

Actors	ACT_01	Passenger
	ACT_02	Super Admin
	ACT_03	Scheduling Manager
	ACT_04	Maintenance Manager
	ACT_05	Inventory Manager
	ACT_06	Security Personnel
	ACT_07	Station Manager
	ACT_08	Finance Manager
	ACT_09	Sanitary Staff
	ACT_10	Customer Service
	ACT_11	Train Driver
	ACT_12	Train Attendant
	ACT_13	Luggage Personnel
	ACT_14	Luggage Scan
	ACT_15	Ticket Authentication
	ACT_16	Train GPS
	ACT_17	Train Performance
	ACT_18	CCTV Camera
Status	Proposed	Req has been identified but not yet finalized
	Approved	Req is formally approved for implementation
	In Progress	Req is being worked on
	Completed	Req has been fully implemented
	Verified	Req has been tested and meets the acceptance criteria
Type	FR	Functional Req
	NFR	Non-Functional Req
	SR	System Req
	UR	User Req
Priority	1	High
	2	Medium
	3	Low

FUNCTIONAL REQUIREMENTS [FR]

ID	Name	Actors(s)	Description	Related Req	Type	P.	Status
REQ_001	Create & Delete Own Account	ACT_01	User can create their own account, by filling the following mandatory fields: Name, Last Name, Birth Date, Hire Date, Personal ID Number, Gender, Phone, Email. They register with email/phone (works via a third-party service to send a verification code) and create/change their own password. Note: Each client, when registering, has its own unique ID number provided by the system (auto-incremented).		UR	1	Verified
REQ_002	Edit Own Account	ACT_01, ACT_02	User can edit all credentials of their own personal account.	REQ_002	UR	2	Verified
REQ_003	Log In/Out Of Account & View Account	ACT_01 - ACT_13	User can log in and out of their personal account. User can also view all details of his account.	REQ_001, REQ_002, REQ_004	UR	1	Verified
REQ_004	Add, Edit & Delete Staff Accounts	ACT_02	User is able to create staff account, edit all their credentials (the same credentials as when passenger creates an account, plus assigning the job and station where they work at) and delete them. Since only this user can edit the staff's data, user is also the only one who can change passwords. But this user cannot add the wage detail when creating the account. So what happens is, after he is done adding the staff's account details and confirms the process, a notification is sent to another user to add the wage. User can also post notification IMPORTANT to any of the staff, based on his choice. PS: All staff except Superadmin, Scheduling and Finance Manager, can be assigned only one station. The Superadmin, Scheduling and Finance Manager automatically have access for all stations. Note: Each staff member/account has its own unique ID number provided by the system (auto-incremented). All deleted staff account go to the Past Employees Database.	REQ_003	UR	2	Verified
REQ_005	Add, Edit & Delete Stations	ACT_02	User is able to add, edit and delete stations. To add a new station, he fills the following mandatory fields: Station Number (which shows an error if user tries to enter the same number as a station who already exists), Station City, Station Location, Station Name.		UR	2	Verified
REQ_006	Add Wage to New Staff	ACT_02, ACT_08	User is able to add the wage to new staff and then confirm it. User receives a notification when a new staff is just added, so they get reminded to enter their wage, and then confirm it, so another user can continue to add them into the work shift timetable.	REQ_004	UR	2	Verified
REQ_007	View Personal Work Timetable	ACT_02 - ACT_13	User can see their own work shifts timetable. Only the first and 7th user has access to all of the other staff timetable too. They all receive a	REQ_026	UR	2	Verified

			notification, whenever it is ready or edited. Users can also receive notification IMPORTANT by another user.				
REQ_008	Tracking & Storing GPS	ACT_16	Device tracks location and route (in real time) the train takes, and stores it.	REQ_009, REQ_043	SR	1	Verified
REQ_009	Access to View GPS Data, Train Performance & Receive Alerts	ACT_02 - ACT_04, ACT_06 - ACT_08, ACT_11, ACT_12	User can view the data (in real time) stored by the GPS. User is able to view the data stored by Train Performance device in real & past time. User gets alerted with a notification if train changes planned route, or issues related to performance.	REQ_008	UR	1	Verified
REQ_010	Tracking & Storing Train Performance	ACT_17	Device tracks and stores in real time speed, fuel consumption, brakes, wheels, acceleration/deceleration, journey time, engine health, train load, temperature, vibration, etc.	REQ_011, REQ_043	SR	1	Verified
REQ_011	Checking & Storing Ticket Authentication	ACT_15	Device scans the ticket code, checks both the database of the ticket buyers and of the trains' trips to compare and find a match for the current passenger for the current trip. If code matches, it shows a green light with the message "You may proceed. Have a good trip!". If ticket doesn't match, it shows a red light with message "Error. Ticket is not for this train."	REQ_013, REQ_043	UR	1	Verified
REQ_012	Access to View Ticket Authentication Data	ACT_02, ACT_06 - ACT_08, ACT_11, ACT_12	For the first 4 users, user is able to view the database of both the passengers that boarded the train and the ticket codes that were banned to enter the train. But for the 2nd and 3rd, this data is for the passengers of the trains owned by that station (wherever the trains are), and trains coming (1) and leaving (1) from that station. For the last 2 users, user is able to view the database of the passengers that boarded the train, but only the train they are in, at that time, not all trains all the time, meaning when they are at work, and boarded the train they have to work in, and train is departing in a minute, this list is available for them, also knows as passenger list.	REQ_012	UR	2	Verified
REQ_013	Luggage Handling Process	ACT_14	Client first has to scan his ticket code on the scan. Scan checks whether the ticket belongs to the passenger list of that station's departures (3h before only). If ticket belongs, but its earlier than 3h, scan displays the message "Luggage Scan for that trip not opened yet. Please scan luggage no earlier than 3h before the trip.". If ticket does not belong at all, displays message "Error. Ticket Code Not Found.". If everything goes okay, it displays the message "Please put your luggage in the cart.". Device measures and weighs the luggage and provides the measurements and the amount to be paid. Client must choose form of payment on the screen: Cash/Card, as the luggage scan also works as an	REQ_015, REQ_043	UR	2	Verified

			'ATM'. Client proceeds with payment, if anything goes wrong, displays the message "Something went wrong with payment. Try again." and it cancels the whole process and restarts from the beginning. If all goes right with the payment too, it prints a sticker to put at the luggage, displays the message "Please put sticker on your luggage, put the luggage on the carousel and press Enter to send it to the train." After client does all this, luggage scan automatically puts this luggage and its details to the database of the Luggage Scan, for the Luggage Personnel to view.				
REQ_014	Access to View Luggage Handling Database	ACT_02, ACT_06 - ACT_08, ACT_13	User is able to view the Luggage Scan Database, to make sure all luggages are boarded to/boarded from their specific train and to announce into the mic if for example the scan has detected a suspicious luggage and they must call the passenger whom it belongs to come forward with the key to open it. First 2 users can view this information at all time, for all stations, for all trains. Second 2 users can view this information at all time, for all trains coming and leaving or station's own train. The last (5th) user can only see this information 3 hours prior of the trips of arrivals and departures of the station they work in.	REQ_014	UR	2	Verified
REQ_015	Emergency Alarm Button	ACT_02 - ACT_13	User is able to press this alarm button to declare "a state of emergency" to all staff in case they are suspicious of an upcoming danger or witness crime of any kind.		UR	1	Verified
REQ_016	Access to Trips Timetable & Ticket Searching	ACT_01 , ACT_02, ACT_04 - ACT_07, ACT_10	User is able to view all trains timetable by being able to search for the ticket(s) they're interested in, by adding filters such as city origin, city destination, date of arrival, date of departure and number of passengers (free seats). Except the third, fourth, fifth and sixth user, who are able to view the timetable for the trains departing and arriving to their own station, and their own trains, wherever they are.	REQ_023, REQ_024, REQ_025	UR	2	Verified
REQ_017	Ticket Booking & View Upcoming/Past Bookings	ACT_01 , ACT_10	User is able to book the ticket(s) by filling the following mandatory fields: First Name, Last Name, Personal ID Number, Birthdate, Email, Gender, Accept to Terms & Agreement (text that provides the rules and laws and what is included in the price [a carry-on bag with dimensions 40x30x20cm with max weight 10kg), Form of Payment: Paypal/Credit/Debit Card to be billed [will work via a third party app that verifies the authenticity of the card data], and 2 optional fields Middle Name and Phone. After all is verified, it provides the ticket with all the data entered (including the trip information from the searching and choosing process, and generates a unique ticket code needed later to board the train. It also displays the Terms & Agreement, for the user to check Agree. Program will not generate ticket in 2 cases: 1 - If user has	REQ_003, REQ_030	UR	1	Verified

			not entered all mandatory data and wants to proceed booking, it says "Please fill all required fields."; 2 - If form of payment does not authenticate, program shows the message "Error. Ticket booking failed." Second user, unlike the first one, has the option to have 2 forms of payment Cash & Card. If form of payment is cash, in the program appears a field where you type the "input"=the amount of money the client gave the employee, and based on the bill amount, it calculates the change the employee must give. User is able to view upcoming bookings and view the ticket or download it if they need to. They can also see past bookings made. They receive notification if an upcoming booking is delayed, advanced, changed, etc.				
REQ_018	Create, Edit, Delete & Store in Database New Offer	ACT_02, ACT_08	User is able to create new offer and it automatically gets posted as a notification to the users who can book them.	REQ_018, REQ_020	UR	2	Verified
REQ_019	Access to View & Book Current Offers	ACT_01, ACT_10	User is able to view and book the current available offers. These offers will appear automatically in the ticket searching section, if filters apply and match.	REQ_018, REQ_019	UR	3	Verified
REQ_020	Record & Store Camera Footage	ACT_18	Device records and stores the CCTV footage.	REQ_022, REQ_043	SR	1	Verified
REQ_021	Access to View CCTV	ACT_02, ACT_06, ACT_07, ACT_11, ACT_12	First user can view the CCTV of all stations and all trains. Second and third users can view the CCTV of station, its own trains and trains coming/leaving from station. Last 2 users can view the CCTV of the train which they are working in, only at that time.	REQ_021	UR	2	Verified
REQ_022	Create, Edit & Delete Trips (Origin & Destination)	ACT_02, ACT_03	User creates a new trip to add to the trains timetable. User enters the origin, destination, max duration of trip and then he presses confirm. After user does so, it goes as a notification to another user to add the price for this trip. Only then is this trip available to happen and to add to the timetable.	REQ_018, REQ_024, REQ_025	UR	1	
REQ_023	Set & Edit Price to Trips	ACT_02, ACT_08	User receives notification that a new trip is added and needs a price, so user adds price to make this trip happen.	REQ_018, REQ_023, REQ_025	UR	1	Verified
REQ_024	Schedules All Train & Trips Timetables	ACT_02, ACT_03	User is able to create a timetable as much as 6 month prior to the trips. When a trip in timetable is edited, users who can view it and booked it receive a notification. Also posts notification when it is a holiday/day off.	REQ_018, REQ_023, REQ_024	UR	1	Verified

REQ_025	Schedules Work Shifts For All Staff	ACT_02, ACT_03	User can schedule the work shifts of all staff. When timetable of work shifts is ready, edited, updated, it gets posted as a notification to all users who can view it. User also posts when there's a day off.	REQ_007	UR	1	Verified
REQ_026	Tracks, Routes & Speed Limits (Create, Edit & Delete)	ACT_02, ACT_03	User can create, edit, and delete tracks, routes & speed limits. Whenever an update of any kind is made, it gets posted as a notification to the users who can view it.	REQ_028	UR	1	Verified
REQ_027	Access to View Tracks, Routes & Speed Limits	ACT_11, ACT_12, ACT_16	First 2 users are able to view the database created by another user. They receive any notification that that user posts for this process. Third user=device uses this database to continue to check and verify its own process.	REQ_027	UR	2	Verified
REQ_028	View Employees (Current & Past/Deleted) & Searching	ACT_02, ACT_06 - ACT_08	First and fourth user can view all current and past employees details (including num of hours/workdays worked). The second and third user can only view their own stations' employees.	REQ_004, REQ_040	UR	2	Verified
REQ_029	Current/Deleted Client Accounts & Searching	ACT_02, ACT_08	First user can view and edit all credentials (by request of client in case they encounter problems like forgotten password, etc.) of all current and just view deleted client accounts. Second user has access to only view the client credentials (current and past) without the password. Both can just view the purchases done and can search with filters.	REQ_001	UR	2	Verified
REQ_030	Create, Edit, Delete & Search Maintenance Scheduling & Maintenance Database	ACT_02, ACT_04	User can create, edit, delete and search maintenance scheduling (details about next scheduled maintenance - item code, name, next scheduled m.c.d., work order, description) and maintenance database (details entered after maintenance was done - item code, name, quantity, location, service, repair date & parts replaced). Posts notification when a maintenance scheduling is updated (delayed, advanced, created, canceled, etc.) and when new data is entered in database, to the users who can view it.	REQ_032	UR	1	Verified
REQ_031	Access to View & Search Maintenance Scheduling & Maintenance Database	ACT_03, ACT_05, ACT_07, ACT_08	User can view and search for the maintenance scheduling and the records of the maintenance database. They receive a notification by the users who can post the notification whenever an update is made, in database or scheduling. First and last user have access to view all stations maintenance, unlike the other ones, who have access to view the maintenance of their own station only.	REQ_031	UR	2	Verified
REQ_032	Create, Edit, Delete & Search Database of Inventory	ACT_02, ACT_05	User can create, edit, delete and search database of inventory. He enters the following details for each equipment - Item Code, Name, Quantity, Date Bought, Price, Total Price, Location, Condition, Additional Description.	REQ_034	UR	2	Verified

REQ_033	Access to View & Search Database of Inventory	ACT_03, ACT_04, ACT_08	First user needs this database to access the trains for scheduling, so can view only trains without prices. Second user can view and search through database, but the prices are not visible. Third user can do the same but can view the prices too.	REQ_033	UR	2	Verified
REQ_034	Create, Edit, Delete Luggage Options	ACT_02, ACT_08	User can create, edit and delete luggage options. User has to enter 3 dimensions of the luggage: height, width and depth; the weight limit and the price.	REQ_036	UR	2	Verified
REQ_035	View Luggage Options	ACT_14	Device has the database in order to bill the client for the luggage they put.	REQ_035	UR	2	Verified
REQ_036	Update & Store Budget to Station's Inventory & Get Updates	ACT_02, ACT_08	User sets and edits budget for each station's inventory. Posts a notification to the users who can view it, whenever an update on budget provided is made. All of this is stored for him to view only. User gets updates whenever the budget changes.	REQ_038	UR	2	Verified
REQ_037	View Inventory Budget Provided	ACT_05	User can view the budget made by another user. Receives notification whenever an update is made on the budget.	REQ_037	UR	2	Verified
REQ_038	Notification (Posted & Expired)	ACT_02 - ACT_08	For the users who can post notifications - User has to enter the type of notification (a dropdown list with names of types - based on permissions), then enter the title and duration (which are text and mandatory), and a description (which is optional). They can choose which users view it (multiple if possible), again based on permissions. After a notification is made they cannot edit it. User who posts the notification, can view the current available notification at the Posted Notifications section, and the late expired ones at the Expired Notifications (both at the View Account section)	REQ_004, REQ_006, REQ_007, REQ_009, REQ_011, REQ_013, REQ_015, REQ_017, REQ_019, REQ_020, REQ_023 - REQ_028, REQ_031 - REQ_034, REQ_037, REQ_038	UR	2	Verified
REQ_039	Access to Set & Edit Workers' Wages	ACT_02, ACT_08	User receives a notification that a new staff is added. User sets the staff's wage, and now the staff account is finalized. The wage is added to the account details of that person. Then and only then is the staff's new account finalized, and ready to be put in the work timetable. Later on, user has access to edit the wages, but never leave it empty.	REQ_004, REQ_029	UR	1	Verified
REQ_040	Generate Reports	ACT_02, ACT_08	User can generate a wide range of reports, such as: Most Frequent Route Report, Train Arrival/Departure Report, Delay Causes Report, Real-	REQ_007, REQ_009,	UR	1	Verified

			Time Location Report, Distance Traveled Report, Most Used Inventory Item Report, Low Stock Alert Report, Inventory Usage Report, Inventory Value Report, Supplies by Location Report, Most Common Repair Report, Maintenance Costs Report, Upcoming Maintenance Schedule Report, Most Expensive Repair Report, Maintenance Completion Time Report, Most Overtime Hours Report, Employee Payroll Report, Labor Costs by Department Report, Wage Distribution Report, Bonus and Incentive Report, Most Popular Ticket Type Report, Ticket Sales by Time of Day Report, Revenue by Ticket Class Report, Least Popular Routes Report, Discount Ticket Report, Most Frequent Routes Report, Trip Performance Report, Passenger Load by Trip Report, Route Utilization Report, Trip Revenue Report, Most Efficient Train Report, Customer Satisfaction Report, Staff Performance Report, On-Time Arrival Report, Safety Incident Report, Most Frequent Passengers Report, Passenger Boarding Time Report, Passenger List by Train Report, Passenger Validation Report, Passenger Demographics Report, Most Popular Destination Report, Least Traveled Routes Report, Passenger Origin/Destination Report, Peak Travel Time by Route Report, Route Demand Report, etc. – more to add in the future if needed, based on station or some stations or all stations - all of these in a timeline that user enters.	REQ_011, REQ_013, REQ_015, REQ_017, REQ_019, REQ_029, REQ_030, REQ_032, REQ_034, REQ_037, REQ_042			
REQ_041	Tickets for Trips Database	ACT_02, ACT_06, ACT_07, ACT_13 - ACT_15	First user has access to all tickets of all trips. The second and third users have access to the tickets for the station's own trains wherever they are, and the stations departures and arrivals. The fourth and fifth users have access to this database for the departures and arrivals, but only 3h before. The last user has access only for the departures from that station, only 20 minutes before.	REQ_018	UR	2	Verified
REQ_042	Register, Edit & Delete Device	ACT_02, ACT_04, ACT_05, ACT_07	First and last user acquire these devices and registers them, fills the following details: device name, type (5), model/serial number, acquisition date, location of installation. The second and third user enters this device in inventory and maintenance, because although they are actors, they still are devices who need maintenance.	REQ_008, REQ_010, REQ_012, REQ_014, REQ_021	UR	2	Verified

NON-FUNCTIONAL REQUIREMENTS [NFR]

ID	Name	Description	Type	P.
REQ_043	Usability – Learnability	New passengers (ACT_01) shall complete account creation in ≤ 3 minutes without training.	UR	2
REQ_044	Usability – Help Systems	Context-sensitive help shall be available for all staff interfaces (ACT_02-ACT_13), with searchable documentation.	SR	2
REQ_045	Usability – Accessibility	The passenger portal shall comply with WCAG 2.1 AA (e.g., screen reader support, 4.5:1 contrast ratio).	SR	1
REQ_046	Usability – Task Efficiency	Staff shall schedule a train trip (ACT_03) in ≤ 5 steps using drag-and-drop tools.	SR	2
REQ_047	Performance – Concurrency	The system shall support 20,000 simultaneous users (15,000 passengers + 5,000 staff) during peak hours	SR	1
REQ_048	Performance – Real-Time Data	GPS tracking (ACT_16) shall update train locations every 0.5 seconds with ≤ 1 sec end-to-end latency.	SR	1
REQ_049	Performance – Throughput	The ticket booking system shall process 500 transactions/second during peak demand (e.g., holiday sales).	SR	1
REQ_050	Performance – Response Time	95% of database searches (timetables, passenger lists) shall return results in ≤ 1.5 seconds.	SR	2
REQ_051	Performance – Luggage Processing	Luggage scans (ACT_14) shall complete payment/sticker printing in ≤ 10 seconds per bag.	SR	2
REQ_052	Availability – Uptime	Core systems (booking, GPS, security) shall maintain 99.99% availability (≤ 5 mins downtime/month).	SR	1
REQ_053	Availability – Geographic Coverage	All features shall be accessible in remote stations with intermittent connectivity (offline mode for ticket validation).	SR	1
REQ_054	Availability – Maintenance	Scheduled maintenance windows shall not exceed 2 hours/month, with 72-hour advance notice to staff.	SR	2
REQ_055	Availability – Failover	Critical services (e.g., ACT_16 GPS) shall switch to backup servers within 30 seconds of failure detection.	SR	1
REQ_056	Security – Authentication	Multi-factor authentication (MFA) shall be mandatory for all staff accounts (ACT_02-ACT_13).	SR	1
REQ_057	Security – Data Encryption	CCTV footage (ACT_18) and GPS data shall use AES-256 encryption at rest and in transit.	SR	1
REQ_058	Security – Audit Logs	All account modifications (ACT_02) and emergency alerts (ACT_06) shall generate immutable logs retained for 10 years.	SR	1
REQ_059	Security – Payment Security	PCI DSS-compliant tokenization shall protect card data; no PANs stored locally.	SR	1
REQ_060	Security – Role Isolation	Finance managers (ACT_08) shall be physically unable to access CCTV feeds (ACT_18).	SR	2

REQ_061	Organizational – Compliance	Wage reports (ACT_08) shall adhere to [Country] labor laws for overtime calculations.	SR	1
REQ_062	Organizational – Training	New staff shall complete a 2-hour system onboarding module before account activation.	SR	2
REQ_063	Organizational – Disaster Recovery	Full system restore shall be possible within 4 hours of a catastrophic failure.	SR	1
REQ_064	External – Interoperability	The system shall integrate with national rail GPS networks via GTFS-RT standards.	SR	1
REQ_065	External – Legal	Passenger data retention shall comply with GDPR (deletion within 30 days of request).	SR	1
REQ_066	External – Third-Party APIs	Payment gateways shall support ISO 8583 messaging for card transactions.	SR	2
REQ_067	Real-Time Constraint – Emergency Alerts	Emergency alerts (ACT_06) must propagate to all relevant staff devices in ≤ 3 seconds.	SR	1
REQ_068	Real-Time Constraint – Ticket Scanners	Ticket scanners (ACT_15) shall reject invalid tickets in ≤ 0.3 seconds to prevent queue buildup.	SR	2
REQ_069	Data Integrity – Train Performance Data	Train performance data (ACT_17) shall be validated against sensor tolerances before storage (e.g., reject implausible speed values).	SR	2
REQ_070	Scalability -	The database shall scale horizontally to accommodate 5x growth in stations/trains without schema changes.	SR	3
REQ_071	Localization – Internationalization	Passenger interfaces shall support 12 languages with auto-detection based on IP/device settings.	UR	2