Student dorm Accommodation application

PROIECT DE DIPLOMĂ

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# Introduction

## Project context

Although we live in a high tech era, the bureaucracy, paperwork, and queues did not reduce. Even if the technology we have at hand is more advanced than ever, the queues in some institutions, in example the city hall, the police office, hospitals, and insurance companies did not shorten at all, especially in rush hours.

The queues have slowly became a part of our daily lives: in hypermarkets, banks, ATM machines and so on. The bureaucracy has a key role in the growth of the queues in different institutions. The number of documents required for a wide range of approvals from institutions are the first thing a person runs into when they need some signed documents by a public institution. This happens especially while signing up for your driver’s license, where you need numerous notices: psychological, ophthalmological and so on but as well when enrolling into a university where you need your high school diploma, birth certificate, ID card, and so on. The problem that still persists is that there are periods of time when a really high number of people are requesting a really high number of documents from the same institutions.

There are some methods through which the shortening of the time spent in a queue was attempted. Some of these methods are the following: paying with your credit card in hypermarkets, without the cashier having to calculate the change you should receive. One other method for this are the queue spot machines used in most of the Romanian public institutions today. When you arrive at the queue, you punch a button on the machine and a small card with your queue number is released. Doing this you can get a hint of how much time you have to wait before your turn comes. Taking in consideration that you wait for a while to check how long the persons currently in line wait, in example 30 minutes per person, you could calculate the number of hours you would have to wait and return back to the institution when your time has come. Although this seems like a good idea on paper, that period could vary a lot. In example, you have ten people ahead of you, and each should take up about 30 minutes to finish, probably some of them will encounter some other difficulties and take more than 30 minutes, so when you return to the queue just before your turn you will find out that you have to wait an extra hour in the best case.

Every year, the students who need to live in the university’s dorms are put through a constant struggle of waiting in queues for hours, endless paperwork, and frustration. The accommodation process should be relatively simple, but due to the current used application, which is old and rudimentary, it can become really stressful as well for the students and the dorm committee and administrator as well.

Since I took part in the accommodation process as a committee member for the past two years, I was able to figure out some of the problems which made the entire process end up in a bottle-neck. In both these years, the current application crashed, resulting in lost data and having to repeat the process all over again. Aside of that, the only ones who could add the students’ data were the dorm administrators.

The student has to arrive at the dorm he was placed in with his file of papers required for the process. Then the student receives an order number. When his turn finally comes the accommodation process begins. In the best case scenario, the dorm administrator assigns him a room. In the worst case scenario, the student is not featured in the database and the administrator or a committee member has to add all the student’s data in the application and only after that the student is assigned to a room. After being assigned to a room, his file is processed and his documents are stored. The next step is to have a custom contract for the student printed out, and then have a committee member fill out a badge so that the student can prove he lives in that particular room. After all these steps are over, the student then proceeds to make the payment for the first month. The entire process could take up to 4 or 5 hours for a student (including his waiting time).

In order to reduce the time spend waiting in queues in order to get accommodated a new accommodation web application was proposed in order to shorten the accommodation process for each student.

The web application’s role is to reduce the number of steps required going through before a student receives the key to his new room in the dorm he was assigned to and it gives the student the opportunity to enter the relevant information on his own before even joining the queue. So, as mentioned above, this way the time spent by a student in order to get accommodated should be more constant now since the possibility of not having his information in the database and having the administrator adding it by hand is diminished.

The application’s use should shorten the entire process’ duration by at least 60% for each user, therefore reducing the stressful waiting in lines, and as well helping out the dorm administrators and committees since they won’t be required to work for 12 – 13 hours a day during those 4 or 5 days of the accommodations.

## Objectives

The proposed project consists in a web application and a QR code that should be used by the students waiting in the queue in order to register their information in the database before their turn comes.

The application’s purpose is to make the accommodation process of each student easier by using a user-friendly interface that can be easily used by the accommodation committee.

One of the objectives is the creation of a REST service that can be used by a wide range of devices, therefore increasing the number of users without keeping in mind the model of the used device that would be used in the process. For the data transmission the JSON format will be used. JSON is a platform independent format and so it facilitates the use of the application on a wide range of devices without depending on the device model or the operation system on the respective device. Using this REST service the number of additional implementations for more platforms will be reduced to zero.

Another objective is the development of a web application that ensures a fast paced processing of a student. Usually the accommodation flow in any dorm is known. This process takes longer when all the information regarding a student have to be added by hand and so creating a bottle-neck in the process, because the student next in line should wait more time until the administrator adds the data. And taking in consideration that most of the dorm administrators’ age is over 50, many of them are not so familiar with the use of a computer, therefore they type in the data way slower than usual.

Another important aspect is having the student upload his documents in digital version while registering his information. In this case, when the respective students’ turn in the queue is up no additional paperwork processing would be needed. The administrator would just assign him to a room, generate the contract and the student should only pay the first month rent.

## Specifications

One of the application’s objectives is having a simple, crisp, and user-friendly interface. This is an important factor because the application should offer the possibility of shortening the duration of the process, and in order to do this, the administrator and the accommodation committee should get used to the application and the steps required going through in order to increase the speed of the accommodation process.

A register account and authentication page is required so that each dorm administrator and committee member can have a username and a custom password. The password should be encrypted using an encryption algorithm so that in the case of someone unauthorized gaining access to the database intending to damage the system by any means the current existing users’ passwords should be protected.

One of the key objectives of the application is creating a page where the dorm overview is available, in order for the administrator to see the status of each room: available places in the room and other students from that room.

A page containing a table with all the students in the database and the option to assign them to a room in the dorm as well as a search option in order to get rid of the scrolling until a respective student is found in the table should be implemented.

Another objective of the application is to generate a QR code that can be scanned by students so they update their information in the database on their own. Scanning this code would redirect the student to a web page of the application containing a registration form and a file uploader for the documents. This page, besides the other pages of the application, will not require to be authenticated with and existent user in order to be accessed

Another aspect of the QR code linked page is having certain restrictions on the page with the URL encoded in the QR code is demanded because students should not have access to any other private information inside the application such as other students’ data, or the possibility to select a room for themselves before the administrator decides.

# Bibliographic research

## QR Codes

The QR code( abbreviation from Quick Response code) is a matrix bar code( or a bidimensional bar code) that was initially used in the Japan railway industry. The QR code system was invented in 1994 by Denso Wave having as a purpose the tracking of vehicles during fabrication. The QR code was conceived to allow fast scanning.

The QR code is conceived to be detected by a two dimensional image sensor and then being analyzed by a processor, unlike the standard one dimensional bar code which was conceived to be scanned by a narrow beam of light. The processor identifies the three distinct squares placed in the corners of the QR code image and uses one, or more, small squares in the fourth corner of the code in order to determine the orientation, scanning angle and size. The small dots in the QR code are then converted in binary code and validated by an error correction algorithm.

The amount of information stored on a QR code depends on the data type( binary, alphanumeric, numeric, kanji) as well as on the error correction code.

The error correction in a QR code is achieved using the Reed-Solomon error correction algorithm. A higher error correction level translates into a smaller amount of information encoded on the respective QR code. In the case of large dimension QR codes the information is split in more Reed-Solomon blocks. The dimensions of these blocks is chosen such as the number of errors that can be corrected in one block does not exceed 15 therefore limiting the complexity of the decoding algorithm. The Reed-Solomon blocks will be overlapped so that the errors in one QR symbol will not overwhelm the capacity of that block. Due to the error correction we can insert errors into the QR on purpose to make them more aesthetic for the human eye [9].

### Classification

Micro QR is a smaller version of the standard one designed for application where the dimension of the symbol is limited. There are 4 versions of the Micro QR code: from the largest one being able to store up to 35 numerical characters to the smallest one composed of 11x11 modules.

IQR code was developed by Denso Wave as an alternative to the standard QR code which can be used in square or rectangular shape. The rectangular shape comes in handy when the object which the QR is generated for has a cylindrical shape. These codes can store the same quantity using up to 30% less space. There are 61 versions of square IQR codes and 15 of the rectangular ones.

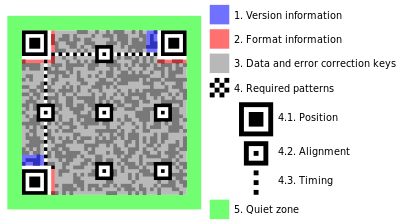


Figure 2.1 QR code structure

### Risks

The only case in which standard QR codes can have executable data is the URL data type. These URLs may contain JavaScript code that can exploit vulnerabilities on the reader or the web browser.

If the software is not exploited, malicious QR codes combined with permissive readers can expose the computer’s content and the user’s private information. This process is known by the name of “attagging”. On a smartphone it can gain complete access to the internet, permission of using the camera, reading and writing local data and globally modifying the system’s data.

Scanning a malicious QR code can lead to accessing unsecure websites which exploit various browser vulnerabilities allowing access to the phone’s camera, microphone and GPS and then transmitting sensitive data( passwords, files, contacts, transactions) to a server in order for them to be analyzed. It can as well send e-mails, SMS messages, Instant messages or DDOS packages as part of a botnet corrupting the confidentiality settings and leading to identity theft. All these intrusive processes can run in the background while the user thinks he opened a harmless web page[11].

### Uses

#### Mobile devices’ operation systems

These operation systems support URL redirecting, allowing QR codes to transmit metadata to other apps already installed on the device. A wide range of free or purchasable applications have the option of scanning QR codes and redirecting to specific external URLs.

#### QR code payment

The QR codes can store the information of a bank account or a credit card account and can as well be specially designed to work with a specific payment provider’s applications.

The QR code payment was broadly used in the Czech Republic in November 2012 when an open format for exchanging payment information was released and approved by the Czech Banking Association as an official solution for paying using QR codes.

QR codes are often used in the field of cryptographic currencies such as Bitcoins. Cryptographic keys, transaction information and other information are shared between digital wallets this way.

#### Encryption

An android app can encrypt and decrypt QR codes using the DES algorithm. One particular case where encrypted QR codes are used is in the Japanese Immigration system, where they are used for passport visas. Otherwise, encrypted QR codes are not generally used.

#### Funerary use

Ishiniokoe in Yamanashi Prefecture, Japan started selling tombstones with QR codes in 2008. Those codes would lead to a digital grave site of the deceased.

#### Website authentication

The website generates a QR code and the user can scan that code inside a mobile app. After scanning the code, the user is authenticated on the website as well. This procedure is used by Whatsapp web application.

#### URLs

Since the QR code is a faster method of accessing a website than manually entering the URL it quickly became an interest for the publicity industry. Excluding the simple commodity of the fast website access, publicity companies hope to turn the ad into a selling process, by bringing the user to the company’s website

## State of the art

#### Current student dorms accommodation app used by the TUCN.

The current student dorms accommodation app is a web application used by the Technical University of Cluj-Napoca during the dorm accommodation period. It is linked to the databases of the University’s department of Informatics.

# Analysis and Theoretical Foundation

## ASP .NET MVC

### The MVC pattern

Model-View-Controller( MVC ) is an architectural pattern which influenced the computer science domain over the last decades. Originally named Thing-Model-View-Editor in 1979, it was later on simplified to Model-View-Controller. It’s an elegant and powerful method of separating the logic in an application which works really well with web applications. It is explicit concern separation increases the complexity level of an application’s design by a small amount but the extraordinary benefits justify the extra effort. Since it was introduced, the MVC pattern has been used in more and more frameworks. MVC can be found as well as Java and C++, on MAC OS and windows and it can be found as well included in a broad variety of frameworks.

### ASP .NET MVC

ASP .NET is a web platform providing all the necessary services in order to build an enterprise server based web app. ASP .NET is developed based on the .NET framework so that all the framework’s facilities are available to the ASP .NET applications

Web applications developed with ASP .NET are ran by the .NET framework and not by the OS. This makes the apps type-safe and has the advantage of having automated memory for garbage collection. In addition, the .NET framework provides us with a structured error management and supports multithreading. Information about classes, members, and in general, all our code is stored as metadata in kits generated during the compilation.

To launch ASP .NET web applications we can use one of the various existing techniques, in example Web Deploy, or the most basic method, copying of the files onto the server. After all the applications are on the server, the Microsoft web server( Internet Information Services or IIS ) must be configured. The previously mentioned server will host all our ASP .NET applications and will make them available to the clients.

One notable fact is that ASP .NET is completely object oriented. The written code will have access to all the objects in the .NET framework and it also can implement all the benefits of an object oriented development environment( inheritance, polymorphism, encapsulation ).[2]

ASP .NET MVC is a web application development framework which is using the Model-View-Controller pattern. It is developed on top of the ASP .NET framework. The main purpose of this pattern is to isolate the business logic from the interface for a better maintenance, improved testing and simplifying the structure of the application.

The Model-View-Controller( MVC ) pattern is an architectural design principle which separates the application’s components into three levels. This separation offers more control over the individual parts of the application, allowing a faster and better development, improvement and testing of the specified parts.

The MVC pattern in ASP .NET would consist of the following:

* The Model: The classes representing the domain of work. Often these objects encapsulate data stored inside a database as well as the code for the data manipulation and imposes the business logic. In ASP .NET MVC this would most likely be the Data Access Layer
* The View: A template for dynamic generation of the HTML. We could say that the view is responsible for transforming one or more models into a visual representation
* The Controller: A special class managing the relationship between the view and the model. It reacts on the data entered by the user, communicates with the model and decides which view should be displayed ( in the case the view exists ). In ASP .NET MVC this class is conventionally named with the “Controller” suffix.

A representative image for the MVC architecture can be seen in figure 3.1 below



Figure 3.1 MVC Architecture

ASP .NET has certain abilities that make it the best option if you have to choose between one or many of the following:

* High level of control over the generated HTML. The ASP .NET MVC view will be generate exactly how the code was written.
* Easier unit testing
* Separating concerns. Having all the aspects of the system clearly separated one from another. Because of the pattern it implements, a MVC application is split in different decoupled parts( model, views, controllers ), therefore permitting a much more simplified maintenance process.

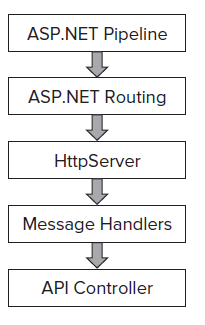
One of the most important concepts of the MVC application is that there is no relation between requesting a page and a certain file on the server.

In MVC applications, when a request is made, a component named routing engine attempts finding the correct route for the current request. A route defines the requests using a string as a pattern and decides which controller and which method in the selected controller should process the request. Once the route is identified the routing engine creates a request handler, which will create a Controller type object to process the requests. The controller will then call the specific method for the requests processing. These methods found in the Controller classes are called action methods. When a request is done being processed, the action method will come up with a result to be passed back to the user. Usually, the result is a HTML code which the user will see in the browser.[4]

#### JSON

JSON (JavaScript Object Notation) is a standard for data exchange. There is a broad range of parsers for different languages. JavaScript objects can be represented in JSON and can be sent as a part of an Ajax request. The same way if an action method in a controller returns a JavaScript Object, MVC is capable of converting the object in JSON in order to be returned with the response.

JSON is usually preferred over XML for data exchange between the browser and the server because JSON can represent almost every data structure XML can but with a lesser load.[6]

Figure 3.2 Web API Architecture

## ASP .NET Web API

ASP .NET Web API is a framework that facilitates building HTTP services for a broad range of clients, including mobile devices and browsers.

Web API is an ideal platform for the construction of pure HTTP services where the requests and response are generated using the HTTP protocol. The client can call one of the following requests: GET, PUT, POST, and DELETE, and the Web API will return the corresponding response.

### Web API Architecture

The routing configuration in Web API is a bit different than the routing in ASP .NET MVC because Web API is using HttpRouteCollection and Route. The Web API team reused the routing logic from MVC, but this one is different due to desiring to keep it independent of the ASP .NET routing. They decided to make it independent so that Web API will not have any dependencies of the ASP .NET classes and so it can be used in the Windows console or a Windows service.

While using the ASP .NET routing the system won’t only register the HttpRoute object, but will as well create a Route wrapper object.

The difference between ApiController and the MVC controller consists in the fact that in the WebApiController the requests are automatically sent to the corresponding actions according to the type of the HTTP request. There is still some flexibility left, allowing the overwriting the previous mentioned fact so that WebApi will use the action’s name in order to redirect the requests to the corresponding WebApiController method.[3]

### Content negotiation in Web API

Content negotiation is the process implying the selection of the data’s best representation for a response when more representations are available.

The framework Web API is based on allows the client to select a specific data type on request because it implements content negotiation.

Web API responds using the JSON format by default, although when making a request to a certain resource you can specify the returned data type so that Web API will know what is requested and choose the requested data type.

### Routing in Web API

In order to determine which action should be called, the framework uses a routing table which is similar to the one used in MVC.

The Web API framework receives a HTTP request, and it tries to match the URI with one in the routing table. If no route in the table matches, the client will receive an error 404.

The simple data type parameters are taken directly from the URI, but the more complex parameter types are taken from the request body, the body being deserialized based on the sent content.

## Entity Framework

Entity Framework is a set of technologies from ADO .NET that support the development of data oriented software applications.

Entity Framework allow the developers to work with the data structured as objects and proprieties specific to the domain, such as clients and their addresses without bothering with database tables and columns that store the data. With Entity Framework the developers can use a higher level of abstractization while working with the data. They can create and maintain data oriented applications with less code required than in traditional applications. Since Entity Framework is a component of the .Net framework, the applications using Entity Framework can run only on a computer with the .NET framework( minimum version 3.5 SP1 ) installed.

### Architecture

The ADO .NET architecture contains the following:

* Data source provider using the database connection interfaces when coding on the conceptual schema
* Map provider, a specific provider for each database translating the Entity SQL command tree in a native SQL query for the database
* EDM Parser and view mapping receiving specifications from the data model and maps it to the relational model allowing coding on the conceptual model. From the relational schema it creates visualization of the data corresponding to the conceptual model. Information from more tables are aggregated into an entity.
* Queries and updates: processes queries, filters and updates the requests in order to convert them into canonical command trees, which are then converted into native database queries by the mapping provider.
* Metadata services: handling the metadata related to the entities, relationships and mappings
* Transactions: in order to integrate with the transactional capacities of the used database
* Conceptual layer API: exposes the programming model in order to code on the conceptual schema. It uses the ADO .NET connection type object pattern in order to refer to the mapping provider using Command type objects to send the query and return EntityResultSets or EntitySets containing the result.
* Embedded databases: ADO .NET Entity Framework includes an easy to embedded database for caching and querying relational data on the client side
* Design tools such as Mapping Designer are also included in ADO .NET Entity Framework which simplify the mapping of the conceptual schema to a relational schema. It can specify as well which properties of one entity type correspond to a database table.
* Programming layer which exposes EDM as programming constructs to be consumed by programming languages.
* High level services such as reporting services working with entities rather than relational data

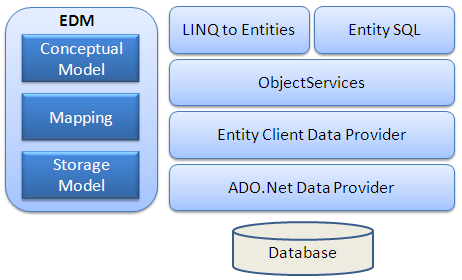


Figure 3.3 Entity Framework Architecture

### Entity Data Model

Entity Data Model( EDM ) specifies the conceptual data model using a technique known as Entity Data Model, which is an extended version of the entity-relationship model . The data model mainly describes the entities and their associations. The EDM schema is expressed in Schema Definition Language( SDL ).

Visual studio contains Entity Designer, in order to visually create the EDM and specifying the mapping. Using the Entity Designer results in XML files with the “.edmx” extension specifying the schema and the mapping

### Mapping

EDM Wizard in Visual Studio initially generates a one to one mapping between the database and the conceptual schemas. In the relational schema the elements are composed of the tables with the keys linking the related tables.

The entity types are an aggregation of multiple typed fields. Each one maps a column of the database and can contain information for multiple tables. The entity types can be related to each other and independent of the relationship in the physical schema. The related entities are exposed similarly using a field describing the relation they are participating in. Instead of retrieving the value from a column, it returns the entity or a collection of entities.

The logical schema and its mapping with the physical one is represented as an EDM and specified as an XML. ADO .NET Entity Framework uses that EDM to perform the mapping allowing the application to work with the entities.

ADO .NET Entity Framework performs the joins necessary to have entity reference information from multiple tables. When a certain entity is updated it traces back to the table from which the information came and does SQL update queries to update the modified values. ADO .NET Entity Framework uses eSQL which is a derivative of SQL in order to perform queries, set theoretic operations and update entities and their relationships. The eSQL queries are translated into native SQL if required.

### Entities

Entities are instances of Entity Types. They represent individual object instances ( such as client, and commands). An Entity’s identity is defined by the entity type it is an instance of. The properties of an entity type in ADO .NET Entity Framework are fully typed and fully compatible with the type system used in a DBMS system as well as the Common Type System of the .Net Framework. A property can be SimpleType( corresponding to primitive data types such as Integer and Characters ) and ComplexType which is an aggregate of multiple SimpleType propreties

### Relationships

Any entity types can be related by Association or Containment. A relationship type can have an operation or action associated with it allowing some action to be performed on an entity in the event of an action being performed on the related entity.

## AngularJS

Angular is a framework for dynamic web applications that allows the use of HTML as the template language but also allow you to extend the HTML syntax in order to express your applications component more clearly.

The use of data binding and dependency injection helps eliminating a part of the code that otherwise would have to be written. Since all of this happens within the browser this makes Angular to work great with any server side technology.

The mismatch between static documents and dynamic application is solved with either a library or a framework. A library is a collection of functions used while writing web apps. The code calls into the library when it is needed (in example jQuery). A framework is basically a web application template where the custom code fills in the details. Unlike the libraries, the framework is in charge and calls the custom code when needed.

Angular attempts to minimize the impedance mismatch between HTML and what the application really needs by creating new HTML constructs. Angular teaches the browser new syntax through directives

### Main advantages of AngularJS

Angular presents a higher level of abstraction and so it simplifies the application development but the cost of this abstraction is the flexibility. During the process, the developers created AngularJS with the CRUD applications in mind. Thankfully the majority of web applications are CRUD applications.

### Considerations while writing Angular code

Since Angular was built around the belief that declarative code is better when you have to build User Interfaces and wire software components together and the imperative one is better for expressing business logic

Here are some good ideas to keep in mind while writing AngularJS code:

* Decouple DOM manipulation from the app logic in order to increase testability
* Testing is as important as writing code since the testing difficulty is affected by the code structure
* Keep the client side of the application decoupled from the server side. This allows development work to be done in parallel on both sides

## Node.js

### Introduction to Node.js

Node.js is a server-side platform build on Google’s V8 Engine (JavaScript engine) and it was developed by Ryan Dahl in 2009.

Node.js is an open source cross-platform runtime environment for server side developing and networking applications. Since the Node.js applications are written in JavaScript they are compatible with Windows Linux and Mac OS X.

Some of the most important features of Node.JS:

* Event driven and Asynchronous – All the Node libraries are non-blocking because they are asynchronous. This essentially means that a Node server will never wait for an API to return data.
* Fast – Because it was built on the Google V8 JavaScript Engine, it is very fast in code execution
* Single Threaded but Highly Scalable – A single threaded model is used even while looping. The event mechanism helps the server to respond in a non-blocking way resulting in a highly scalable server as opposed to the traditional ones which had limited threads to handle the requests.
* No Buffering – The data is never buffered. The Node applications output the data in chunks

### Node Package Manager (NPM)

The Node Package Manager (NPM) is the default package manager for Node.js. It consists of an online database of packages and a command line client.

NPM helps JavaScript developers share their solutions for particular problems for other developers to use them as well. These solutions are called packages and sometimes modules. A package is a directory with some files in it and also a file named “package.json” containing metadata about the respective package. A typical application will depend on a pretty large number of packages, sometimes up to hundreds, but the packages are often small.

The idea behind node packages is that a developer creates a small block of code that solves a particular problem. So using these block-like packages you can build more complex applications.

A broad variety of packages and modules can be found while browsing the NPM website. Since it was initially started as a package manager for the Node.js server applications you will find many modules to help on the server side but at this point there are a lot of packages for the front end use as well.

## Bootstrap

Twitter bootstrap, also known as simply Bootstrap is an open-source framework for CSS HTML and JavaScript. Briefly after its launch it became the most popular project on GitHub.

One of the main reasons of Bootstrap being used so often is that it allows the building of aesthetic site and clean interfaces without putting much effort into it. Bootstrap also offers a wide range of free website templates and as well as components required for development.[10]

Using CSS frameworks and Bootstrap inside an ASP .NET MVC application works brilliant. Bootstrap manages the typography, form layout and the user interface components while allowing the developer to focus on the back-end functionality. This approach is important especially for small start-up companies which may not have a designer in their team. Starting with Bootstrap3 the mobile-first approach was implemented, which means that every site built on Bootstrap will be automatically optimized for small displays as well.

Some of the reasons that make Bootstrap a great framework for web design:

* Reusability: a modular template is preferred because there is no need of duplicating code for different sections of the design. Bootstrap already comes with pre-made components ready to be used.
* Consistency: the code readability is crucial for a designer. This trait helps when there is a larger number of developers on the same project. So that all of them get a better understanding of the code.
* Flexible grid layout: Bootstrap comes with a incorporated grid consisting on up to 12 columns growing with the screen resolution

# Detailed Design and Implementation

## Use Cases

### Student

The student scanning the QR code placed in front of the Dorm building will be redirected to the Student Register page in the Dorm Accommodation Application. After the respective page has opened up on his mobile device he will be allowed to complete a registration form with his personal information required for the dorm accommodation in order to ensure a faster process.

### Administrator and committee member

The dorm administrator and the accommodation committee members each possesses a username and a password for logging into the application. Once they authenticated they can make the following actions.

#### Find and start the accommodation for a student

They can navigate to the Student Search page. On this page they can either select or search for the student they want to start the accommodation flow for.

#### Accommodate the student

The administrator or committee member can check if the personal information of the student is valid and edit it if it is not, select a floor and after that a room on that floor in which the student will be accommodated. After checking the data and selecting the room they can add a special case to the respective student in order for him to have a monthly payment discount, and then generate the custom contract for the student.

#### Check the dorm status

The user can access the dorm’s status page seeing each floor with their rooms and the number of occupied and open places. The rooms are colored differently depending on the number of open places in that room. They can select any particular room and view its details (total places, available places and students currently in that room). They can also choose to check out a student from the room they are viewing the details of.



Figure 4.1.2.3 Room status color palette

## System Architecture

The system consists of two principal components interacting with each other: the web application and the server. Both of these communicate with each other when the administrator or committee member does any of the previously mentioned actions or when a student enters the register page and adds his personal information.

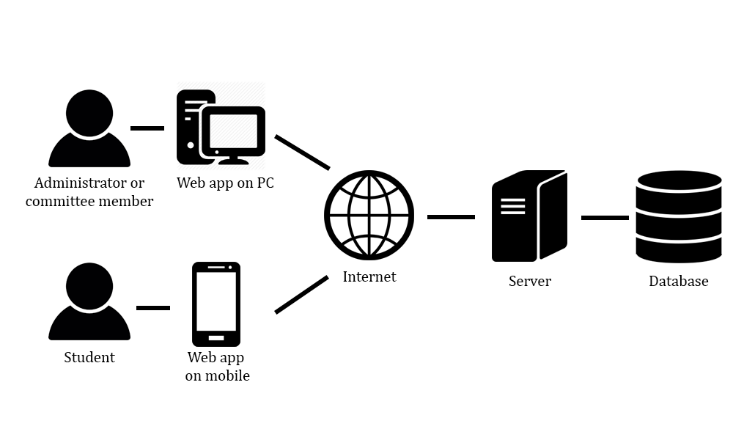


Figure 4.2 System Architecture

For the web application to communicate with the server a request has to be made to the Web API Controller which depending on the request will send the corresponding content

The majority of server requests are for accessing or modifying various data in the database

## Database Structure

For the creation of the database MS SQL Server 2014 was used. The current SQL server was chosen because it is free and it allow the usage of the SQL Management Studio which comes with a user-friendly interface in order to manage the databases. Another reason for which this server was used is because it’s a Microsoft product so we do not have to install additional tools in Visual Studio 2015 in order to start a connection to a database

The database consists of 11 tables soon to be explained. A diagram of the current database can be seen in the following figure.

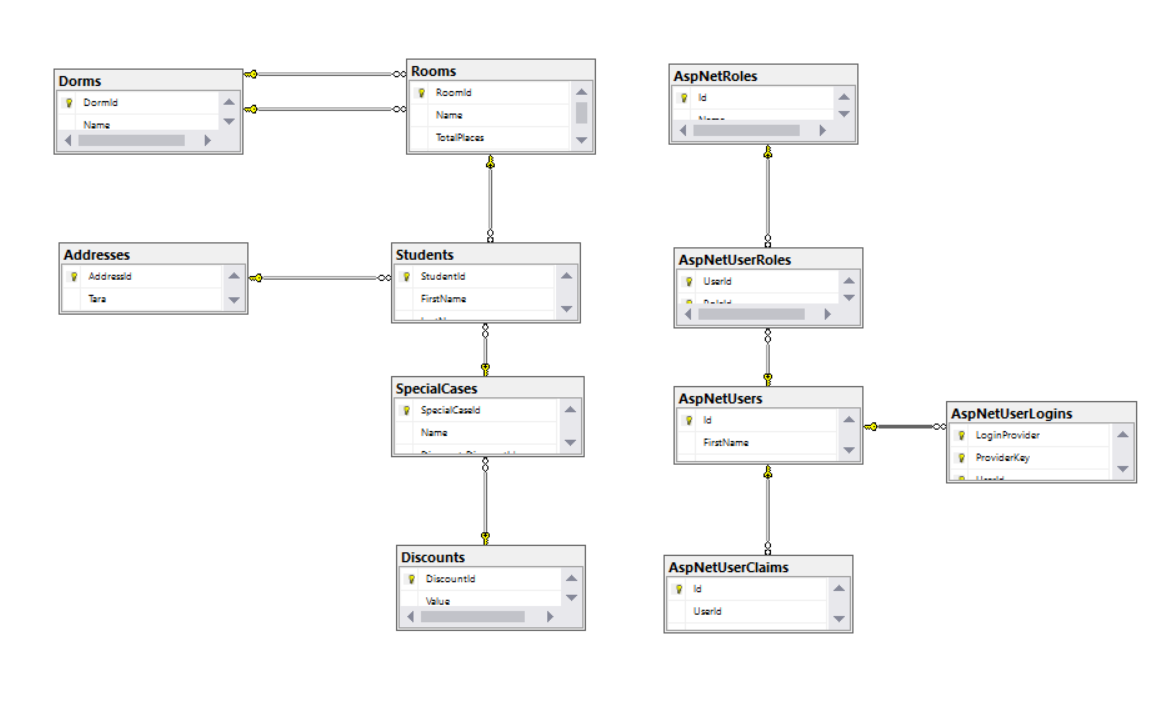


Figure 4.3 Database diagram

The Students table consists of personal information about the student, a foreign key to a Room, an Address and a Special Case if one was defined.

For the management of the Students, the Students table was created and it contains personal information about the students. Three foreign key for AddressId, SpecialCaseId, RoomId to link the student to a specific address, special case and room in the database. In The SpecialCases table the special case names and the foreign key DiscountId in order to link the special case to the required discount from the Discounts table.

The Dorm table contains an Id and a Name for each dorm and foreign keys for RoomId for each room that can be found in that particular dorm.

CONTINUA SI DESCRIE AUTHENTICATION TABLES

# Testing and Validation

# User’s manual

# Conclusions

## Rezultate obținute

Evidentiați toate rezultatele pe care le-ați obtinut și trageți concluzii din ele. Puteți prezenta o analiză critică a ceea ce ați realizat comparativ cu alte lucrări/studii anterioare.

Includeți o listă a contribuțiilor pe care le-ați avut în domeniul temei abordate.

## Direcții de dezvoltare

Descrieți direcțiile posibile de dezvoltare.

# Reguli de formatare

## Formatarea paginii

* + Dimensiunea paginii: A4
  + Margini: 2.5 cm (sus, jos, stânga, dreapta)
  + Antet și subsol: 1.27 cm de la marginea paginii
  + În antetul paginii (header): titlul capitolului, centrat, stil: Header\_style
  + În subsolul paginii: numărul paginii, centrat

## Titluri și stiluri

Titlurile capitolelor și subcapitolelor se marchează cu stilurile Heading 1 – 4, conform documentului model anexat în format Word. Descrierea stilurilor utilizate în document este prezentată în Tabelul 5.1.

Tabelul .. Stiluri utilizate în acest document

| Nr. | Stil | Utilizat pentru | Format |
| --- | --- | --- | --- |
| 1 | Normal | Text normal | Font: (Default) Cambria, 12 pt, Justified, Line spacing: Multiple 1.1 li, Space After: 6 pt |
| 2 | Titlu | Titlul proiectului, prima pagină | Font: 24 pt, Small caps, Centered Line spacing: single, Space Before: 126pt, After: 0 pt, |
| 3 | Titlu2 | Titlul proiectului, pagina de prezentare | Font:14pt, Bold, Centered |
| 4 | Heading 1 | Titlurile capitolelor (nivel 1) | Font: 24 pt, Indent: Left: 0 cm Hanging: 0.76 cm, Space Before: 24pt, After: 12pt |
| 5 | Heading 2 | Titlurile subcapitolelor (nivel 2) | Font: 14 pt, Bold, Indent: Left: 0 cm  Hanging: 1.02 cm, Space Before: 18pt, After: 12pt |
| 6 | Heading 3 | Titlurile secțiunilor (nivel 3) | Font: Bold, Indent: Left: 0 cm Hanging: 1.27 cm, Space Before: 6 pt, After: 6pt |
| 7 | Heading 4 | Titlurile secțiunilor (nivel 4) | Font: Italic, Indent: Left: 0 cm Hanging: 1.52 cm, Space Before: 2 pt, After: 0 pt |
| 8 | Caption | Legenda figurilor și tabelelor | Font: Italic, Font color: Text 1, Line spacing: single, Space After: 10 pt, |
| 9 | Header\_style | Antetul paginii | Font: 10 pt, Italic, Centered, Border: Bottom: (Single solid line, Background 1, 0.5 pt Line width) |

## Figuri, tabele și ecuații

### Figuri

Figurile se inserează în text centrate, cu etichetă de numerotare și legendă (Caption) în partea de jos a figurii. Numărul figurii include și numărul capitolului, după exemplul prezentat în Figura 5.1.



Figura .. Figură exemplu, stil: Caption

## Tabele

Tabelele se inserează în text centrate, cu etichetă și legendă (Caption) în partea de sus a tabelului, aliniată la stânga. Numărul tabelului include și numărul capitolului, după cum este prezentat, de exemplu, în Tabelul 5.1.

## Ecuații

Ecuațiile se inserează în text centrate, cu numerotare în partea dreaptă. Numărul ecuației include și numărul capitolului, conform exemplului din relația (5.1).

|  |  |
| --- | --- |
|  | (5.1) |

## Referințe bibliografice

Se recomandă ca citarea referințelor bibliografice să fie făcută în formatul IEEE.

În secțiunea Bibliografie sunt prezentate exemple pentru: o citare a unui capitol dintr-o carte [1], un articol publicat într-o revistă [2] și un articol publicat la o conferință [3].

Detalii cu privire la formatul citării diverselor tipuri de referințe pot fi găsite în [4] sau [5].

Referințele bibliografice se pot insera în text utilizând facilitățile Word de a adăuga surse și bibliografie unui document (References -> Citations & Bibliography). Dacă formatul IEEE pentru bibliografie nu este instalat implicit în Word, se poate descărca gratuit de la:

<https://bibword.codeplex.com/wikipage?title=Styles&referringTitle=Home>

Instrucțiunile de instalare pentru diferite versiuni de Word se pot obține de la aceeași adresă.

# Bibliography

|  |  |
| --- | --- |
| [1] | P. Nume, "Titlul capitolului," in *Titlul cartii*, Oras, Editura, 2016, pp. 1-24. |
| [2] | P. Nume, "Titlul articolului," *Titlul revistei,* vol. 1, no. 2, pp. 22-30, 2016. |
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