ETMS Requirements Specification

Version 1.0

April 22, 2022

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1. Executive Summary

1.1 Project Overview

ETMS (Epoka Transport Management System) is a software product created to increase the efficiency of transportation for Epoka University students, staff and visitors. With a 17 km distance from Tirana and 23 km from Durres, it is an everyday challenge for students and staff to get to the university in time. By using this software, visiting and leaving the university will be much more easier, controlled and less time consuming.

1.2 Purpose and Scope of this Specifications

ETMS main purpose is to help Epoka's students and staff receive a better transport experience when going to and leaving the university. It intends to help the transport company at the university to better manage the flux of students and staff that need to use Epoka's transport

In scope

These specifications make up the foundations of this product and how it intends to be used:

- Make transportation available to all the students and staff, whenever they need it
- The software is user-friendly and easy to use
- User upload their personal information in an easy way to help them receive a better service
- Their information is secured by the software and can not be used by malicious users
- The intended users are of all ages, but mainly 19-24

Out of scope

These specifications are explanations and clarifications on what this software intends to make available for the users:

- This software intends to give the users a more efficient transport, whether they choose bus or car transportation
- It helps the users by improving the quality of public and private transportation by creating a seating and parking system to create an order to avoid unnecessary past problems
- Users' information is secured and kept private; only the user can view their data and make changes (except from the admin and manager), no malicious user

2. Product/Service Description

2.1 Product Context

How does this product relate to other products? Is it independent and self-contained? Does it interface with a variety of related systems? Describe these relationships or use a diagram to show the major components of the larger system, interconnections, and external interfaces.

2.2 User Characteristics

Create general customer profiles for each type of user who will be using the product. Profiles should include:

- Student/faculty/staff/other
- experience
- technical expertise
- other general characteristics that may influence the product

2.3 Assumptions

It is assumed that every person who is going to use the program has a smart device and internet connection to access the system. The program is assumed to be user friendly and easy to use, in order for no problems to be created. No more than 200 users are assumed to access the system at the same time since It is assumed to be available 24/7.

2.4 Constraints

The constraints of this system are:

- Users need to have a smart device to access the system (Smartphone, Laptop,Tablet)
- Each user needs to have an account to access system.
- Users need to have internet connection to check for available seat and/or parking spot.
- Drivers must have internet connection to check the QR Code and see when they will need to drive the bus.
- Guardsman need to have an account and internet access to check the QR Code for the parking spots.
- The system can accommodate no more than 200 users concurrently.

2.5 Dependencies

Need of all users to stay connected to internet while:

- booking a seat or while showing the QR Code to the driver that checks it
- booking a parking spot or while showing the QR Code to the guardsman that checks it

3. Requirements

3.1 Functional Requirements

ETMS – Epoka Transport Management System

Req#	Requirement	Comments	Priority	Date Rvwd	SME Reviewed / Approved
TMS_01	The system will be branched in two main parts: those who want to use the bus and those who want to use parking lot.		1	22/4/2022	
TMS_02	The system should have different user profiles		2	22/4/2022	
TMS_03	The users should authenticate themselves to have their different views and permissions		1	22/4/2022	
TMS_04	Each user should have access to their own section of the system		1	22/4/2022	

Req#	Requirement	Comments	Priority	Date Rvwd	SME Reviewed / Approved
TMS_05	The system should assist every user to complete their requested needs		2	22/4/2022	
TMS_06	The passengers should be able to reserve their seats in the requested time and station		1	22/4/2022	
TMS_07	The parking lot users should be allowed to book their lot in the requested timeline		1	22/4/2022	
TMS_08	The system should provide to the manager a good point of view about buses situation		2	22/4/2022	
TMS_09	The system should give to the manager full information about the parking lot state		1	22/4/2022	
TMS_10	The busman should check whether the bus user have done the reservation or not		1	22/4/2022	
TMS_11	The passenger can have the possibility to pay the ticket in cash or directly by using the system		1	22/4/2022	
TMS_12	The users have the possibility to have a wallet where he/she may deposit an amount of money which will be used to pay the tickets		2	22/4/2022	
TMS_13	The users may also have a monthly-subscription to access the system facilities		2	22/4/2022	
TMS_14	The wallet filling should be done directly with the manager		1	22/4/2022	
TMS_15	The manager should order to depart a new bus in case that one bus cannot fulfill the needs in a specific time (there may be more passengers than the number of seats)		1	22/4/2022	
TMS_16	The system should notify the passengers whether the seat reservation has been successfully done or not		2	22/4/2022	
TMS_17	The system should give the availability to the parking lot users in real time		1	22/4/2022	

Req#	Requirement	Comments	Priority	Date Rvwd	SME Reviewed / Approved
TMS_18	The system should give the seats availability to the bus users in real time		1	22/4/2022	
TMS_19	The passengers may be of different categories like student or staff		2	22/4/2022	
TMS_20	The system should generate a ticket to the passenger in order to be checked later on by the busman		1	22/4/2022	
TMS_21	The manager should assign the bus driver for a specific time and station		1	22/4/2022	
TMS_22	The bus driver should see when his turn to drive is and in which station to start		1	22/4/2022	
TMS_23	Users' information should be kept private	Data security	1	22/4/2022	
TMS_24	Both parking and bus users should be able to see their money balance		1	22/4/2022	
TMS_25	The parking and bus users should be able to cancel their reservation before the time which have specified in the system		2	22/4/2022	
TMS_26	While logging in, the students should provide their Epoka email to enter in the system		1	22/4/2022	
TMS_27	The staff should proof their role to have the system facilities		1	22/4/2022	
TMS_28	For the parking lot users may be the possibility to have a discount from subscribing monthly, or by entering some coupons which will be generated once in a while		~~2~~	22/4/2022	

3.2 Non-Functional Requirements

3.2.1 User Interface Requirements

The user interface must be convenient, extensible, easy to use and of course secure so it can avoid conflicts. Security requirements include the need to protect authorized information from unauthorized

access, customer privacy and ongoing payment tracking. The user interface should work well in both speed and usage and speed of use is one of the most important aspects of the program.

3.2.2 Usability

- The main purpose of this web application is to be useful, precise and simple to use even for inexperienced users so everyone is comfortable using it.
- The web application will be directed towards different users, like: students, staff, busman, school guard, etc. and the interface will be specific to each of the users.
- There will be the possibility to confirm every important action the user takes to avoid mistakes. Also the users will be able to edit or remove their booked place.
- Students/staff will book their place and the busman will confirm their booking by their end of the web application and all the actions will be viewed and reviewed by the admin.

3.2.3 Learnability

- The web application should be easy to use since it will be used by different ages and we will also provide a manual just in case.
- The program will be available in Albanian as well as in English so foreign students or professors are able to understand it.
- The UI will contain “self-explaining” colors so it becomes pretty straightforward.

3.2.4 User-specific UI requirements:

3.2.5 Performance

- The server will be able to accommodate an average number of 100-200 users concurrently.
- There will be a 2-5 seconds of pageload time on both mobile and desktop devices with the assumption they have 3G or 4G internet connection.
- Since the main system's scope is to send and receive information like available seats, parking lot etc., the duty of the program relies on how fast these data will be exchanged. So, as performance parameter will take in consideration the speed of interchanging which will be approximately 0.4 seconds. Have to mention that a lot of the program's performance depends on the internet speed, but not only (traffic limit will be something to 1500 users per day).

3.2.5.1 Space Requirements

- In terms of the space needed on user end, it will be approximately 0 not including the cache, since it will be a web based application.
- In terms of the space needed to store the web application it will require no more than 3-5 gigabytes for the database to store the student records.

3.2.5.2 Availability

- The system will be accessible to the users at any moment and everyday. To talk in numbers it should be accessible 98% of the month, with the remaining time going to system maintenance break.
- It should have no location restriction.
- The maintenance break should not be a problem since it will be in a non-business day.

3.2.5.3 Latency

The minimum acceptable time for a request should be 2-3 seconds.

3.2.6 Manageability/Maintainability

The application should be simple to manage, by publishing critical health status information from the monitoring capabilities and for analyzing the root cause of failures.

3.2.6.1 Monitoring

There should be a user feedback button or a contact form, so the user is able to report and malfunctioning of the application as well as ask any question he/she has with the response to be back in 1-2 business days.

3.2.6.2 Maintenance

- There should be a 80% maintainability in 24 hours, which means that there is a 80% chance that any component can be fixed within a day.

3.2.6.3 Reliability

- The system is expected to be reliable 24/7 with 1-2 hours break on Sunday mornings to update any feature or fix any potential bug.
- The system should have 85 percent reliability for a month, which means that during this month, under normal usage conditions, there's an 85 percent chance that the system won't experience critical failure.

3.2.6.4 Accessibility

- Every user will choose his role when opening the Web application.
- The system will be able to handle multiple actions at the same time.
- Every process should be verified and confirmed.
- It will be accessible from the PC as well as the smartphone/tablets.
- Will be available 24/7.

3.2.7 System Interface/Integration

Specify the use of other required products (e.g., a database or operating system), and interfaces with other systems (e.g., UWHires package interfaces with PubCookie and ODS, HEPPS system interfaces with Budget system). For each interface, define the interface in terms of message format and content. For well-documented interfaces, simply provide a reference to the documentation.

Outline each interface between the product and the hardware or network components of the system. This includes configuration characteristics (e.g., number of ports, instruction sets), what devices are to be supported, and protocols (e.g., signal handshake protocols).

3.2.7.1 Network and Hardware Interfaces

Specify the logical characteristics of each interface between the product and the hardware or network components of the system. This includes configuration characteristics (e.g., number of ports, instruction sets), what devices are to be supported, and protocols (e.g., signal handshake protocols).

3.2.7.2 Systems Interfaces

Example systems interface requirements:

A. System1-to-System2 Interface

The <external party> will create and send a fixed length text file as an email attachment to System2mail@u.washington.edu to be imported into the System2 system for payroll calculation. This file

must be received on EDIT day by 4:00 PM in order to be processed in the EDIT night run. The requirements below document the file specifications, data transfer process, and specific schedule. This file is referred to as "FileName" in this document.

File Structure and Format

A1. The FileName file is a fixed length text file.

A2. The FileName file is an unformatted ASCII file (text-only).

A3. The FileName file contains a batch totals record and several detail records.

File Description: Batch Totals Record

A4. The batch totals record can be placed at the beginning, in the middle, or at the end of the file.

A5. The batch totals record contains the following:

- Record Type (value: XA)
- Process Type (value: A)
- Batch Number (3 digit number assigned by Payroll Dept)
- Origin Code (AIG)
- Total number of detail records
- Total deduction amount

File Description: Detail Records

A6. The FileName file contains a row for each record meeting xxx criteria.

A7. Each row in the FileName file contains the following fields, comma-delimited and encased in double-quotes where the data includes commas or spaces:

- Employee Id
- Record Type
- Process Date (MMDDYY)
- XYG Number
- Element Code
- Amount
- Amount Sign
- Year Flag
- Total Amount
- Total Amt Sign

3.2.8 Security

3.2.8.1 Protection

The web application is not supposed to not a high security so e mid-level security should be more than okay to handle the verification of a valid booking since the validation on the part of the busman should be done by scanning the QR code generated on the passenger's phone after booking his/her place. Every user will have a specific authentication based on its role chosen when opening the application. It also should comply with the law of confidentiality by securing user's personal information.

3.2.8.2 Authorization and Authentication

Every user will have a specific authentication based on its role chosen when opening the application. It also should comply with the law of confidentiality by securing user's personal information.

3.2.9 Data Management

Specify the requirements for any information that is to be placed into a database, including

- types of information used by various functions
- frequency of use

- data access rules
- data entities and relationships
- integrity constraints
- data retention
- valid range, accuracy, and/or tolerance
- units of measure
- data formats
- default or initial values

3.2.10 Standards Compliance

Specify the requirements derived from existing standards, policies, regulations, or laws (e.g., report format, data naming, accounting procedures, audit tracing). For example, this could specify the requirement for software to trace processing activity. Such traces are needed for some applications to meet minimum regulatory or financial standards. An audit trace requirement may, for example, state that all changes to a payroll database must be recorded in a trace file with before and after values.

3.2.11 Portability

If portability is a requirement, specify attributes of the system that relate to the ease of porting the system to other host machines and/or operating systems. For example,

- Percentage of components with host-dependent code;
- Percentage of code that is host dependent;
- Use of a proven portable language;
- Use of a particular compiler or language subset;
- Use of a particular operating system;
- The need for environment-independence - the product must operate the same regardless of operating systems, networks, development or production environments.

3.2.12 Other Non-Functional Requirements

Please provide all necessary non-functional requirements, similar to the requirements explained in the lesson slides or in the textbook.

3.3 Domain Requirements

Everything related to the domain that might be needed in the project shall be mentioned in here. Sometimes the domain Requirements might be thought as part of either functional or non-functional requirements.

4. User Scenarios/Use Cases

Use Case Name	Student Login
Summary	A student logs in and wants to have access to the all functionalities of the system.

Dependency	-
Actors	Students, Admin
Preconditions	A network connection is required for the system to function.
Description of the Main Sequence	▪ Enter Epoka e-mail and the password. ▪ Validate the e-mail and password. ▪ Allow access to the system.
Description of the Alternative Sequence	▪ Invalid e-mail. The system will display an error system. ▪ Invalid password. The system will display an error system.
Non-functional requirements	*Narrative description of nonfunctional requirements, such as performance and security requirements.*
Postconditions	System will display a message that tells the user that the log in was successful and they will be redirected to the Student account where they can use a number of functionalities.
Use Case Name	**Staff Login**
Summary	A staff member of Epoka University logs in and wants to have access to the all functionalities of the system.
Dependency	-
Actors	Staff, Admin
Preconditions	A network connection is required for the system to function.
Description of the Main Sequence	▪ Enter Epoka e-mail and the password. ▪ Validate the e-mail and password. ▪ Allow access to the system.
Description of the Alternative Sequence	▪ Invalid e-mail. The system will display an error system. ▪ Invalid password.

	The system will display an error system.
Non-functional requirements	*Narrative description of nonfunctional requirements, such as performance and security requirements.*
Postconditions	System will display a message that tells the user that the log in was successful and they will be redirected to the Staff account.
Use Case Name	**Manager Login**
Summary	The manager of Epoka University logs in and wants to have access to the all functionalities of the system.
Dependency	-
Actors	Manager, Admin
Preconditions	A network connection is required for the system to function.
Description of the Main Sequence	▪ Enter Epoka e-mail and the password. ▪ Validate the e-mail and password. ▪ Allow access to the system.
Description of the Alternative Sequence	▪ Invalid e-mail. The system will display an error system. ▪ Invalid password. The system will display an error system.
Non-functional requirements	*Narrative description of nonfunctional requirements, such as performance and security requirements.*
Postconditions	System will display a message that tells the user that the log in was successful and they will be redirected to the Manager account.
Use Case Name	**Bus Driver/Busman/Guard Login**
Summary	The Bus Driver, Guard or the Busman logs in and wants to have access to the all functionalities of the system.

Dependency	-
Actors	Bus Driver, Busman, Guard, Admin
Preconditions	A network connection is required for the system to function.
Description of the Main Sequence	▪ Enter Epoka e-mail and the password. ▪ Validate the e-mail and password. ▪ Allow access to the system.
Description of the Alternative Sequence	▪ Invalid e-mail. The system will display an error system. ▪ Invalid password. The system will display an error system.
Non-functional requirements	*Narrative description of nonfunctional requirements, such as performance and security requirements.*
Postconditions	System will display a message that tells the user that the log in was successful and they will be redirected to the Bus Driver, Guard or the Busman account.
Use Case Name	**Accessing the page as a Guest**
Summary	A guest can also use the system but they don't have to and can't log in in the system since they don't have an Epoka e-mail.
Dependency	-
Actors	Guest, Admin
Preconditions	A network connection is required for the system to function.
Description of the Main Sequence	▪ On the landing page you should click on *"Continue as a Guest"* to access the website.
Description of the Alternative Sequence	-
Non-functional requirements	*Narrative description of nonfunctional requirements, such as performance and security*

	requirements.
Postconditions	The guest will be redirected to the Guest page where they can access certain features and functionalities of the website such as booking a seat or a parking space.
Use Case Name	**Student Booking A Bus Seat**
Summary	After a student successfully logs in they decide to book a seat.
Dependency	-
Actors	Student, Admin, Manager
Preconditions	Student is logged in and a network connection is required for the system to function.
Description of the Main Sequence	▪ Firstly, the student chooses to book a bus seat. ▪ Secondly, the student chooses the route and the time that he wants to use the transportation. ▪ A projected view of the bus is displayed where the student can choose his seat from the available seats. (The seats that are already booked will be displayed with another color) ▪ The student will click on “Print Receipt” and a receipt with his information will be generated with a unique QR code. Depending on their payment method (paying at the bus, paying through the money they have deposited in their account through the manager or the bus pass).
Description of the Alternative Sequence	▪ There are no seats available The system will display a message which lets the student know there are no seats available and they have to try in another time unless there is more than one time at the given time.
Non-functional requirements	*Narrative description of nonfunctional requirements, such as performance and security requirements.*

Postconditions	The student downloads his receipt with the QR code and saves it in their device and they get redirected to their account's landing page.
Use Case Name	**Student Requests For Another Bus**
Summary	When a student successfully logs in and wants to book a bus seat there are no available ones. This occurs mostly during certain hours.
Dependency	The manager decides if it is possible to make a new bus available for the students depending on the number of requests or if there even is a bus available. Then he notifies the bus man and bus driver.
Actors	Student, Admin, Manager, Busman, Bus driver
Preconditions	Student is logged in and a network connection is required for the system to function.
Description of the Main Sequence	▪ Firstly, the student chooses to book a bus seat. ▪ Secondly, the student chooses the route and the time that he wants to use the transportation. ▪ A projected view of the bus is displayed where the student can choose his seat from the available seat. (The seats that are already booked will be displayed with another color) ▪ If there are no seats available the student can decide to press on the "Request a new bus" button so the Manager can receive a message with the students who is requesting a bus and the time which the bus is requested.
Description of the Alternative Sequence	-
Non-functional requirements	*Narrative description of nonfunctional requirements, such as performance and security requirements.*
Postconditions	The student will be redirected to the landing page and if a bus will be made available, they will be notified by e-mail.

Use Case Name	Student Booking A Parking Space
Summary	After a student successfully logs in they decide to book a Parking Space.
Dependency	-
Actors	Student, Admin, Manager
Preconditions	Student is logged in and a network connection is required for the system to function.
Description of the Main Sequence	▪ The student chooses to book a parking space. ▪ After that the student will choose the time frame on which they will be using the parking space. ▪ Following that a projected view of the parking space will be displayed with the available parking spaces. The unavailable parking spaces will be displayed in red. ▪ The student decides which preferred parking space he wants to book and clicks on it. ▪ After that a dialogue box will pop up and the student needs to click on confirm in order for the information to be saved on the database. Their ID, Name, Surname and mobile plate will be saved on our database accessed by the guard to constantly check on the space.
Description of the Alternative Sequence	-
Non-functional requirements	*Narrative description of nonfunctional requirements, such as performance and security requirements.*
Postconditions	After they confirm their booking, they get redirected to their account's landing page.
Use Case Name	**Student Checks Their Balance Or Buss Pass**

Summary	After a student successfully logs in they decide to check their account balance, which consists of the money they've deposited through the manager or the bus pass they have purchased also at the manager
Dependency	Manager is able to update their account balance or bus pass.
Actors	Student, Admin, Manager
Preconditions	Student is logged in and a network connection is required for the system to function.
Description of the Main Sequence	▪ Student is logged in and clicks on the "Check Balance" section to check their account balance. All the money is added to the account through the Manager. ▪ At the same page they can also see if they have purchased a buss pass for the particular month.
Description of the Alternative Sequence	-
Non-functional requirements	*Narrative description of nonfunctional requirements, such as performance and security requirements.*
Postconditions	-
Use Case Name	**Staff Member Booking A Bus Seat**
Summary	After a staff member successfully logs in they decide to book a seat.
Dependency	-
Actors	Staff, Admin
Preconditions	Staff member is logged in and a network connection is required for the system to function.
Description of the Main Sequence	▪ Firstly, the staff member chooses to book a bus seat. ▪ Secondly, the staff member chooses the route and the

	time that he wants to use the transportation. ▪ A projected view of the bus is displayed where the staff member can choose his seat from the available seats. (The seats that are already booked will be displayed with another color) ▪ After they select their seat, they confirm it.
Description of the Alternative Sequence	-
Non-functional requirements	*Narrative description of nonfunctional requirements, such as performance and security requirements.*
Postconditions	The staff member is redirected to their landing page.
Use Case Name	**Staff Member Booking A Parking Space**
Summary	After a staff member successfully logs in they decide to book a Parking Space.
Dependency	-
Actors	Staff, Admin
Preconditions	Staff member is logged in and a network connection is required for the system to function.

Description of the Main Sequence	▪ The staff member chooses to book a parking space. ▪ After that the staff member will choose the time frame on which they will be using the parking space. ▪ Following that a projected view of the parking space will be displayed with the available parking spaces. The unavailable parking spaces will be displayed in red. ▪ The staff member decides which preferred parking space he wants to book and clicks on it. After that a dialogue box will pop up and the staff member needs to click on confirm in order for the information to be saved on the database. Their ID, Name, Surname and mobile plate will be saved on our database accessed by the guard to constantly check on the space.
Description of the Alternative Sequence	-
Non-functional requirements	*Narrative description of nonfunctional requirements, such as performance and security requirements.*
Postconditions	The staff member is redirected to their landing page.
Use Case Name	**Guest Books A Seat**
Summary	Guest wants to book a seat on the bus. Unlike a student if there are no seats available, they cannot request for a new bus.
Dependency	-
Actors	Guest, Admin
Preconditions	A network connection is required for the system to function.
Description of the Main Sequence	▪ A guest accesses the page as guest and they decide to book a seat on the bus. ▪ A projected view of the bus is displayed where the guest can choose their seat from the available seats.

	(The seats that are already booked will be displayed with another color) ▪ The guest enters their Name, Surname and E-mail to confirm their booking. ▪ The guest will click on "Print Receipt" and a receipt with his information will be generated with a unique QR code which the guest will download. ▪ The guest than does the payment at the busman (150 ALL)
Description of the Alternative Sequence	-
Non-functional requirements	*Narrative description of nonfunctional requirements, such as performance and security requirements.*
Postconditions	-
Use Case Name	**Guest Books A Parking Space**
Summary	Guest wants to book a parking space.
Dependency	-
Actors	Guest, Admin
Preconditions	A network connection is required for the system to function.
Description of the Main Sequence	▪ The guest chooses to book a parking space. ▪ After that the guest will choose the time frame on which they will be using the parking space. ▪ Following that a projected view of the parking space will be displayed with the available parking spaces. The unavailable parking spaces will be displayed in red. ▪ The guest decides which preferred parking space he wants to book and clicks on it. After that a dialogue box will pop up and the guest needs to click on

	confirm in order for the information to be saved on the database. Their Name, Surname and mobile plate will be saved on our database accessed by the guard to constantly check on the space.
Description of the Alternative Sequence	-
Non-functional requirements	*Narrative description of nonfunctional requirements, such as performance and security requirements.*
Postconditions	-
Use Case Name	**Busman scans the QR code**
Summary	Busman checks the passengers' QR code.
Dependency	-
Actors	Busman, Student, Guest, Admin
Preconditions	Busman is logged in.
Description of the Main Sequence	▪ The busman clicks on the QR code scanner and scans the downloaded QR codes in the receipt. ▪ Depending on the output of the QR code there are different actions. For someone who has paid through their account balance or has a bus pass the Busman will not take money from. Otherwise the payment will be done in person by the student and the guest.
Description of the Alternative Sequence	-
Non-functional requirements	*Narrative description of nonfunctional requirements, such as performance and security requirements.*
Postconditions	-