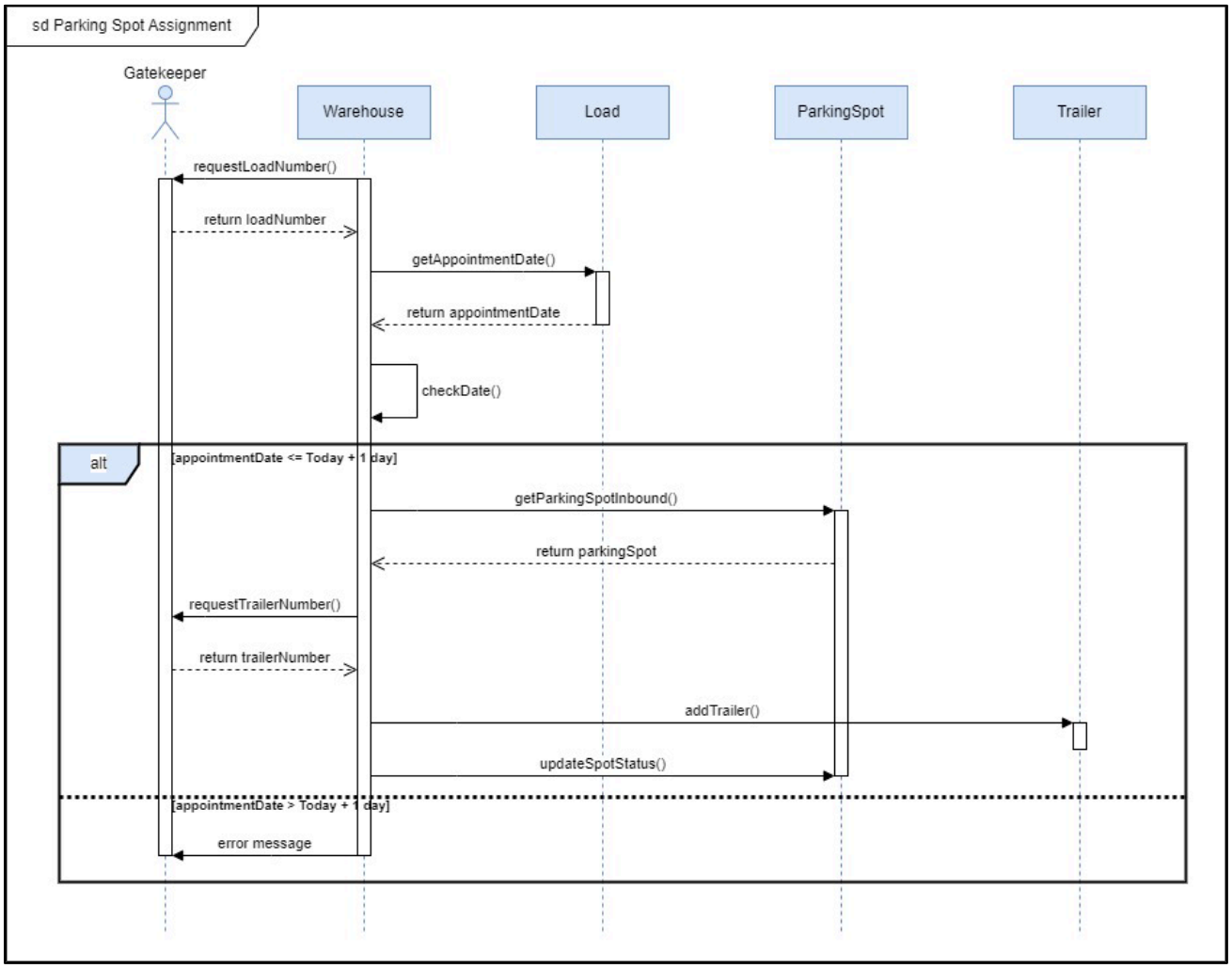


Sequence Diagram and Activity Diagram

System Sequence Diagram – Parking Spot Assignment

Actor: Gatekeeper
Object: Warehouse, Load, Trailer, ParkingSpot

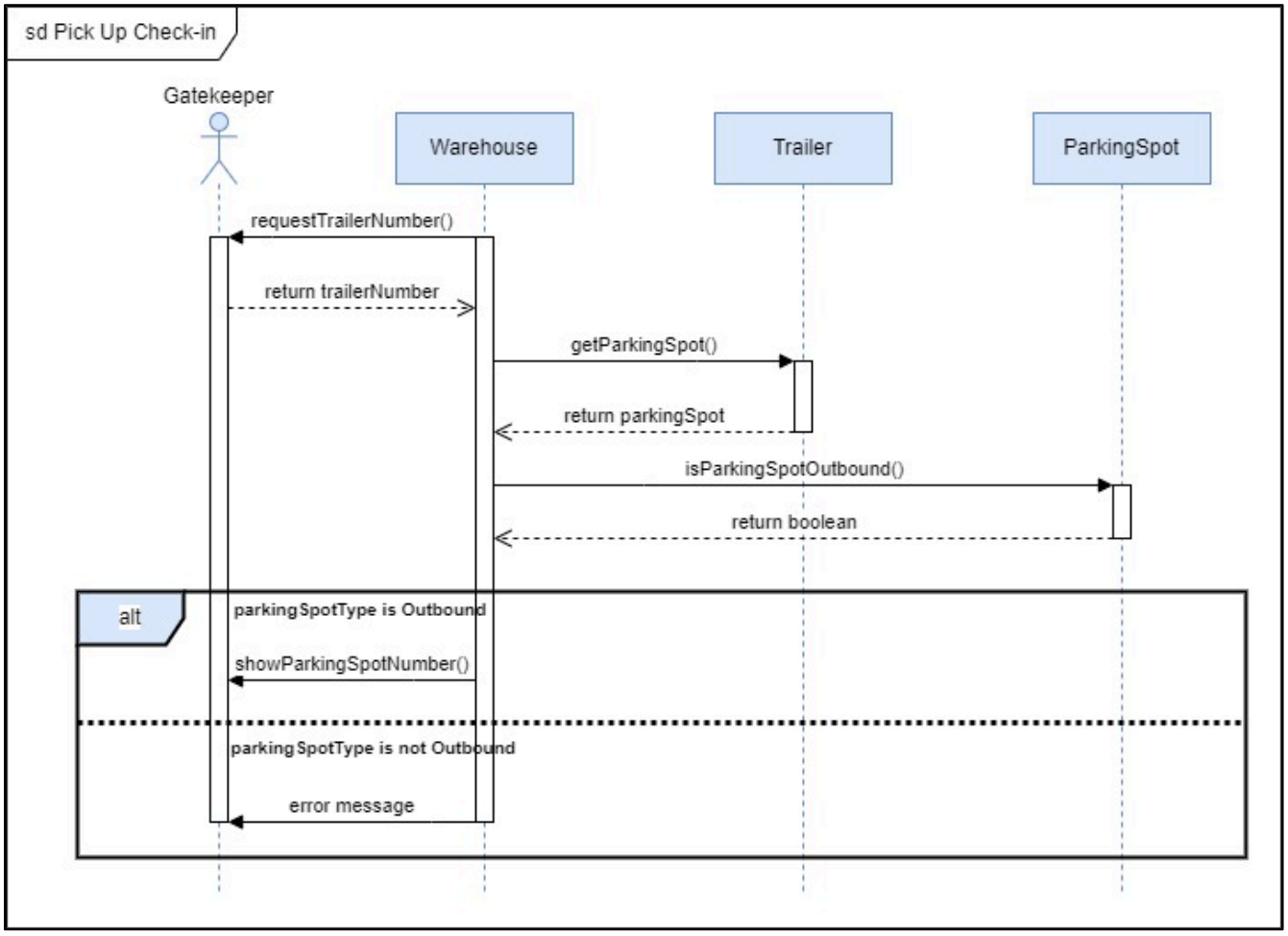
1. Gatekeeper enters load number into Warehouse
2. Warehouse gets Load appointment date
3. If appointment date is greater than 1 day from today: 1. Warehouse displays a message that the arrival date is too early
4. If appointment date is less than or equal to 1 day from today:
   1. Warehouse gets lowest number available inbound parking spot
   2. Warehouse prompts Gatekeeper to enter trailer number
   3. Gatekeeper enters trailer number
   4. Warehouse creates Trailer object
   5. Warehouse updates assigned Parking Spot status to unavailable



System Sequence Diagram – Pick Up Check-in

Actor: Gatekeeper
Object: Warehouse, Trailer, ParkingSpot

1. Gatekeeper enters trailer number into Warehouse
2. Warehouse gets Trailer parking spot
3. If parking spot is not outbound: 1. Warehouse displays error message that trailer is not ready
4. If parking spot is outbound: 1. Warehouse displays the parking spot number



Activity Diagram – Parking Spot Assignment

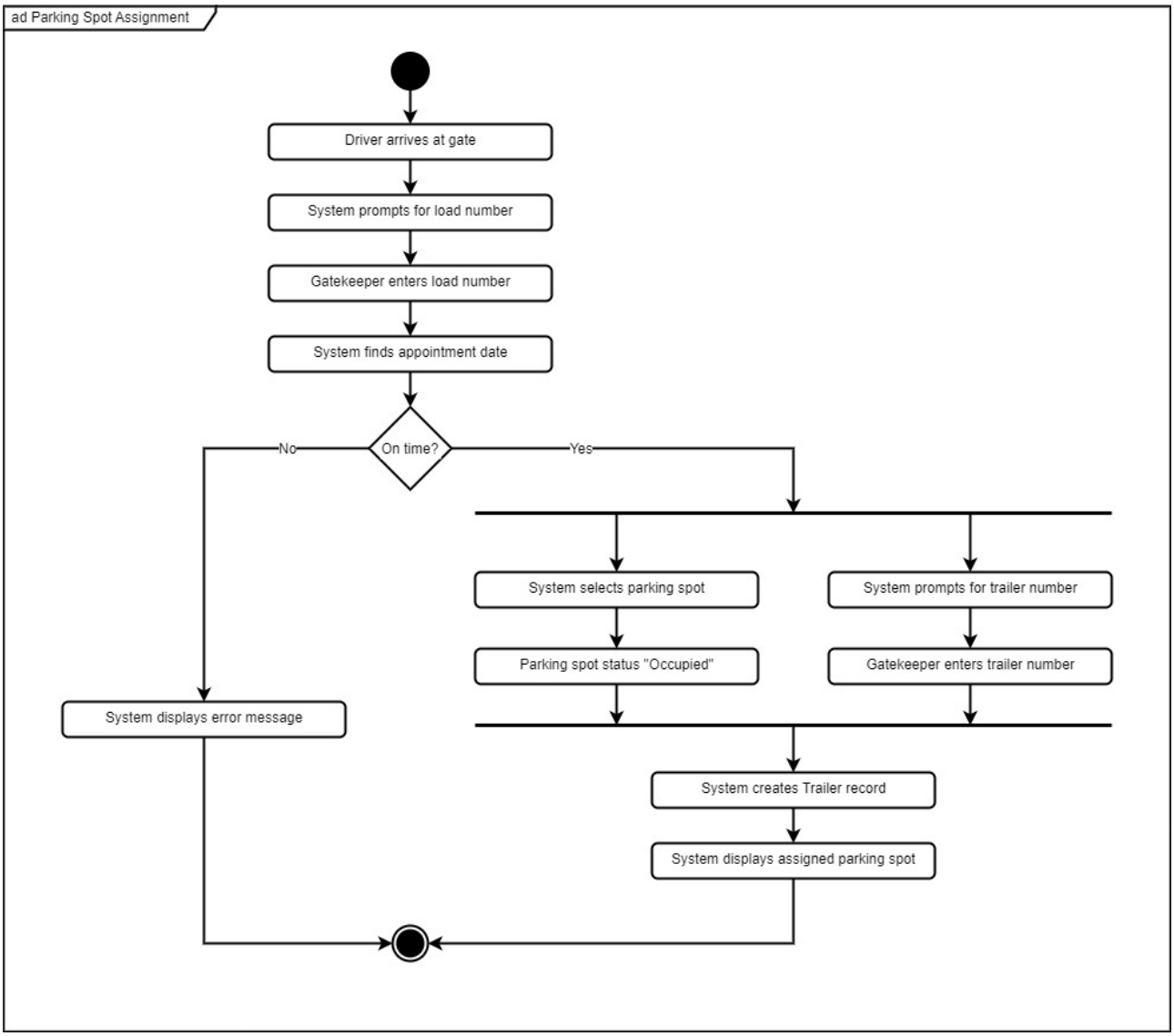
States

Initial State: Trailer arrives at the gate

Final State: 1. The trailer is assigned a parking spot and allowed into the parking lot
2. The trailer is too early and is denied entry to the parking lot

Actions

A driver arrives at the gate with a loaded trailer and gives the gatekeeper the load number. The gatekeeper enters the load number into the system. The system checks the appointment date. If the trailer arrived too early, the system tells the gatekeeper not to allow the trailer into the lot. Otherwise, the system assigns an inbound parking spot and prompts the gatekeeper to enter the trailer number. Then, the system displays the assigned parking spot, and the gatekeeper allows the trailer into the lot.



Activity Diagram – Parking Spot Assignment

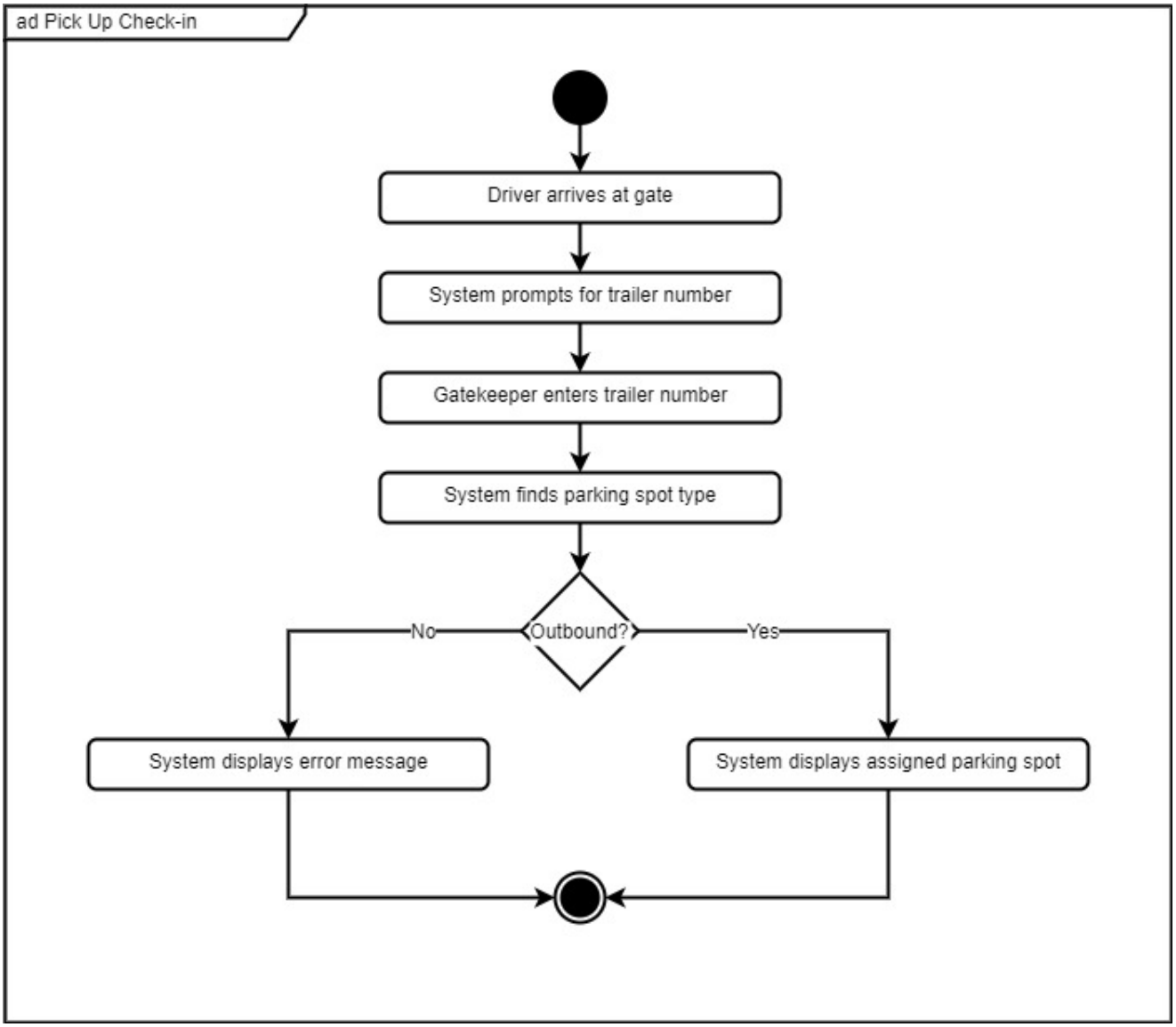
States

Initial State: Driver arrives at gate to pick up a trailer

Final State: 1. The driver is told the trailer parking spot and allowed into the parking lot
2. The trailer is not ready, so the driver is not allowed into the parking lot

Actions

A driver arrives at the gate and gives the gatekeeper the trailer number to pick up. The gatekeeper enters the trailer number into the system, and the system checks the location. If the trailer is not in an outbound parking spot, the system tells the gatekeeper not to allow the driver into the lot. Otherwise, the system displays the trailer parking spot, and the gatekeeper allows the driver into the lot.



User Interface Specification

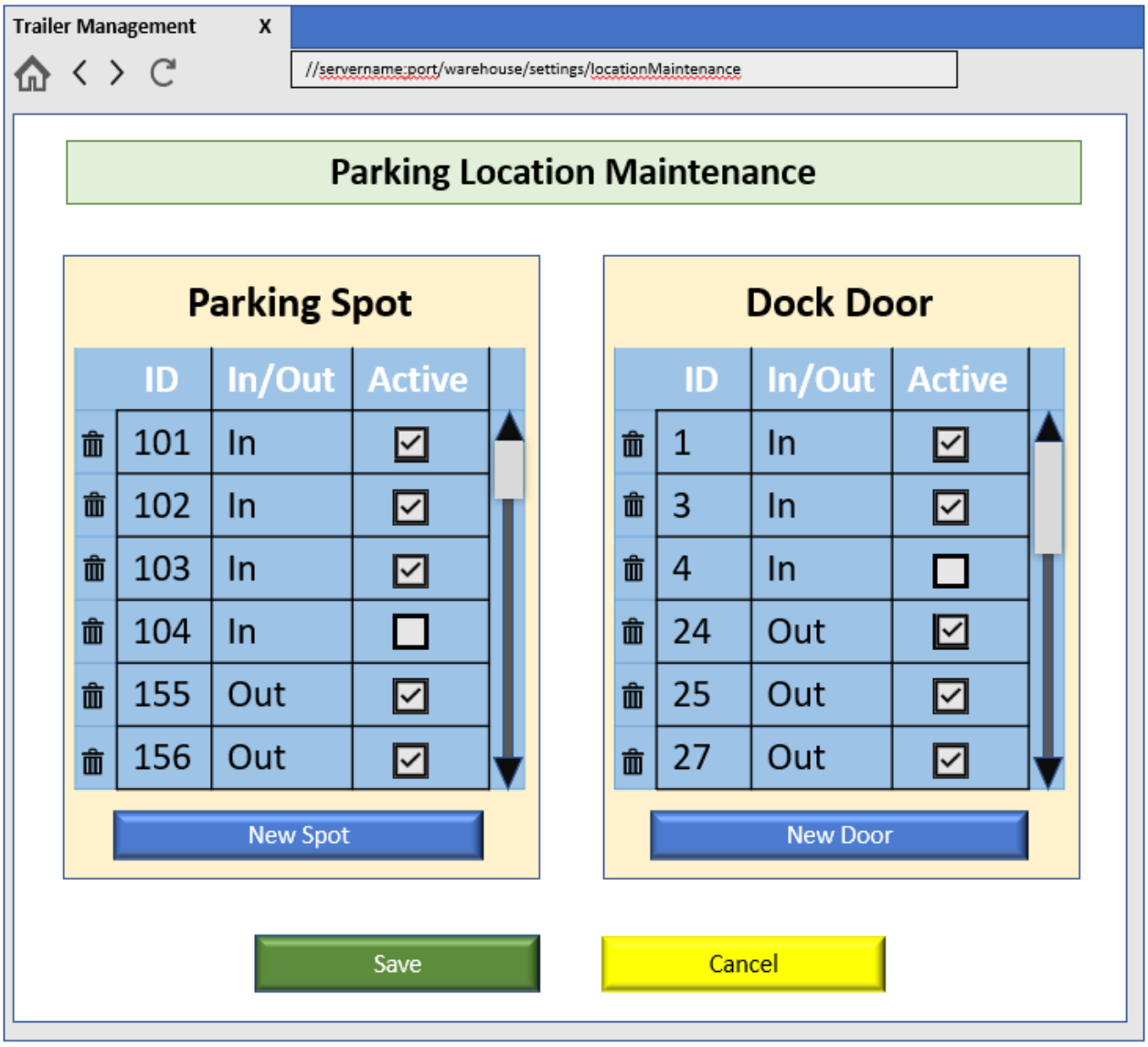
Parking Location Maintenance

Description: This page includes functionality for all use cases related to maintenance of both types of parking locations

Prerequisite: Admin user logged in and selected Parking Location Maintenance from the Settings menu

Navigation: Settings → Parking Location Maintenance

Actor: Admin



Use Cases and Effort:

	Steps	User Effort Estimation
Add Parking Spot	1. Click “New Spot” button 2. Enter ID 3. (Optional) Select “Out” instead of “In” 4. (Optional) Uncheck Active checkbox 5. Click Save button	2-5 mouse clicks 1 data field (keystroke count depends on ID length)
Add Dock Door	1. Click “New Door” button 2. Enter ID 3. (Optional) Select “Out” instead of “In” 4. (Optional) Uncheck Active checkbox 5. Click Save button	2-5 mouse clicks 1 data field (keystroke count depends on ID length)
Edit Parking Spot Status	1. Scroll or drag scroll bar to desired record 2. Click Active checkbox 3. Click Save button	Scrolling 2 mouse clicks
Edit Dock Door Status	1. Scroll or drag scroll bar to desired record 2. Click Active checkbox 3. Click Save button	Scrolling 2 mouse clicks
Delete Parking Spot	1. Scroll or drag scroll bar to desired record 2. Click trash can icon 3. Click Save button	Scrolling 2 mouse clicks
Delete Dock Door	1. Scroll or drag scroll bar to desired record 2. Click trash can icon 3. Click Save button	Scrolling 2 mouse clicks

Trailers

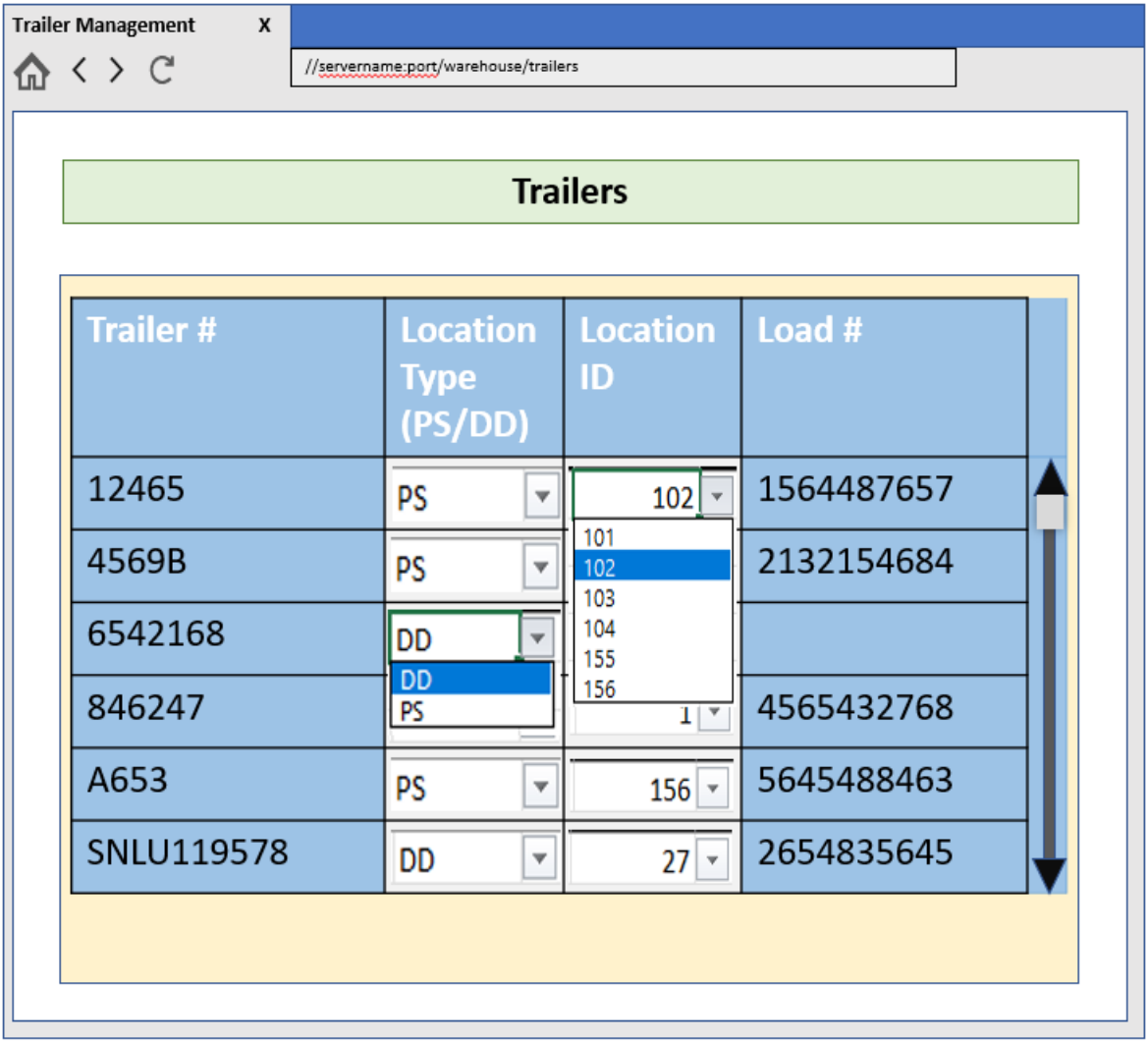
Description: This page is the home page for all users; read access is available to all users; editing functions will be different depending on the type of user. Options for each user type are detailed below.

Prerequisite: User logged in

Navigation: Home page

Trailers – Spotter

Actor: Spotter

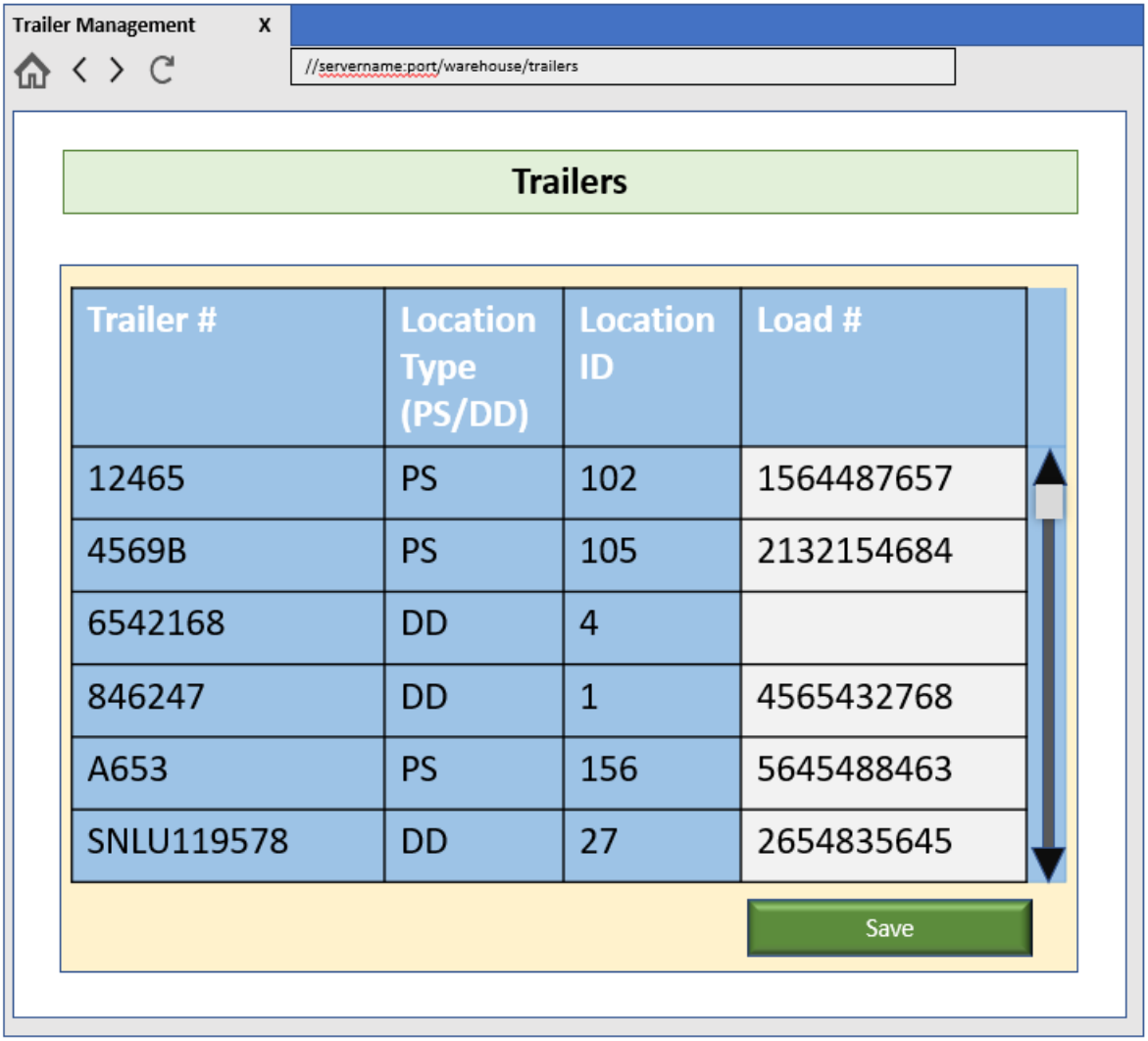


Use Cases and Effort:

	Steps	User Effort Estimation
View Trailers	1. Scroll to find trailer	Scrolling
Edit Trailer Location	1. Click dropdown arrow on Location Type 2. Click “DD” or “PS” for Dock Door or Parking Spot 3. Click dropdown arrow on Location ID 4. Scroll (if needed) 5. Click desired Location ID NOTE: values are saved on selection since Location ID list will change depending on selection of “DD” or “PS”	4 mouse clicks Scrolling, if Location ID list is long

Trailers – Warehouse Operator

Actor: Warehouse Operator

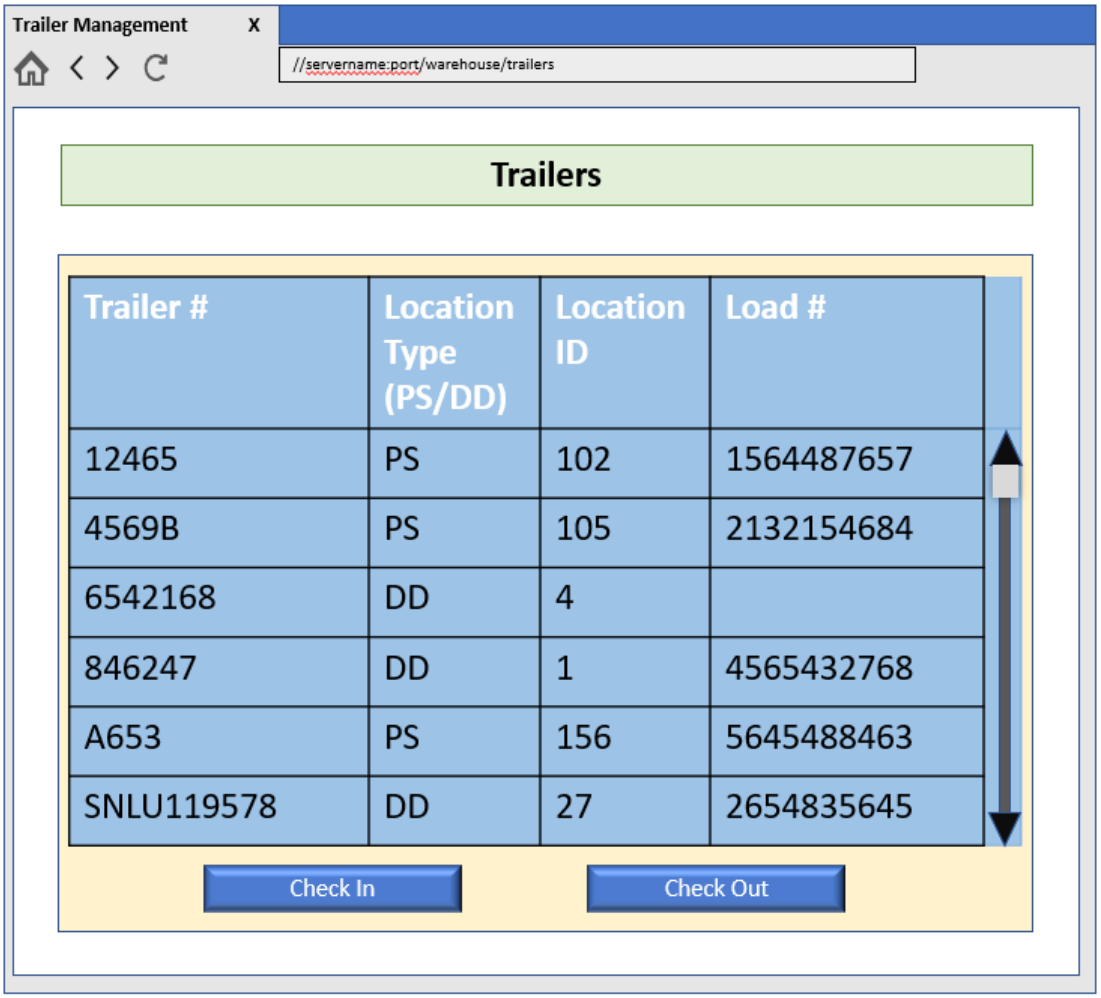


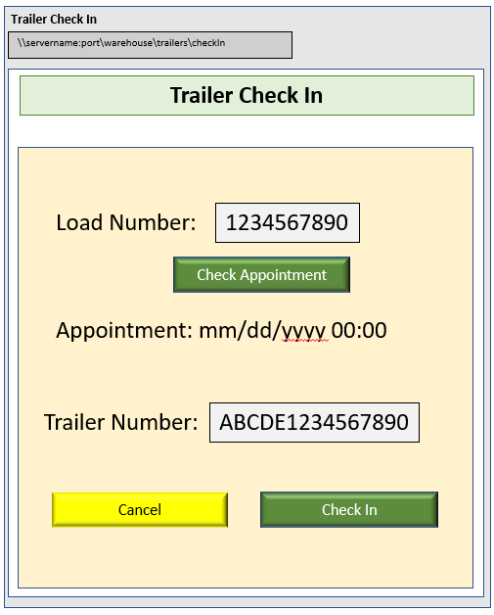
Use Cases and Effort:

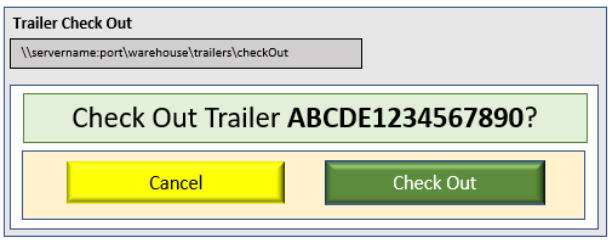
	Steps	User Effort Estimation
View Trailers	1. Scroll to find trailer	Scrolling
Edit Trailer Load	1. Click Load # field to place cursor 2. Delete Load # if trailer is empty Enter Load # if trailer is loaded 3. Click Save button	2 mouse clicks 10 keystrokes max

Trailers – Gatekeeper

Actor: Gatekeeper







Use Cases and Effort:

	Steps	User Effort Estimation
View Trailers	1. Scroll to find trailer	Scrolling
Add Trailer (Check In)	1. Click "Check In" button on Trailers page 2. Enter Load Number on pop-up 3. Click "Check Appointment" button on pop-up 4. Enter Trailer Number on pop-up 5. Click "Check In" button on pop-up	3 mouse clicks 10 keystrokes for Load Number 15 max keystrokes for Trailer Number
Delete Trailer (Check Out)	1. Scroll to find trailer 2. Click on trailer record to select it 3. Click "Check Out" button 4. Click "Check Out" button on confirmation pop-up	Scrolling 3 mouse clicks

Traceability Matrix

System Requirements

Req. No.	Priority Weight	Description
REQ1	5	Users must log in to the program
REQ2	4	Admin can add or delete user, parking spot, dock door
REQ3	5	A trailer may not have multiple locations or statuses
REQ4	5	A dock door or parking spot may not have multiple trailers assigned
REQ5	4	All users can view all trailer records
REQ6	3	Gatekeepers can add or delete trailer records
REQ7	3	Spotters can update trailer location
REQ8	3	Warehouse personnel can update trailer status
REQ9	3	Warehouse personnel can update trailer load
REQ10	1	Users can search for a record using any field
REQ11	1	Records dynamically color-coded per trailer location and status

Use Cases

Req. No.	Description
UC1	Login/Logout
UC2	Add parking location
UC3	Edit parking location status
UC4	View parking locations
UC5	Add user
UC6	Edit/Delete user
UC7	View users
UC8	Add trailer
UC9	Delete trailer
UC10	Edit trailer location/status
UC11	View trailers

Traceability Matrix

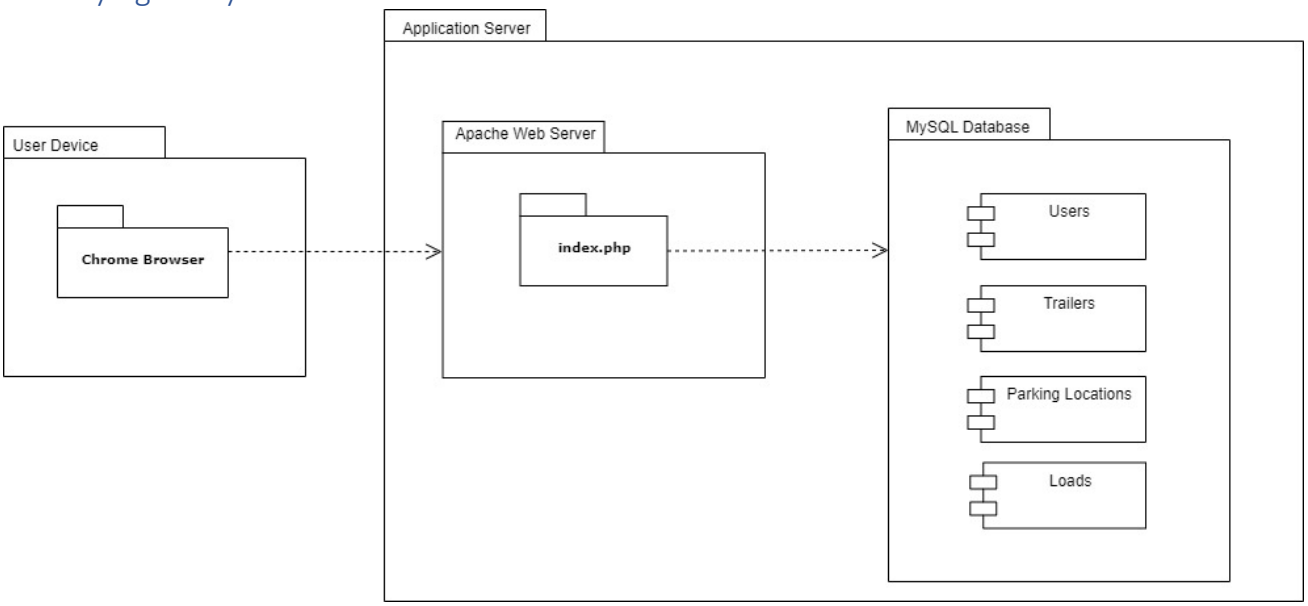
Req #	PW	UC1	UC2	UC3	UC4	UC5	UC6	UC7	UC8	UC9	UC10	UC11
REQ1	5	X				X	X					
REQ2	4	X	X	X		X	X	X				
REQ3	5										X	
REQ4	5			X	X						X	
REQ5	4											X
REQ6	3	X							X	X		
REQ7	3	X									X	
REQ8	3	X									X	
REQ9	3	X									X	
REQ10	1											X
REQ11	1				X							
Max PW		5	4	5	5	5	5	4	3	3	5	4
Total PW		21	4	9	6	9	9	4	3	3	19	5

System Architecture and System Design

Architectural Styles

This program is designed as a client/server architecture, with the client being a thin client type. The entirety of the processing will happen on the server, requiring the client only to be able to display the web-based GUI. The variety of devices used in the various roles makes this the most efficient way to handle the program. Any device that can run a browser can access the program.

Identifying Subsystems



Mapping Subsystems to Hardware

The program will lie on a single server. As the program is more for convenience and business process efficiency, redundancy is not included in the scope, so no backup server. In the case that the system were to go down, the existing analog processes could be employed, limiting impact to efficiency loss

until it could be brought back online. Interfacing hardware will depend on role. Gatekeepers will use a PC; spotters will use phones or tablets; warehouse operators and supervisors will use phones or PCs.

Persistent Data Storage

Data for this system is all held in a mySQL database that lies on the server. No data is held on the client device, so no system data persists between login sessions. A browser may offer username/password storage, but that will be disabled on all shared devices.

Network Protocol

The system uses TCP/IP to connect the clients to the server. PHP scripting is used to send SQL commands and queries with HTML to display the pages.

Global Control Flow

Each transaction in the system is managed ad hoc and updated in the database in real time. There is no batch processing or any other time-based execution. While the possibility exists where multiple users could attempt to update the same record near the same time, business processes and specific permissions per role keep the probability of such instances low.

Hardware Requirements

This system is light in resource requirements. The server should have a minimum of 1GB RAM, x86 or x64 processor, and 250 MB of storage. Recommended network speed is at least 15 Mbps, but will depend on the number of concurrent users. WIFI range must reach all points in the warehouse and in the parking lot. Additional access points may be required. Each client device must be able to connect to either the company's WIFI or LAN and be able to run a modern browser, ideally Google Chrome.

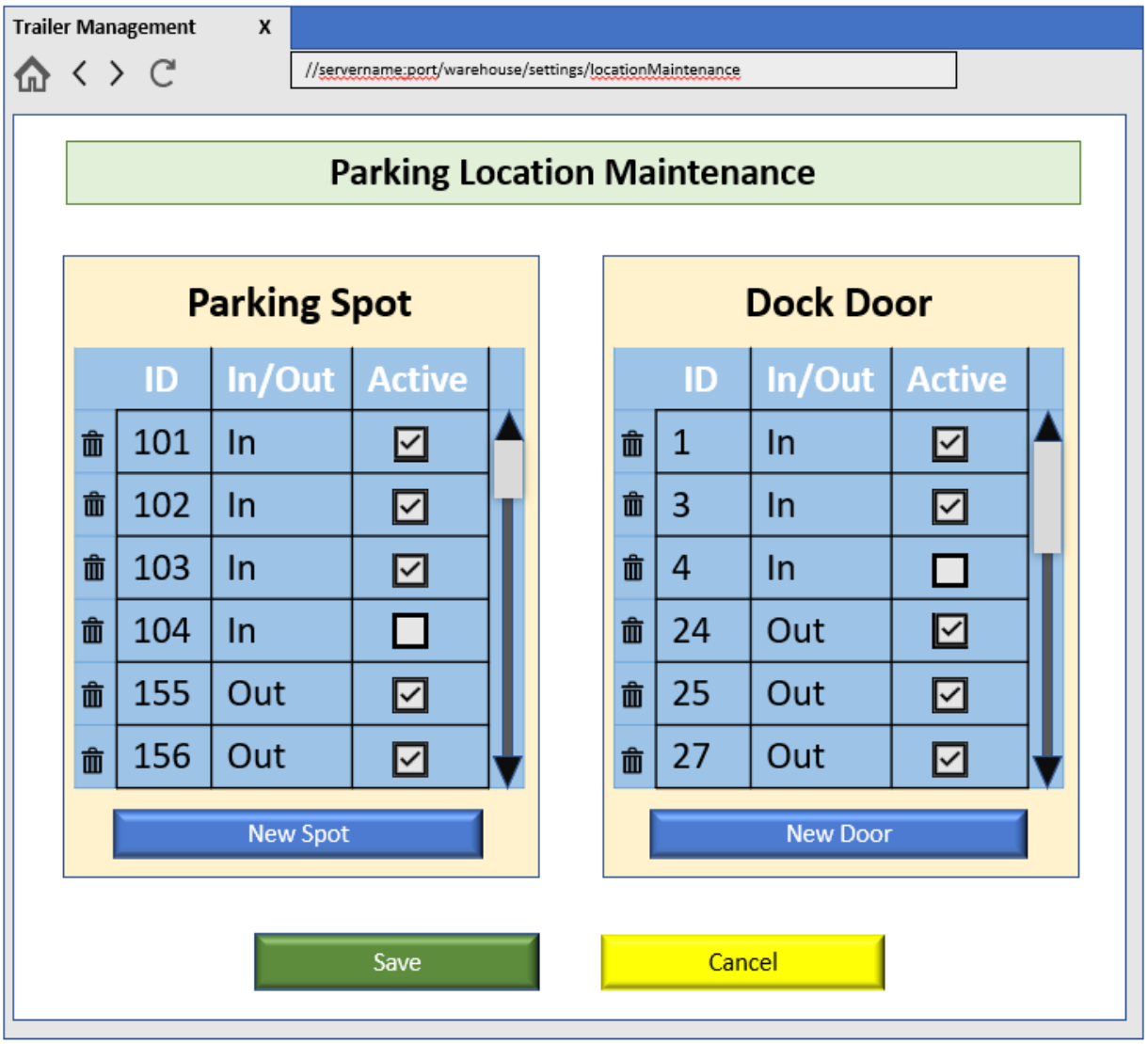
User Interface Design and Implementation

Overview

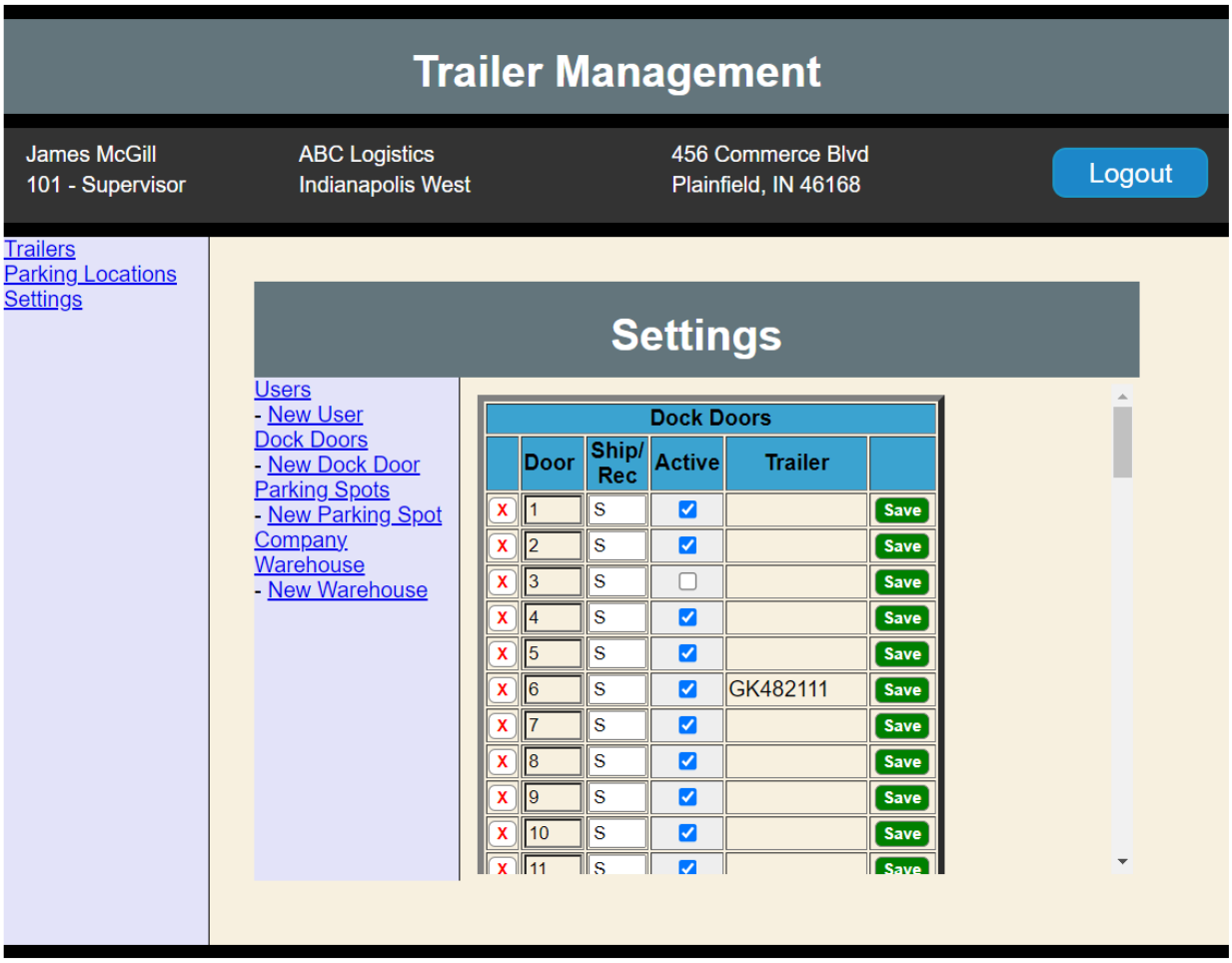
The following user interface examples include the original mock-ups followed by the developed user interfaces. Where significant changes have been made, the impacts are noted in the Use Cases and Effort tables for each. Changes that negatively impact user speed or present data entry concerns are being addressed in the remaining development time to try to mitigate as much as possible.

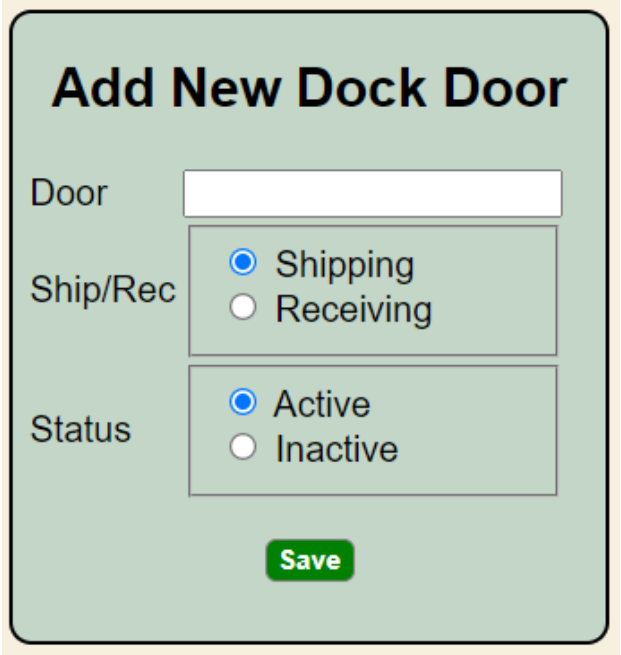
Parking Location Maintenance

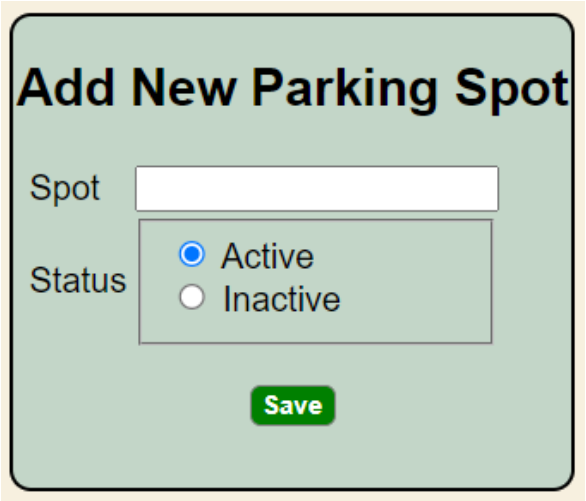
Original Mock-up:



Actual User Interface: (Dock Door and Parking Spots are now in separate windows.)







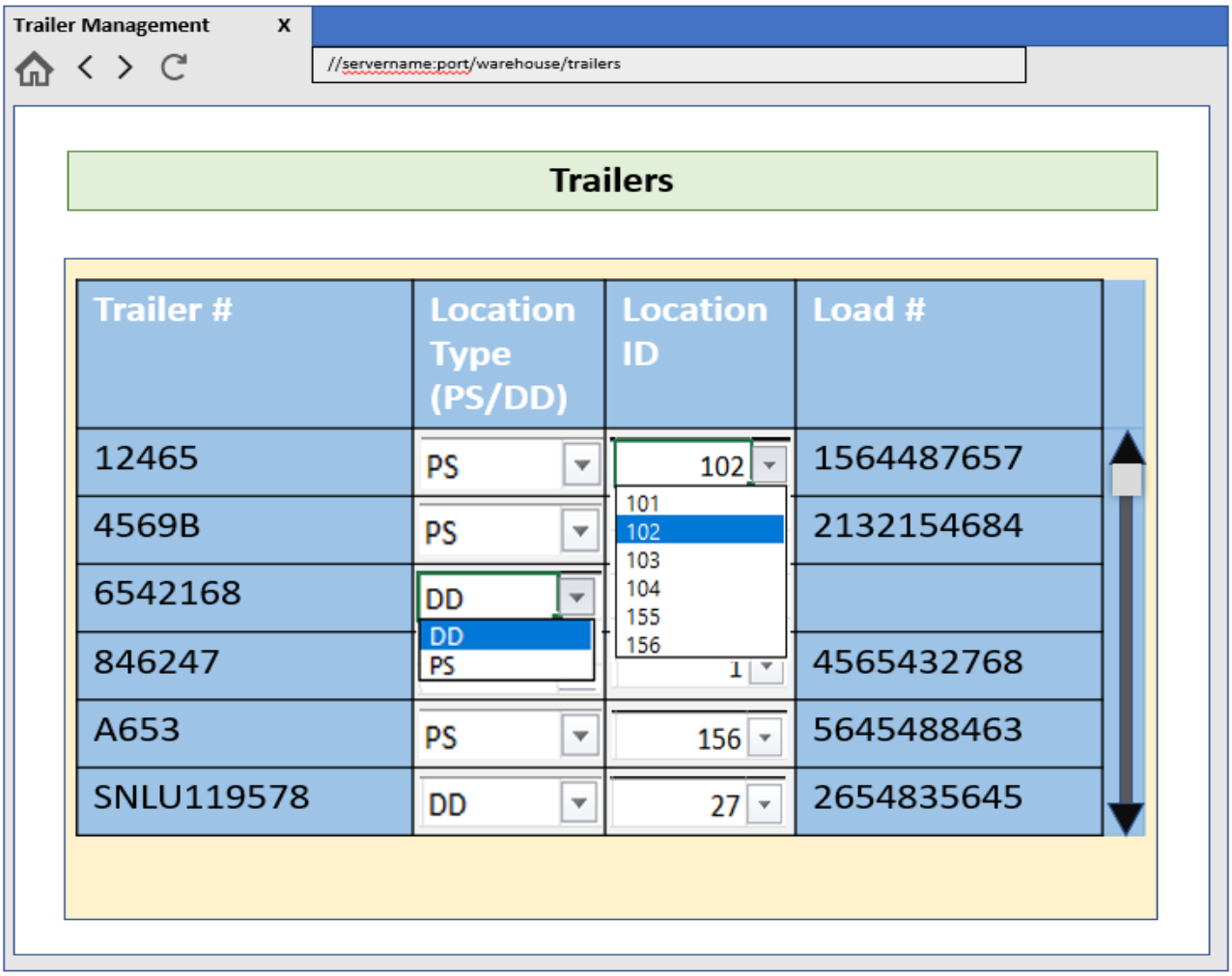
Use Cases and Effort (Changes indicated):

	Steps	User Effort Estimation
Add Parking Spot	1. Click “New Parking Spot” 2. Enter ID ~~(Optional) Select “Out” instead of “In”~~ 3. (Optional) Uncheck Active ~~checkbox~~ radio button 4. Click Save button	2-~~5~~ 4 mouse clicks 1 data field (keystroke count depends on ID length)
Add Dock Door	1. Click “New Door” button 2. Enter ID 3. (Optional) Select “Shipping” instead of “Receiving” 4. (Optional) Uncheck Active ~~checkbox~~ radio button 5. Click Save button	2-5 mouse clicks 1 data field (keystroke count depends on ID length)
Edit Parking Spot Status	1. Scroll or drag scroll bar to desired record 2. Click Active checkbox 3. Click Save button	Scrolling 2 mouse clicks
Edit Dock Door Status	1. Scroll or drag scroll bar to desired record 2. Click Active checkbox 3. Click Save button	Scrolling 2 mouse clicks
Delete Parking Spot	1. Scroll or drag scroll bar to desired record 2. Click red “X” beside record 3. Click OK on confirmation popup	Scrolling 2 mouse clicks
Delete Dock Door	1. Scroll or drag scroll bar to desired record 2. Click red “X” beside record 3. Click OK on confirmation popup	Scrolling 2 mouse clicks

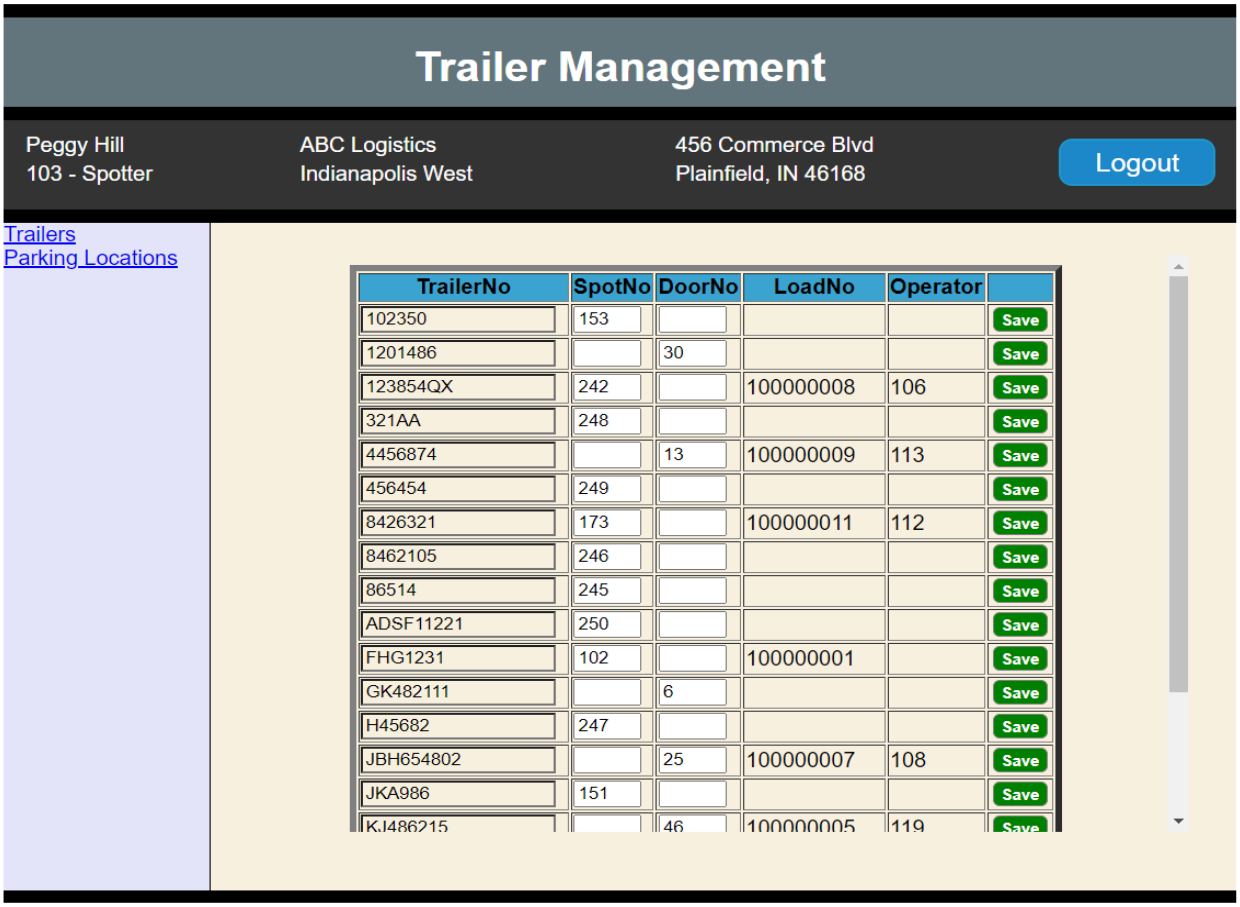
Trailers

Trailers – Spotter

Original Mock-up:



Actual User Interface:

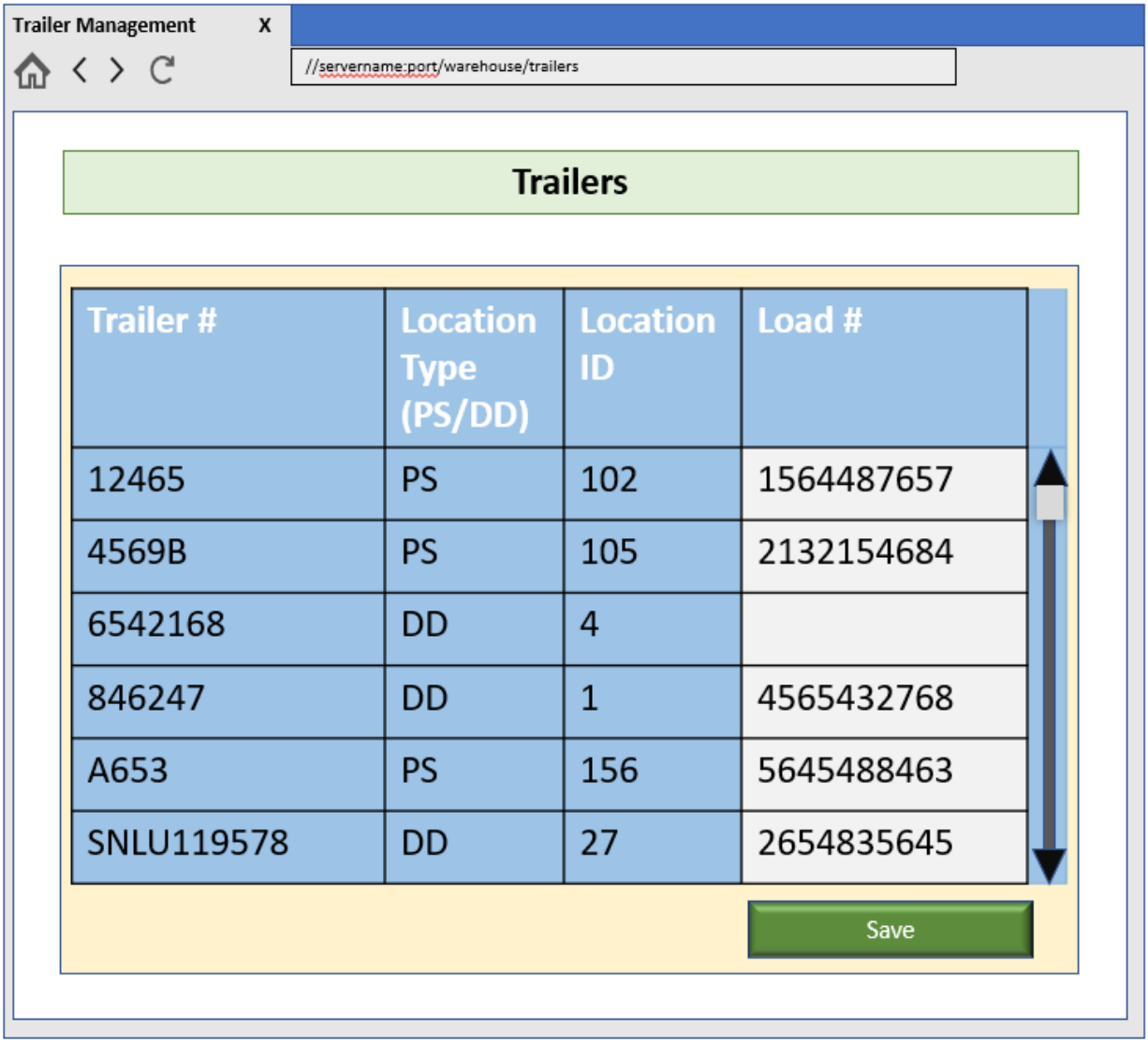


Use Cases and Effort (Changes indicated):

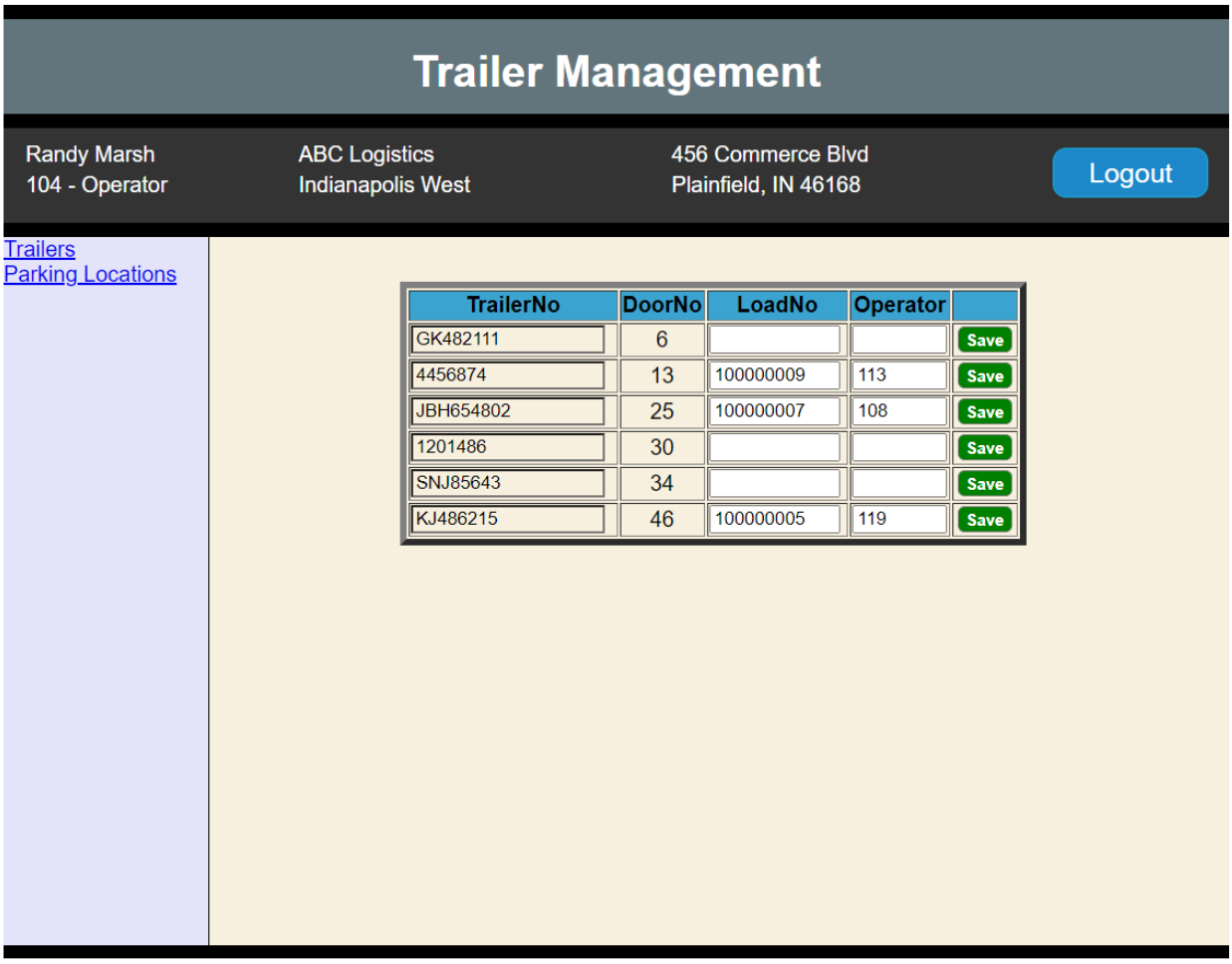
	Steps	User Effort Estimation
View Trailers	1. Scroll to find trailer	Scrolling
Edit Trailer Location	1. Click field of existing location 2. Delete existing location number 3. Click field of desired location 4. Enter new location number 5. Click Save button	3 mouse clicks 2 data fields

Trailers – Warehouse Operator

Original Mock-up:



Actual User Interface:

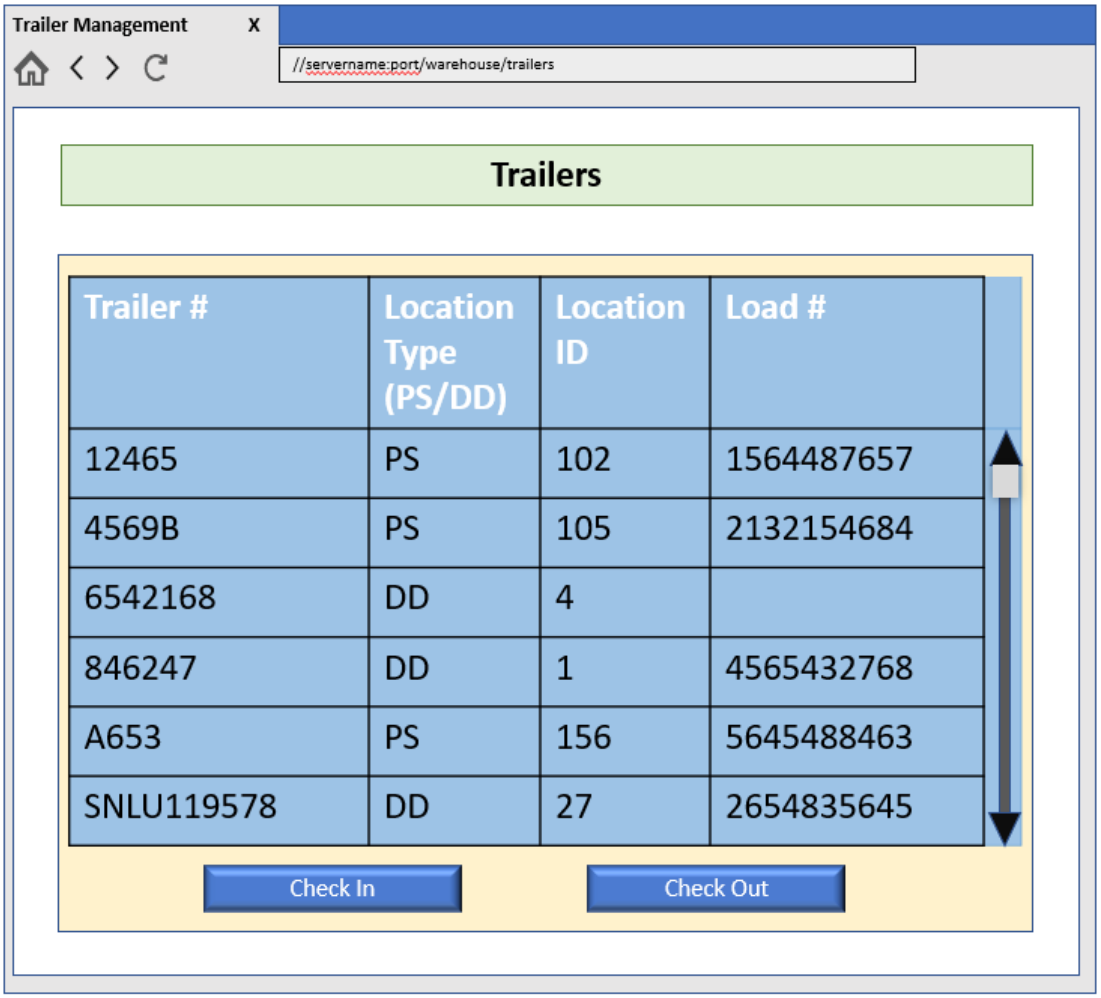


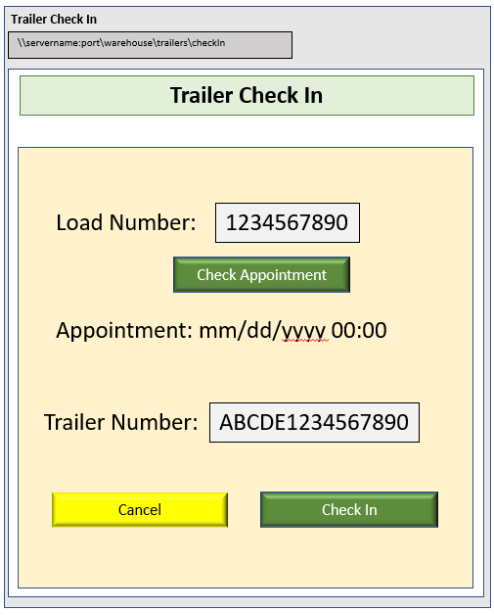
Use Cases and Effort (No changes):

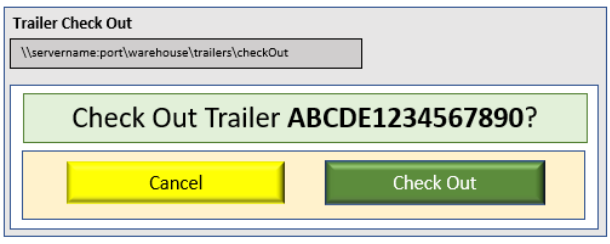
	Steps	User Effort Estimation
View Trailers	1. Scroll to find trailer	Scrolling
Edit Trailer Load	1. Click Load # field to place cursor 2. Delete Load # if trailer is empty Enter Load # if trailer is loaded 3. Click Save button	2 mouse clicks 10 keystrokes max

Trailers – Gatekeeper

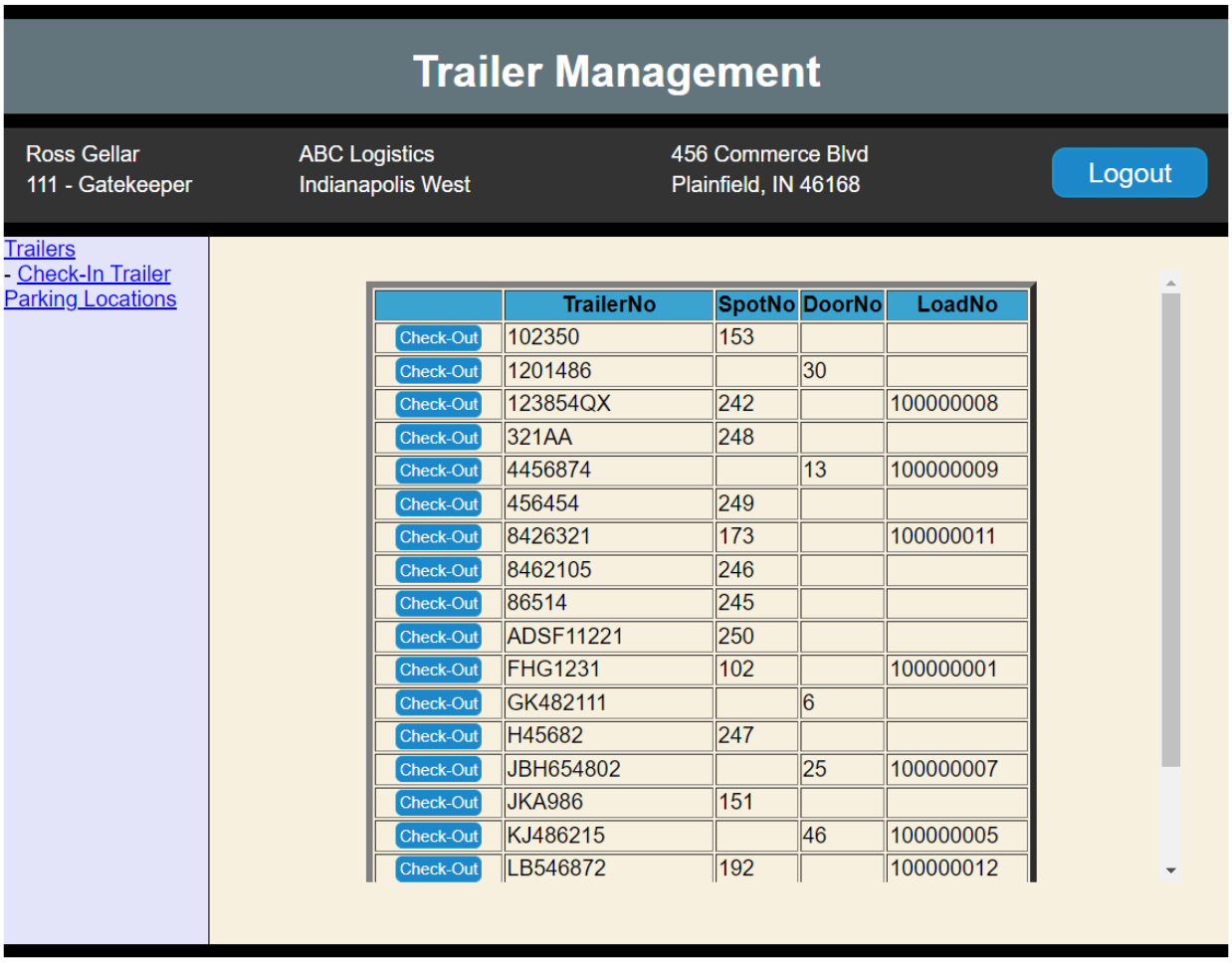
Original Mock-up:

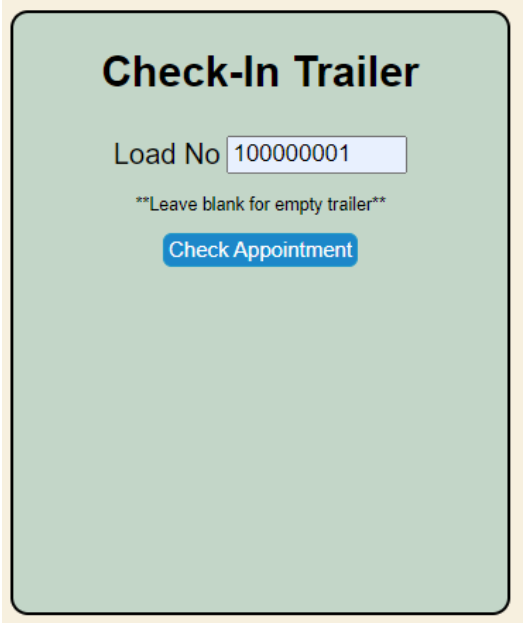


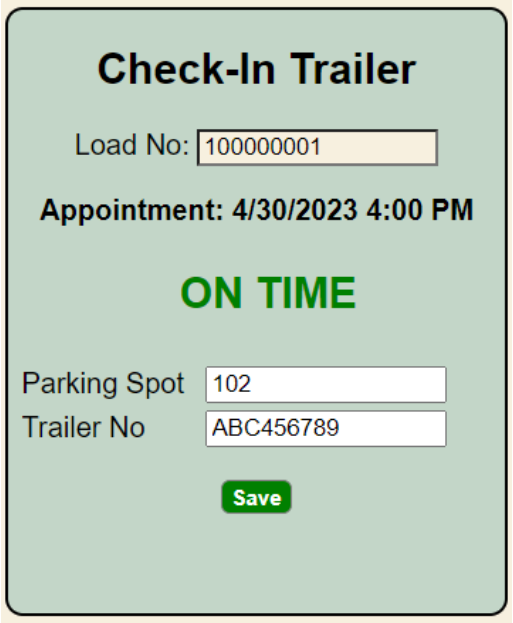


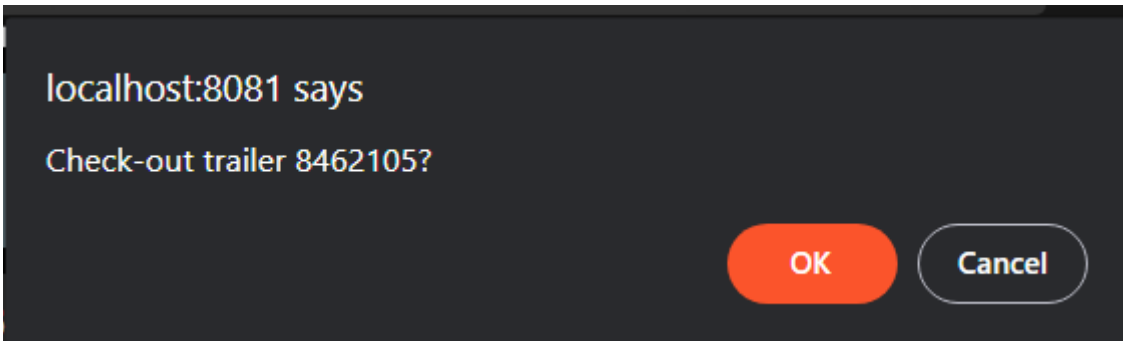


Actual User Interface:









Use Cases and Effort (Changes indicated):

	Steps	User Effort Estimation
View Trailers	1. Scroll to find trailer	Scrolling
Add Trailer (Check In)	1. Click "Check -In Trailer" 2. Enter Load Number on pop-up 3. Click "Check Appointment" button on pop-up 4. Enter Trailer Number on pop-up 5. Click "Check In" button on pop-up	3 mouse clicks 10 keystrokes for Load Number 15 max keystrokes for Trailer Number
Delete Trailer (Check Out)	1. Scroll to find trailer ~~Click on trailer record to select it~~ 2. Click "Check Out" button beside desired record 3. Click OK on confirmation popup	Scrolling ~~3~~ 2 mouse clicks

Trailer Management System Design of Tests

Overview

The following test cases cover the functional requirements. Steps included for each test demonstrate the interface functionality and end with verification steps to show changes made to the system as a result of the test case, as applicable.

Different users will have different access, depending on their role, so login for each test is specified at the beginning of the test steps to be sure that a user with the correct role is performing the test.

Database changes can be checked along the way if someone is logged into the phpMyAdmin portal via http://localhost:8081/phpmyadmin/index.php?route=/. No other integration is included in this project scope.

Test Cases

Test Case	Test Steps
Log in	Enter employee ID: 101 Enter password: 123456 Click Login Show basic navigation to indicate access
Log out	Click Logout Show no access

View parking locations	Login as Supervisor (ID: 101 Password: 123456) Click Parking Locations Scroll to view all locations Click Logout
Add parking spot	Login as Supervisor (ID: 101 Password: 123456) Click Settings Click Parking Spots Show that Spot 100 does not exist in the list Click New Parking Spot Enter spot: 100 Leave status as Active Click Save Show success message Click Parking Spots Show that Spot 100 exists as Active Click Logout
Add dock door	Login as Supervisor (ID: 101 Password: 123456) Click Settings Click Dock Doors Show that Door 90 does not exist in the list Click New Dock Door Enter door: 90 Click Receiving radio button Leave status as Active Click Save Show success message Click Parking Spots Show that Door 90 exists as Receiving and Active Click Logout
Edit parking spot status	Login as Supervisor (ID: 101 Password: 123456) Click Settings Click Parking Spots For spot 102, uncheck the Active checkbox Click Save Click Parking Locations Show spot 102 status inactive Click Logout
Edit dock door status	Login as Supervisor (ID: 101 Password: 123456) Click Settings Click Dock Doors For door 3, check the Active checkbox Click Save Click Parking Locations Show door 3 status active Click Logout

Delete parking spot	Login as Supervisor (ID: 101 Password: 123456) Click Settings Click Parking Spots Click red X beside spot 100 Click OK on confirmation popup Show spot 100 no longer exists in list Click Logout
Delete dock door	Login as Supervisor (ID: 101 Password: 123456) Click Settings Click Dock Doors Click red X beside door 90 Click OK on confirmation popup Show door 90 no longer exists in list Click Logout
View users	Login as Supervisor (ID: 101 Password: 123456) Click Settings Click Users Scroll to view all users Click Logout
Add user	Login as Supervisor (ID: 101 Password: 123456) Click Settings Click Users Show ID 127 does not exist in the list Click New User Enter First Name: Fred Enter Last Name: Flintstone Enter Emp ID: 127 Enter Password: bambam21 Click Spotter radio button Click Save Show success message Click Users Scroll down to show user 127, Fred Flintstone, Spotter Click Logout Login as newly created user Fred Flintstone Enter employee ID: 127 Enter password: bambam21 Show successful login Click Logout
Edit user's name	Login as Supervisor (ID: 101 Password: 123456) Click Settings Click Users Change user 107 Nancy Botwin name to Nancy Reyes Click Save Click Users Show user 107 name is Nancy Reyes Click Logout

Edit user role	Login as employee to be edited – 117, Andy Bernard Enter employee ID: 117 Enter password: 123456 Show access based on role of Spotter Click Trailers Show SpotNo and DoorNo are editable Click logout Login as Supervisor (ID: 101 Password: 123456) Click Settings Click Users For ID 117, show current role of Spotter For ID 117, change role to Gatekeeper Click Save Click Logout Login as edited employee – 117, Andy Bernard Enter employee ID: 117 Enter password: 123456 Show access based on role of Gatekeeper Click Trailers Show SpotNo and DoorNo are not editable Show Check-out option now available Click Logout
Delete user	Log in as employee to be deleted – 111, Ross Gellar Enter employee ID: 111 Enter password: 123456 Show successful login Click logout Login as Supervisor (ID: 101 Password: 123456) Click Settings Click Users Click red X beside ID 111 Ross Gellar Click OK in confirmation popup Show ID 111 no longer exists in list Logout Log in as deleted employee – 111, Ross Gellar Enter employee ID: 111 Enter password: 123456 Show login failure
View trailers (Gatekeeper)	Login as Gatekeeper, Rod Farva Enter employee ID: 114 Enter password: 123456 Click Trailers Show no fields editable Show Check-out option available Show Check-in option available Click Logout

View trailers (Spotter)	Login as Spotter, Archie Bunker Enter employee ID: 121 Enter password: 123456 Click Trailers Show Spot and Door fields editable Show no Check-out option available Show no Check-in option available Click Logout
View trailers (Operator)	Login as Operator, Randy Marsh Enter employee ID: 104 Enter password: 123456 Click Trailers Show Load field editable Show no Check-out option available Show no Check-in option available Click Logout
Add trailer (Check-in)	Login as Gatekeeper, Jenna Maroney Enter employee ID: 126 Enter password: 123456 Click Parking Locations Show parking spot 104 is lowest number available parking spot Click Trailers Show trailer NBC9876 does not exist in list Click Check-In Trailer Enter load: 100000005 Click Check Appointment Show recommended parking spot is spot 104 Enter trailer no: NBC9876 Click Save Click Trailers Show trailer NBC9876 exists in parking spot 104 Click Logout
Delete trailer (Check-out)	Login as Gatekeeper, Jenna Maroney Enter employee ID: 126 Enter password: 123456 Click Parking Locations Scroll down to parking spot 192 Show trailer LB546872 in spot 192 Click Trailers Click Check-out beside trailer LB546872 Click OK in confirmation popup Show trailer LB546872 does not exist in list Click parking locations Show parking spot 192 is available Click Logout

Edit trailer location	Login as Spotter, Peter Parker Enter employee ID: 109 Enter password: 123456 Click Trailers For trailer 123854QX, delete 242 from Spot field For trailer 123854QX, enter 5 in Door field Click Save Click Logout
Edit trailer load	Login as Operator, Lisa Simpson Enter employee ID: 118 Enter password: 123456 Click Trailers For trailer SNJ85643 Enter 100000010 in Load field Click Save Click Logout

Plan of Work

W1-2: Completed; Determine framework and structure, and get the underlying setup completed, including web hosting on the server, mySQL database table structure, sketches of UI

W3-4: Completed; Implement UI and related database tables and calls for Warehouse Supervisor: view/add/edit/delete users; assign security role

W5: Completed; Implement UI and related database calls for Gatekeeper: view/add/edit/delete locations

W6-7: Completed; Implement UI and related database calls for remaining users: view/add/edit/delete trailers; check-in/out trailers (Gatekeeper only)

W8: Completed; Address any issues with the previous work; record midterm demo

W9-12: Not completed; If time allows, implement management functionality with the indicators and color coding of trailers; develop overhead map view of parking locations and status with color coding

W13-14: Completed; Write test cases for all features, and prepare for final demo

W15: Completed; Record final presentation