SOFTWARE REQUIREMENTS SPECIFICATION

GARCON PROJECT

Furkan TAŞBAŞI	Yılmaz Berkay BAT
2041853	2171304

Table of Contents

List of Tables

List of Figures

RECORDS OF CHANGE

Version	Date
1.0	11.03.2019
1.1	19.03.2019

1. Introduction

1.1. Purpose

The purpose of this project is to make life easier in the campus with some specific IoT systems. There are two main functionalities of this system and these functionalities are based on interaction between human and Internet of Things technologies. The first one is an animal care system which enables campus members and campus officials to take care several animal problems. The other one is a smart classroom scheduling and booking system that enables people to take advantage of using classrooms in a more efficient way.

1.2. Scope

The project will facilitate specific users for specific purposes. The first system consists of two types of users: campus members and approval staff. Campus members such as a student or an academic staff will be able to request for empty classroom for a specific time, date and place to organize a meeting on their own purposes. On the other hand, approval staff checks all requests which are filtered and listed by smart ticket system according to university rules. The second system also consists of two types of users: campus members and animal care staff. Whenever a campus member faces with an issue related to animals, he/she will be available to report this problem to animal care staff with the help of the ticket system. Any report coming from campus members will create a record and a notification on the main dashboard of animal care staff. Campus members will be able to access the Garcon system through a tablet device and the other staff will be able to access the system through a web-based application, which will be compatible with the mobile devices with respect to HTML 5, CSS 3 and Bootstrap 4 standards. The Garcon system will be developed by a team 5 people and expected to complete in 6-months duration, starting from 19.03.2019.

1.3. System Overview

1.3.1. System Perspective

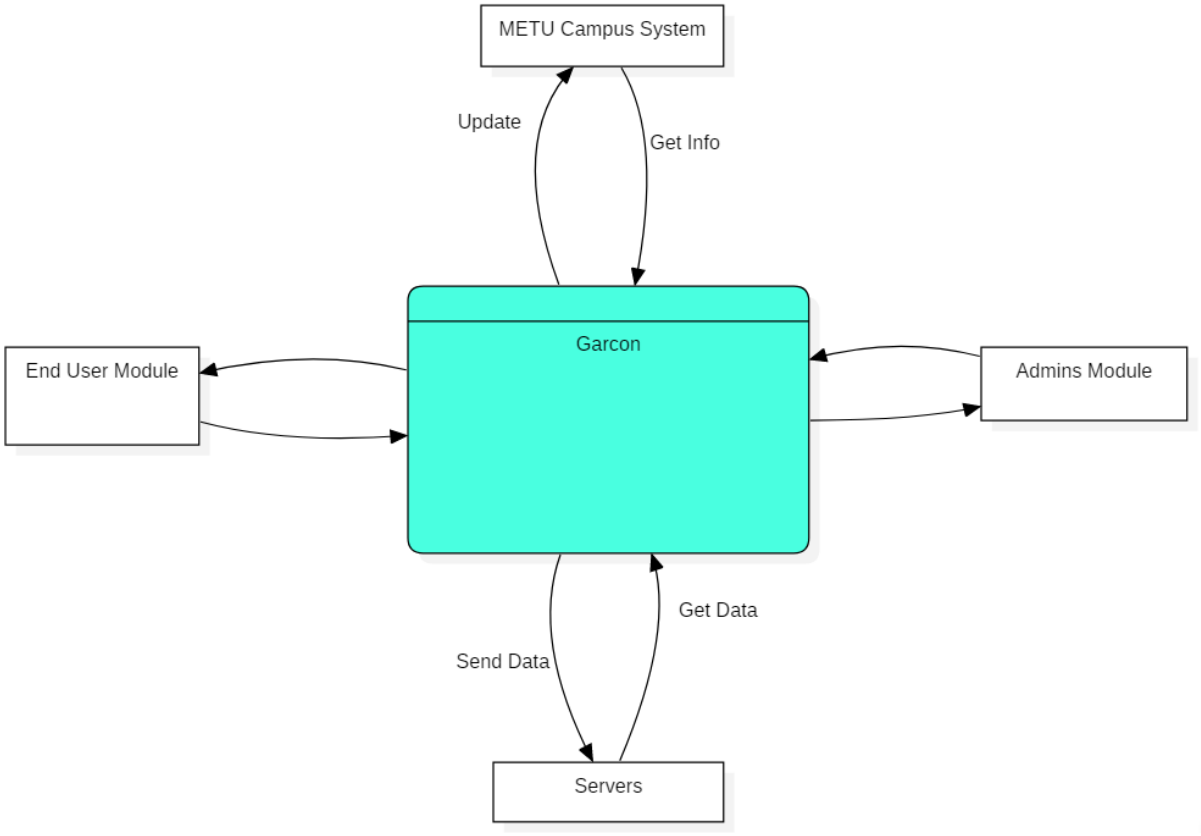

Figure 1 : Context Model

1.3.2. System Functions

One of the main objectives of this project is to provide a ticket system to campus members which will allow them to deal with classroom arrangements without interfering with non-efficient official procedures which will both save time and effort.

Another objective is to provide a ticket system facility to all campus members with distributed IoT devices which will allow them to deal with several different animal problems more efficiently and much more easy way by gathering animal care stuff with all campus members in a synchronized way.

Function	Summary
View/List/Filter Classroom Requests	Shows all classroom requests done by campus members. This action can be done by both Approval Staff who can approve or decline these requests as an extend operation.
Create/Edit/Delete Classrooms Request	Provides an ability to campus members to create new classroom dedication request from Approval staff in a specific time and date for a specific classroom. This function can be saved as a template for convenience of users and this action can be done as a member of formal campus community or as a member of a temporary group generated for a temporary purpose.
List/View/Filter Classrooms	Shows all classrooms in the campus. This action can be done by both campus members and Administrators.
List/View/Filter Announcements	Shows all animal care and classroom related announcements to user. This action can be done by all types of users.
Create/Edit/Delete Announcements	Provides create/edit/delete operations on announcements about animal care issues to Animal Care Staff and Classroom issues to Approval Staff.
Create/Edit/Delete Animal	Provides create/edit/delete operations on animals to Animal Care Staff.
List/View/Filter Animal	Shows all animals in the campus. This action can be done by Animal Care Staff.

Create/Edit/Delete Animal Problem Request	Provides an ability to campus members to create new animal care problem such as health and danger situation to Animal Care Staff.
List/View/Filter Users/Animals	Shows all animals and users in the campus. This action can be done by Administrators.
View/List/Filter Animal Records View/List/Filter Animal Problem Records	Shows all animal care related records. This action can be done by both campus members and Animal Care Staff. Animal Care Staff can respond to these records to take care animals.
View/List/Filter Requests/Records	Shows all animal care related records and classrooms requests. This action can be done by Administrators.
Ban Users	Provides an ability to disable any type of users that will prohibit all operations on the system. This action can only be done by Administrators.
Manage Server/Database	Shows all servers and databases on the dashboard and provides ability to do ready actions on them. This action can only be done by Administrators.

Table 1: System Functions

1.3.3. User Characteristics

Majority of the users will consist of students and academic staff who will be aware of using last generation of technologies like our system. So, there would be no adaptation problem for learning and using this system.

The other big part of the users are the campus employees named as animal care staff and approval staff who will be in charge of dealing with official response and approval procedures. Since all of the employees are sufficiently educated and their education level are qualified by governmental authorities. This enables them to use the system easily.

Lastly, the system administrators oversee and manage all the infrastructures related to this project such as system services and servers.

1.3.4. Limitations

1.3.4.1. Regulatory policies

METU system policies will be valid.

1.3.4.2. Hardware limitations

Only small tablet computers which will be selected by system administrators and developers will be allowed to use.

1.3.4.3. Interfaces to other applications

There is no such specific limitation due to our systems has no such interface with external applications.

1.3.4.4. Parallel operation

There is no such specific limitation.

1.3.4.5. Audit functions

METU id cards will be the only tool for authentication.

1.3.4.6. Control functions

These functions will be handled by related university officials.

1.3.4.7. Higher-order language requirements

There is no such specific limitation.

1.3.4.8. Signal handshake protocols

METU Campus signal handshake protocols will be used.

1.3.4.9. Quality requirements

System must be backed-up ordinarily and must be up 7/24.

1.3.4.10. Criticality of the application

There is no such criticality.

1.3.4.11. Safety and security considerations

Safety and security considerations are the same with the METU systems.

1.3.4.12. Physical/mental considerations

Physical and mental considerations are the same with the METU systems.

1.4. Definitions

The definitions of critical terminology for the project are listed below:

Admin **:** A user has administration privileges on the system like seeing all user profiles, all requests and problem records as well as servers and services.

METU Campus System **:** All IT systems and services of METU including campus member information such as students, academic staff and other employees.

Animal Care Staff **:** Employees who are in charge of solving and coordinating animal problems.

Approval Staff **:** Employees or administrational staff who are in charge of authenticating the classroom requests.

Classroom Request **:** A request which is sent by campus members to gain an empty classroom scheduled time, date and place.

Animal Problem Record **:** A problem that has been created by campus members to take care animal related issues such as injury, food or dangerous cases.

Campus Member **:** Any user who has a METU Id card such as students, academics and employees.

2. References

- IEEE. (2011, December 1). 29148-2011- ISO/IEC/IEEE International Standard - Systems and software engineering -- Life cycle processes --Requirements engineering. Retrieved from http://ieeexplore.ieee.org/document/6146379/ on March 12, 2018. doi: 10.1109/IEEESTD.2011.6146379

3. Specific Requirements

3.1. External Interfaces

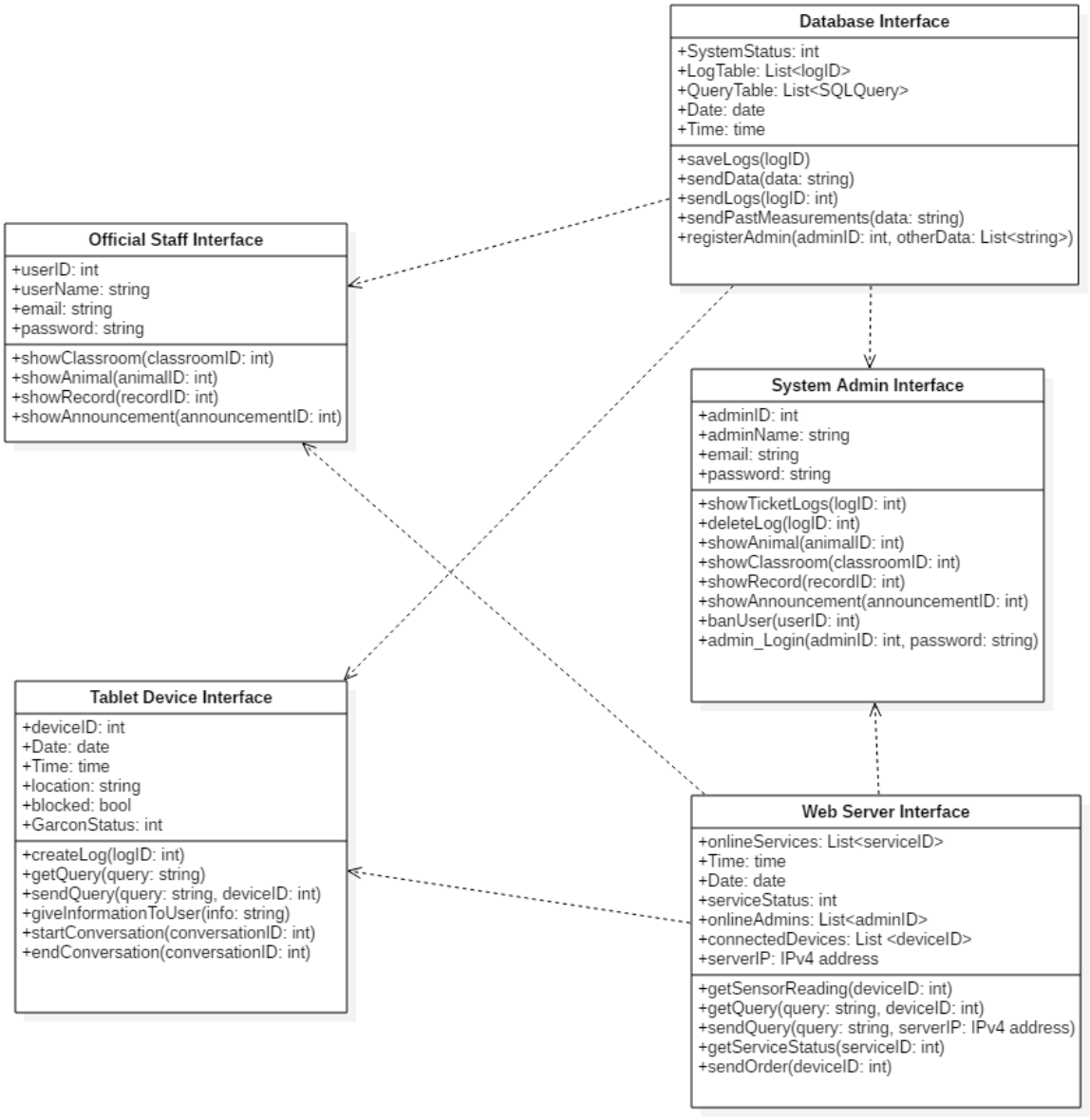

Figure 2 : External Interfaces Class Diagram

3.1.1. Tablet Device Interface

Requirement 1 : If connection to server problem occurs, ticket device should warn user both by saying and creating a pop-up window on the screen about the possible problem.

Requirement 2 : Tablet device shall take a photograph while user is doing logon process for security. This photograph will be kept on the device at least 1 day then it will be deleted.
Requirement 3 : This interface should be directly able to save a new record to Database including a flag information column which shows it needs a approval by related official staff.

3.1.2. Official Staff Interface

Requirement1 : All classroom request should be reported to official staff creating a notification on their dashboard in a live manner.

Requirement2 : All animal problems should be reported to official staff creating a notification on their dashboard in a live manner.

3.1.3. System Admin Interface

Requirement 1 : All disconnected devices should be reported to administrators via creating a notification on their dashboard in a live manner.
Requirement2 : System admin shall see users' last message logs and personal information when he/she is in "disallow member" component of this interface.
Requirement3 : This interface shall show real-time performance and user statistics to system admin.
Requirement4 : This interface shall send e-mails to both authorized and disallowed users at the time of system admin finalizes the procedure. This e-mail shall notify users about the process and contain cause of dismissal for disallow member procedure.

3.1.4. Database Interface

Requirement1 : The interface shall categorize each entry from which component it comes. Then, it shall direct them to appropriate databases and tables.
Requirement2 : This interface shall be responsible of account management and login of system admins and IT staff.
Requirement3 : The interface shall get recent AI data from Garcon in order to use in the future AI calculations.
Requirement4 : The system will provide a management page for authorized personnel to enable them edit or copy the data.

3.1.5. Web Server Interface

Requirement1 : The system shall provide a way of communication between Garcon and web server.
Requirement2 : The system shall allow sensor devices to send data to web server, in order to do that the interface shall use IOT technologies.
Requirement3 : The system shall also let web server to send orders to these devices in

order to manipulate them.

Requirement4 : The interface shall include ways of communication with out of campus services in order to provide information to users or send tickets to them.

Requirement5 : The web server interface shall hold all live information of the system, directly communicate with the garcon and devices to keep them updated.

3.2. Functions

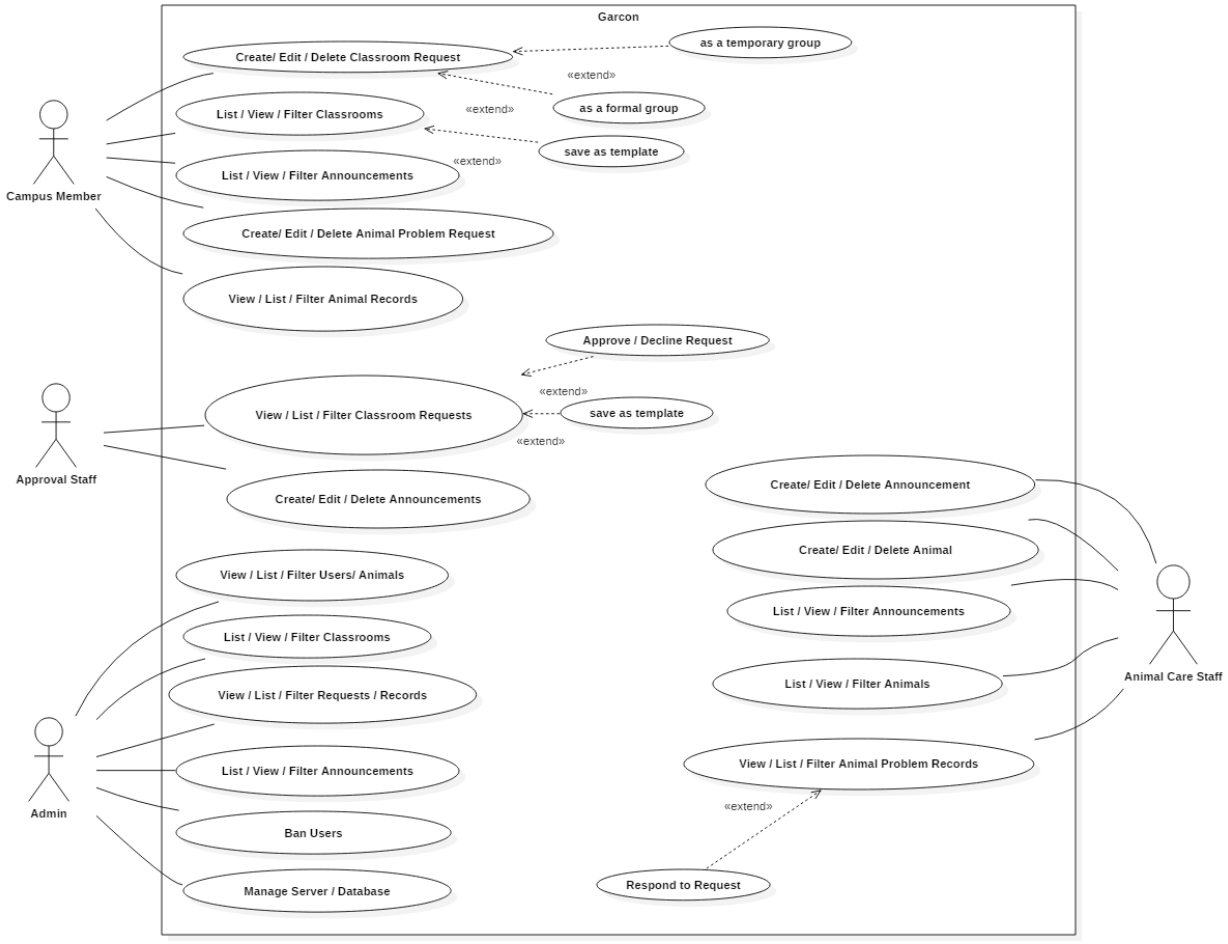

Figure 3 : Use Case Model

Use Case ID	1
Use Case Name	List/Filter/Search Classrooms
Actor	Campus Member
Description	To list all the available classes at a time.
Pre-conditions	1. Campus member ID Card Authentication 2. Campus member navigate to dashboard page.
Post-conditions	1. Ticket system asks for saving this list request. 2. Campus member can select a classroom from the list as a request.
Normal Flow	1. Campus member creates a new search record. 2. Ticket system asks for information about location, date, capacity and facility. 3. Campus member provides asked information about location, date, capacity and facility. 4. Ticket system automatically creates a new search record. 5. Ticket system lists available results from the most matching one to the least matching one.
Alternative Flow	3a. Campus member selects a previously created search record. 4a. Ticket system automatically modifies existing search record.
Exceptions	None.

***Table 2**: Use Case Description for List/Filter/Search Classrooms*

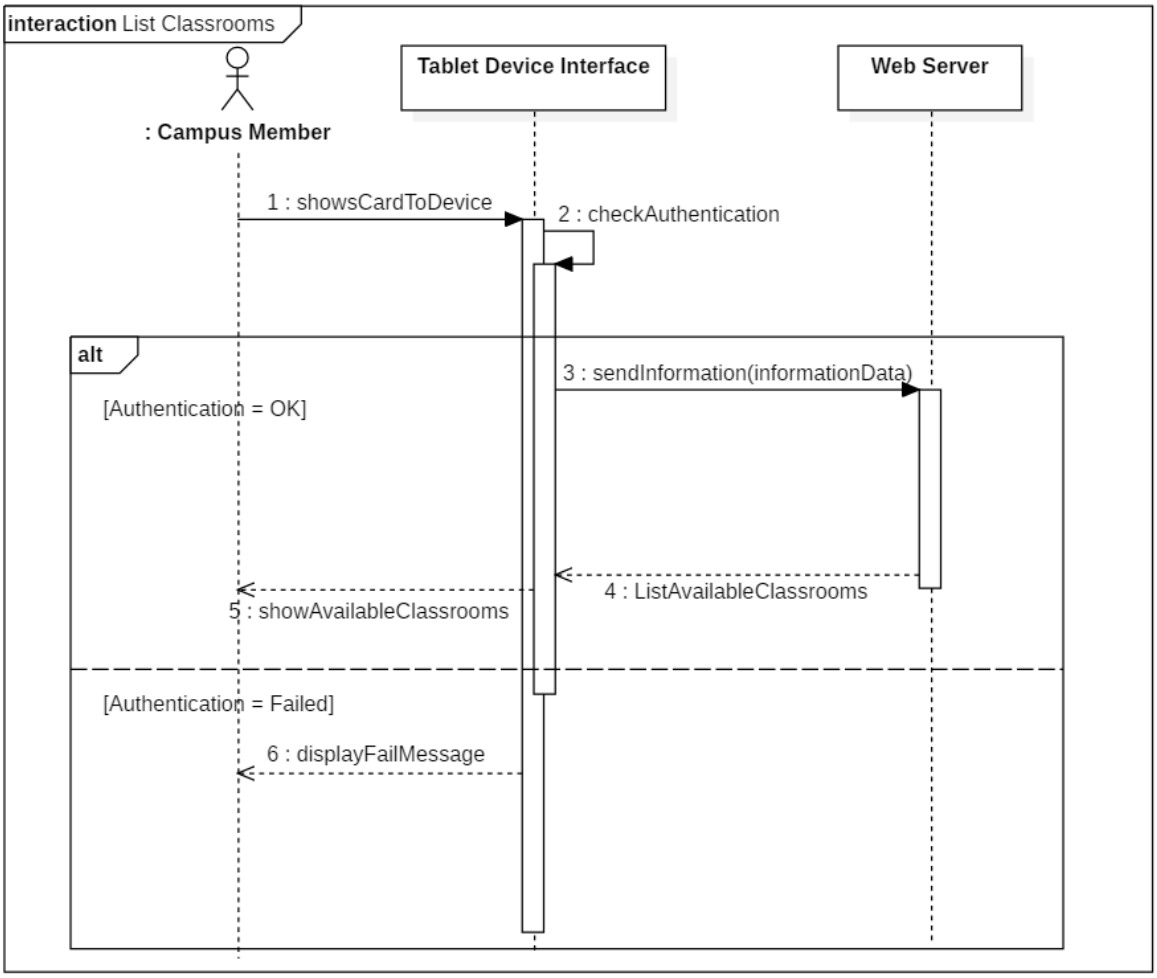

Figure 4 : Sequence diagram of "List Classrooms"

***Table 3**: Use Case Description Create/ Edit / Delete Animal Problem Request*

Use Case ID	2
Use Case Name	Create/ Edit / Delete Animal Problem Request
Actor	Campus Member
Description	To deal animal problems, Campus member creates a request for a specific problem definition such as sick, dangerous or new animals.
Pre-conditions	1. Campus member ID Card Authentication 2. Campus member navigate to dashboard page.
Post-conditions	1. System acts for saving this request. 2. Campus member asks for dealing the problem his/her own.
Normal Flow	1. Campus member creates a new animal request 2. System asks for information about request such as new, sick, injured, dangerous animal or entrance into a forbidden zone. 3. Campus member provides asked information. 4. System automatically saves the request and sends it to the related official staff.
Alternative Flow	3a. Campus member selects a previously created request. 4a. Ticket system automatically sends existing search record.
Exceptions	None.

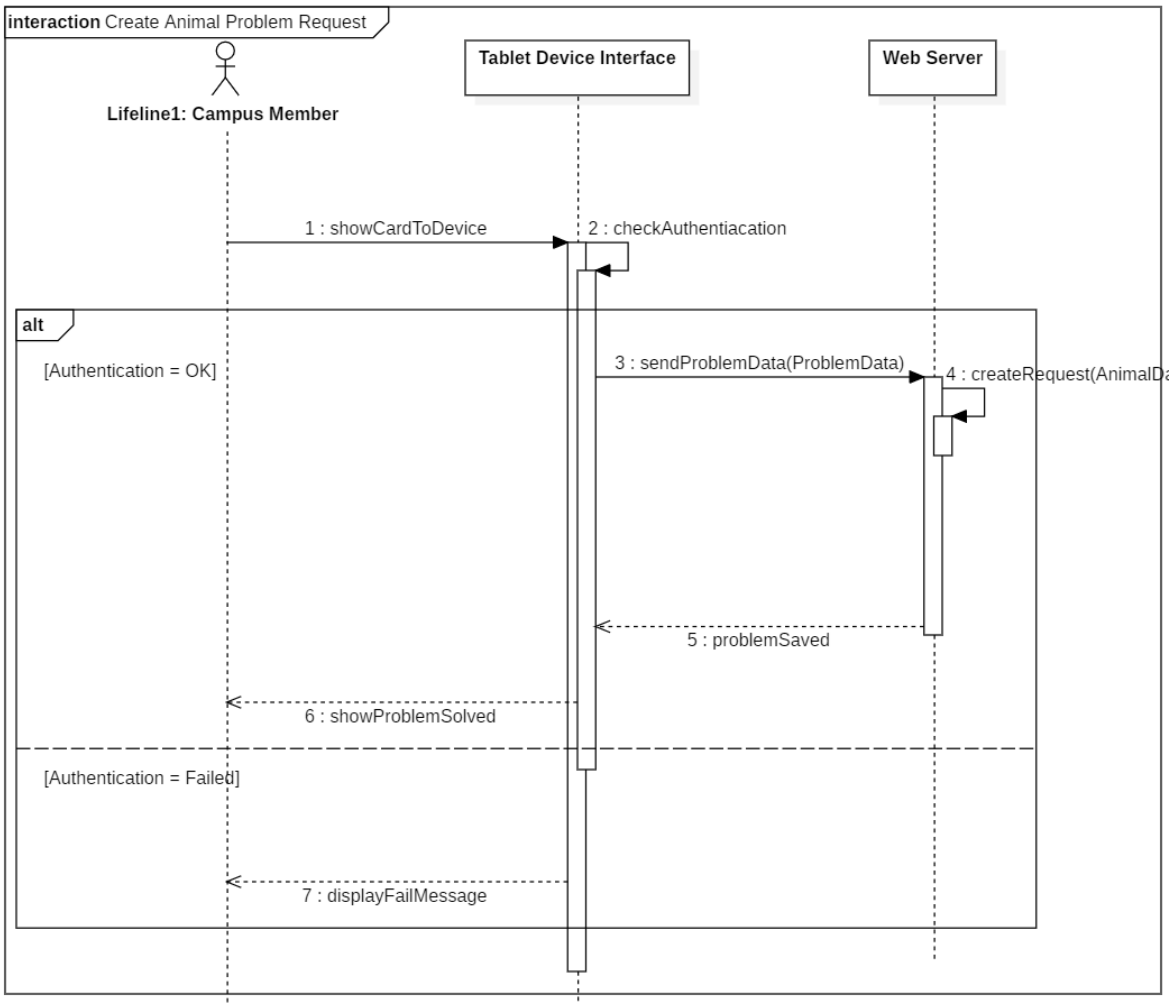

Figure 5 : Sequence diagram of "Create Animal Problem Request"

3.3. Usability Requirements

Requirement 1 : A user shall be able to use all functions provided to him/her of the system wherever a ticket device and an internet is available.

Requirement 2 : In case of recording a new ticket on the ticket device, all conversation should be seen on the screen. Moreover, recent conversations done by the current logged in user can be seen and filtered on the screen by scrolling down.

Requirement 3 : Ticket system should be available for both native speakers of the country and international campus members such as having both Turkish and English options for ticket system.

Requirement 4 : Ticket system screen submission buttons and fonts should be big enough and in a suitable color for both being able to distinguish difference between system feedbacks and user inputs.

Requirement 5 : Ticket system should be available to both blind and deaf people by making notification and options on the screen bigger and more colorful for deaf ones and by making more suitably elevated voices for blind ones.

Requirement 6 : Access to all main services and creating any input or taking any output could be available at most in 5 steps from the user dashboard.

Requirement 7 : All open requests and records should be available to be searched by all user types in a search dialog on ticket system.

Requirement 8 : System Administrators shall be able to create and run direct database queries on administration dashboard.

Requirement 9 : System Administrators shall be able to directly filter system logs via basic list boxes and buttons on the administrator dashboard.

Requirement 10 : Campus employees assigned to work on this system such as an approval or an animal care staff shall be able to have all abilities with campus members.

Requirement 11 : Campus employees shall be able to search, filter and edit all records related to his/her system in at most 5 sequential steps.

Requirement 12 : All user types should be able to save dashboard search, filter and new record templates to gain time for future works.

3.4. Performance Requirements

Requirement 13 : The system shall be available to 30.000 simultaneous users.

Requirement 14 : New record or request creation delay should not exceed 300ms on the ticket device and response notification from server to user shall not exceed 300ms.

Requirement 15 : The time between a user asks or gives any input to ticket device and ticket device response to that input shall be at most 150ms.

Requirement 16 : Network infrastructures between servers should not below 10Gbps.

3.5. Logical database Requirements

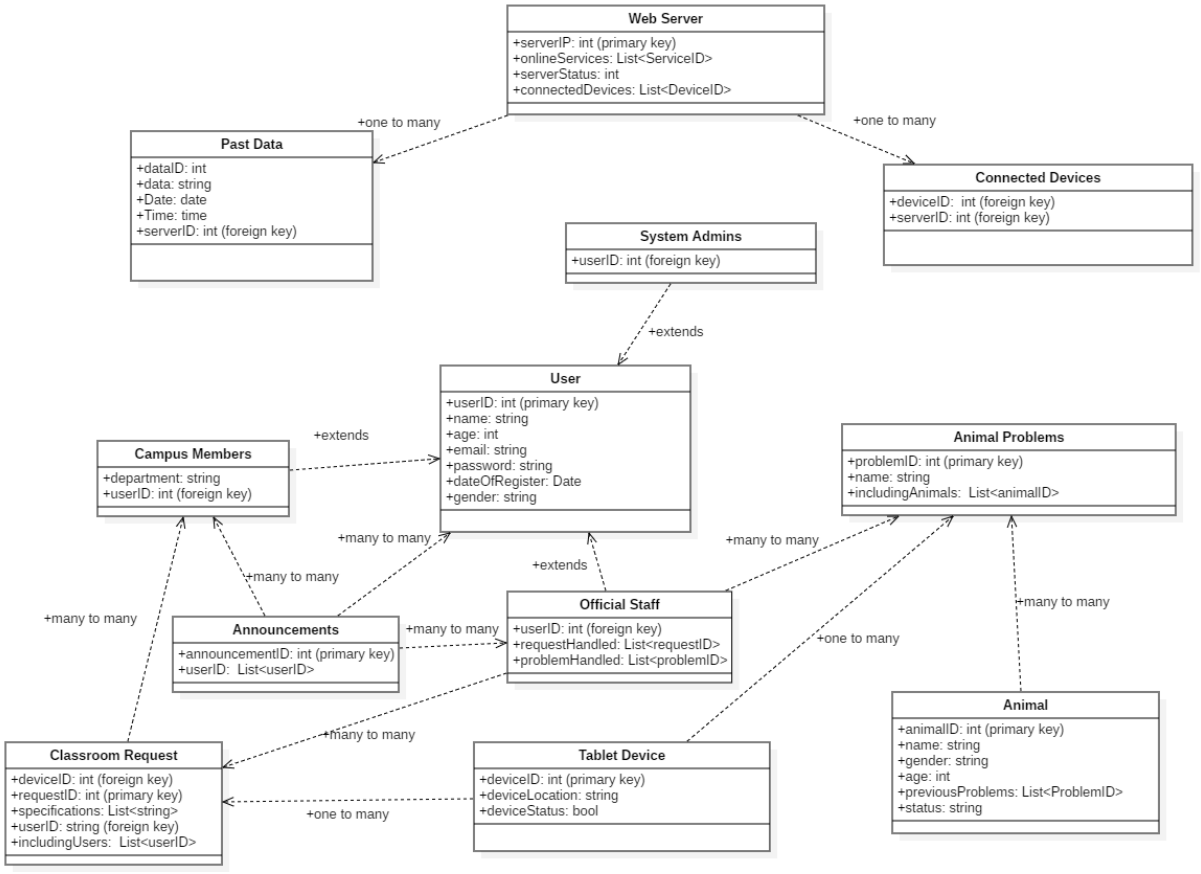

Figure 6 : Logical Database Diagram

Requirement 1 : Only system admins shall have access to system admins table.

Requirement2 : Only system admins shall be able to add new entry to system admins table.

Requirement3 : Only admins shall remove an entry from admin table.

Requirement4 : Campus Members, System Admins and Official Staff are weak entities of the User table.

Requirement5 : Only system admins shall be able to see Classroom Request table and search in it.

Requirement6 : Entries of Classroom Request table shall be updated when new requires is created.

Requirement7 : Animal Problem table shall be updated when new Animal Problem is established.

Requirement8 : Only system admins shall be able to change deviceStatus entry in the Tablet Device table.

Requirement9 : When a new device is connected to the system, connected Devices table shall be updated.

Requirement10 : All passwords must be encrypted when login.

3.6. Design constraints

Requirement 1 : All system a subsystem structures must be designed in accordance with both law and university regularities while providing law of privacy.

Requirement 2 : System logs must be kept at least for 1 year in case of any legal purpose such as investigation process by administration of university or government.

Requirement 3 : There should be no unnecessary information flow from campus IT system to Garcon Project.

3.7. Software system attributes

3.7.1. Reliability

Requirement 1 : Data corruption probability of the system shall not exceed 0.001. To achieve this probability, there will be at least two concurrent databases. Concurrent databases' backups must be taken for every week in a specific day such as 1 pm Saturday. Moreover, these backups will include incremental backups already in a schedule such as per 12 hours all time which provide both efficiency and flexibility while coming back from backups for specific time in a shorter time in case of any disaster scenario.

Requirement 3 : The system should have a disaster recovery center in a different location from live system with a minimal cost.

Requirement 17 : All new coming records should be kept on the ticket device at least 12 hours in case of any connection between ticket device and servers and the device should do all accumulated records' write operations to servers or databases whenever it finds a connection to them. The ticket tablet device should have at least 500MB offline storage for disconnected cases.

Requirement 4 : All new system and software packages are tested on all different types or models of tablet devices for the purpose of compatibility.

Requirement 5 : After all compatibility tests, performance tests are done, if the new coming updates do not acquire system performance regulations given in this document, they can't be distributed through the system.

3.7.2. Availability

Requirement 1 : All system and service structures must work on virtual servers and all these servers should be placed in a failover cluster structure which prevents sudden server down cases and possible data losses and creates 7/24 availability.

Requirement 2 : Physical cluster structured servers should have enough physical resources and configurations to provide live migration of virtual servers between

physical servers in at most 5 minutes with so that users would face at most 5 minutes wait minute delay in case of worst-case disaster scenario.

Requirement 3 : All maintenance schedule should be in weekend nights and it will be decided by system administrators in coordination with campus administration and there should be announcements about maintenance to all user types. Maintenance work should be finished at most 2 hours.

Requirement 4 : System administrators should be responsible to take reaction in an hour on the system in case of any disaster scenario.

Requirement 5 : Total amount of shutdown status of the system should not exceed 10 days for a year.

3.7.3. Security

Requirement 1 : Web Server Interface should do its broadcast via https protocol using valid international SSL certificate.
Requirement 2 : All network devices and servers should use TCP or equivalent secure communication and transfer protocol for information exchange.

Requirement 3 : All software socket programming modules should use secure protocols such as TCP and send critical values encrypted such as passwords. Used encryption methods should be strong enough for known attacks such as brute force and man-in-the-middle.
Requirement 4 : All devices including network devices, ticket tablet devices, servers and databases should be scanned by commercial vulnerability tool in a scheduled period and it must be one every week in a flexible time which will be chosen by system administrators and finally all vulnerabilities must be closed by necessary actions by system administrators.
Requirement 5 : All system security updates will be proven to be installed on related devices which will take at most 1 week from the release date of regarding security update package.
Requirement 6 : All system will be protected by a enhanced firewall device against all possible attacks from the Internet.

3.7.4. Maintainability

Requirement 1 : All system development and maintenance procedures should be exactly documented for future developers and system administrators. In addition, the document(s) mentioned above should be easy to read and be understandable by new IT colleagues that will be hired in case of any personnel crisis to maintain this all system without more complexity.

Requirement 2 : All system should consist of subsystems in a modular manner that is developer should keep modularity as much as possible to decrease complexity of the system in future.

Requirement 3 : The system should allow software upgrade of whole project without any down time.

3.7.5. Portability

Requirement 1 : The system should enable any location change of ticket devices and the system should not be affected by these changes.

Requirement 2 : Ticket tablet devices should have a plug and play ability manner which should provide any ticket tablet device installation in any place in campus if there is a network connection over there whether cabled or wireless.

3.8. Supporting information

Garcon Project is a system that extends abilities of campus by implementing IoT and AI technologies and putting these technologies together with human interaction. This project aims to create perfect efficiency in both classroom scheduling, sharing and animal care issues by getting together human and campus authorities in a collective way.

This project does not stores any private information of individuals, it just process existing passwords of users via campus information system to create security and prevent anonymity in case of law issues.