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IN PRAGUE**

F3

Faculty of Electrical Engineering

Bachelor's Thesis

Mobile application development and its launch

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Study program: Software technologies and management

Branch: Manager informatics

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ZADÁNÍ BAKALÁŘSKÉ PRÁCE

I. OSOBNÍ A STUDIJNÍ ÚDAJE

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II. ÚDAJE K BAKALÁŘSKÉ PRÁCI

Název bakalářské práce:

Vývoj mobilní aplikace a její uvedení na trh

Název bakalářské práce anglicky:

Mobile application development and its launch

Pokyny pro vypracování:

Navrhnete a vytvořte mobilní aplikaci zabývající srovnávání kin, díky které se zefektivní vyhledávání promítání pro lidi.

Cíle práce jsou:

- analýza
- návrh
- implementace
- testování
- udržba/nasazení aplikace

Při vývoji dodržujte agilní metody vývoje softwaru. Výsledné řešení by mělo být snadno rozšiřitelné a mělo by dodržovat pravidla OOD (object oriented design).

Seznam doporučené literatury:

- 1/ <https://developer.apple.com>
- 2/ Edward Yourdon. 1993. Object-Oriented Systems Design: An Integrated Approach (1st ed.). Prentice Hall Professional Technical Reference.

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Acknowledgement / Declaration

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I declare, that I have done assigned bachelor thesis alone led by supervisor. I used only literature, that is listed in work. In Prague 25. 5. 2018

.....

Abstrakt / Abstract

Bakalářská práce se zabývá analýzou, návrhem a implementací mobilní aplikace, která se zaměřuje na zobrazení programu kin. Tato aplikace je založena na potřebách uživatele a soustředí se zejména na jednoduchost. Výsledkem této práce bude prototyp mobilní aplikace pro platformu iOS, jež bude zobrazovat program kin v Praze.

Klíčová slova: Mobilní aplikace, iOS, kina, filmy, hledání

The bachelor thesis deals with analyzing, designing and implementing a mobile application focused on displaying cinema schedules. The application is designed based on user needs and focuses on simplicity for the user. The result of this thesis is a prototype of a mobile application for iOS platform that displays program for films in cinemas in Prague.

Keywords: Mobile application, iOS, cinema, film, searching

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Chapter 1

Introduction

The primary goal of the application can be easily described as an easy way of searching for a cinema screening on a mobile phone. For instance in a cold environment when you are trying to do the task as fast as you possibly can. With current website solution, you can run into problems with them not being optimized for small touchscreen of smartphones. This perfectly works when sitting behind a personal computer but on a small touchscreen you will quickly notice trying to find the screening times of film in a cinema near you is quite hard and comparing different cinemas is nearly impossible. So the main idea behind the application is to quickly enable smartphone users to find a screening in any cinema around them for a particular film as fast as possible.

In this project, I would firstly look for competitors trying to solve or solving the same problem. Then I would define the application itself this would mean stating the targeted audience and research into technologies I would use for the application. The next part would talk about the back-end of the application and how I am getting all necessary information. The fourth part consists of describing the front-end of the application how it's designed. The next section would be dedicated to testing of the application. And the last part would be explaining the different deployment possibilities with comments regarding financial details and scalability of the application and also would include features that would be implemented into the application before going onto the market.

Chapter 2

Competitor Analysis

This chapter is dedicated to competitor analysis. I am going to focus on applications that also can display cinema screenings. I won't only be comparing mobile application I'll also include web application that offers to simplify the process of searching for screening that fits the user needs. I have split the competitors into direct and non-direct.

2.1 Direct Competitors

As direct competitors, I take into account mobile application that offers a solution for the same problem as the subject application of this project, and this would mean searching for screening on a smartphone. I've searched for on two platforms and their specific application markets (App Store for iOS and Google play for Android) based on keywords. Based on this search I've found several applications that I would be stating below.

2.1.1 Art Kina

This application is released for both analyzed platforms. This application has a rating of 4.7/5 on the Apple App Store, and it was updated three months ago. On Google Play, it also has high rating of 4.7/5.

The primary goal of the application to display the program for small independent cinemas, for instance, Bio Oko, Lucerna. The application enables to see the screening times for the cinema in chronological order. Like other features, the user can see the rating of the film, see the prices for the screening and set a notification for the film.

2.1.2 Kinohled

This application is only on the iOS platform from Apple. The application does not have a very good rating as the only two reviews display rating the application 1/5. Also, the last update was 2.10.2015, so it seems that the application was abandoned by the developers but still works.

The application is straightforward. When opened you are shown one screen with all the films in cinemas, and at the corners, you can continue to customize the results. In the left corner, you can select the city you want to look in and in the right corner you can choose the date to see for the screenings. For each film, you see the Czech and English name. What genre the movie is and how long it is. Also if you click on the name of the cinema you get redirected out from the application into a browser.

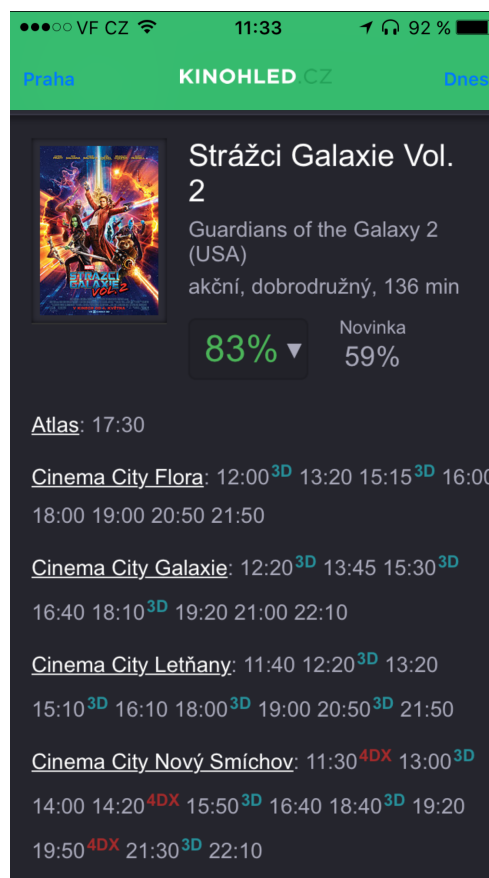


Figure 2.1. Kinohled application main screen (version: 1.3)

2.1.3 CSFD

Czech-Slovak movie database CSFD, in short, is one of the biggest competitors on the Czech market. It's the biggest website within this subject with approximately 3 million unique users a month.

The main focus of CSFD is to be as the title might indicate is to be a film database. This would mean providing information regarding movies, actors, and directors in the Czech language. In other things, the portal has community features like writing reviews for films and giving star ratings to films. CSFD also have many other features like premier calendar, new regarding films in general and also display current TV program.

CSFD also has a mobile application. It should have a similar features set as the web application. As one of the features is a simple view for cinema screening times, this would mean the application is solving the same kind of problem but is quite basic. It displays just data based on picked cinema, so you are not able to search for screenings of the film regardless of cinema.

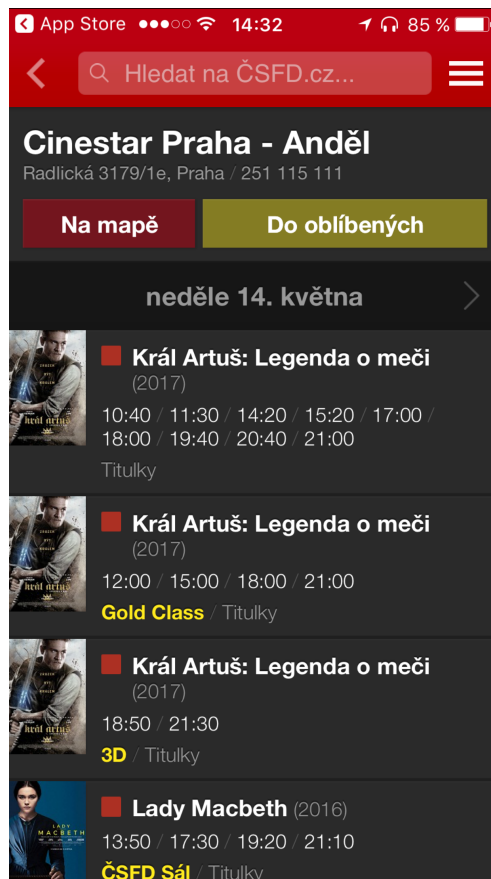


Figure 2.2. CSFD application, screen with times for a cinema (version: 2.2.4)

■ 2.1.4 FDB.cz

Fdb.cz as has the similar goal in mind as CSFD that is to be a film database. This would mean to inform about film and details regarding them. Other than this the portal also has features ranging from news to TV program and also a cinema program.

The primary product is their website. The website is trying to show as much information as possible without considering the end user. On the main page, you can find information about movie premieres, TV program with tips what to watch, news and films that are about to be released on DVD and BLU-RAY. This indicates the FDB is trying to please everyone when it comes to film and TV information but TV is their primary goal. They show cinema screenings in a similar way like CSFD. So after picking a city and a cinema place you are given a table with all the screenings for the day.

FDB also have their mobile application. That tries to implement all the features that the web application has. This means that the layout seems cluttered and confusing. Similarly to the web application, the mobile app focuses on the TV program and as a side feature is also displays cinema program.

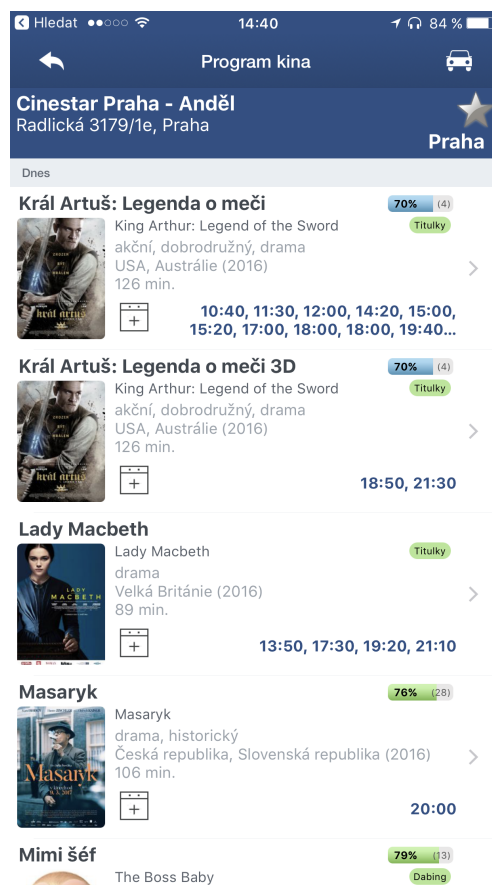


Figure 2.3. Fdb.cz application, screen with times for a cinema (version: 7.00)

This feature works in a way that you select a city and then a cinema place that you want to see the program for. A list of all films screened is loaded with the rating, length and with basic information. The film is repeated in the list of its different in a way that it has subtitles or is in Czech. This also applies to the type of technology for instance 3D.

selection of all cinemas that have this film, and you see the screening times. When you choose a movie place, you see a list of films with their ratings and times.

■ 2.2.3 Dokina.cz

Dokina.cz is a portal that its main subject is to provide information about the news in the movie world. This website is part of the tiscali.cz group. This website is not like much similar application looks very professional and pleasant for the user to navigate, in my opinion, it's the best website out of all in this analysis. The page also displays screening times and as many other in a table format. The timetable is clean and easy to navigate, and a nice feature is a line showing what time it is on the table so at a glance you can get a sense of time when looking for a screening.

■ 2.2.4 Sms.cz

This website contains a lot of interesting information for its users. For instance, it includes TV program, jokes, horoscopes and news from culture. In the culture section, you have information about theater, clubs, and cinema. The cinema section also has the information about screening times. It's displayed in a list of cinema places, and when selected you have a list of all the films with film name, genre, director and a short description for each one with screening time on the right side.

■ 2.2.5 Kinohled.cz

Kinohled was once already mentioned as a mobile app with the same name. The web application has feature parity with the smartphone app. The user of the website can choose the city and date, and after selecting this information, a list of all film appears that are screened on the selected date. Every film has information about rating from multiple sites (CSFD, IMDB, FDB), a link for a movie trailer and a list of all the cinemas where the movie is screened with information about it.

■ 2.2.6 Google

Google also has a feature that shows the screening times. If you try to google the name of the film, you not only get information about the film, the cast but you also get a table that contains the information about screenings.

■ 2.2.7 Cinestar

Cinestar is one of the companies that run cinemas in the Czech Republic. As of right now, it has 13 cinemas in 11 cities across the country. This company enables its costumers to reserve a spot for a specific screening or directly buy the ticket and save it in a digital format that is verified at the entrance to cinema area. When it comes how they display the information about screening, it's a table for each cinema individually with categories based on the screening technology and for each film information about language and age restriction.

As a user, you have all the necessary information at a glance, but the problem is all adjusted work with a big screen, and you can run into a problem when having a small smartphone touchscreen. The problem is that the table doesn't fully fit on the small screen and it's hard to navigate using touch through it, and it's even harder to compare different cinema locations. The next step would be to reserve or buy a spot for the movie. But on the phone again this quite a challenge as the page is not optimized for a touchscreen.

■ 2.2.8 Cinemacity, Premiere Cinemas, and others

In this section, I would like to summarize other cinema chains, and independent cinemas as most of them have similar features for its customers.

Cinemacity is the largest cinema chain in the Czech Republic with 15 cinemas across the country. Like others, it offers to reserve and buy tickets online. When the ticket is purchased, you get a QR code in an email that you show at the entrance to the cinema. The website is again primarily designed to work with a computer, and you have no option to compare films and their screenings. And as the company has multiple cinemas in the same city, then the user has no easy way of looking for the best suitable location for him.

Premiere Cinemas, this company runs three cinemas across the country and as other offers to buy and reserve tickets. But their website has a mobile version that is optimized for touchscreen interaction.

The application in the early versions won't be focusing on independent cinemas. For instance, Lucerna or Bio Oko as they don't that many screening rooms and they don't that many screenings every day. But they still offer to buy a ticket online and send it into an application called Cool Ticket.

■ 2.3 The appearance of new competitors

A new application with the solution to the same problem can be developed very quickly. But if the user is satisfied with the application that he is using there

is a little chance for him to look for alternatives. But the application must be kept up to date with feature updates. And it has to be stable because if the app crashes just a few times, the users start looking for alternatives. And stability is the biggest concern because of the inexperienced team. So if any competitor would have even an application with fewer features but more stable, the users would switch to it, and they would lose trust in our product.

Another possibility is that one of the applications mentioned above could be redesigned to a similar solution. But that's very unlikely because most of them have it just as a side feature and the rest are not updated. And even if they did some changes to the features, the change could go unnoticed by our user base without some direct marketing.

But if one of the big companies (for instance CSFD) would redesign their application, there is a big chance of it following up with a marketing campaign. This could have a significant impact on our application and would probably lead to changes in the direction or termination of the development.

Further on I would be describing features that could mitigate this issues and bring value to the end user which none of the current competitors can.

2.4 Conclusion

I would like to sum up the whole analysis and option for our application.

When it comes to direct competitors I found out that there are a few applications that can deliver the same functionality. But upon further investigation, I found out that a lot of the users are not happy with current solutions and give bad reviews to the applications. One of the other things is that some of the application are not actively developed and could stop working with any software update to the platform. That could mean a shift of users to our solution.

Other things to take into account are the design and features which each application has. Most of the mobile applications have the display of screening times just as a side feature, and it's missing depth or any other advanced features for the user. For instance to pick a film and easily see where it's being screened at a glance and with what technology it's being screened in (Dolby Atmos, 3D). Also, it's missing any kind of easy comparison between cinemas. Also, another aspect is that many of the mobile apps look very dated and do not follow concepts that people are used to or they are not updated to support new phones.

When it comes to indirect competition, the user has many options to choose from. As there are many tools to search on the computer and you can easily compare just by opening multiple tabs in the browser or have multiple windows.

When searching on a computer, you often have a better environment to do so and even have more time, as this application should be optimized to work in bad condition (like rain, night).

So if our application gets to be properly maintained and has advanced features can find its users on the market. Even if there are other solutions, there is a blind spot when it comes to this specific problem. There is a significant threat that the competitors adjust if this application succeeds, but in my opinion, if the users are happy with the application, they have no reasons to switch to another until it's far worse than the others.

Based on this competitors analysis I think that this is a worthy application and could find its market share and has a chance to succeed. The reason is there is no application on the market dealing with certain issues in the area and will further define these areas in the next chapters.

Chapter 3

Application Analysis

3.1 Introduction

In this chapter, I will be looking into and defining the market for this application. In that means I would set the requirements, targeted audience and also as a part of this chapter would be research about the market.

3.2 Defining the market

The main product of this project is a mobile application for simplifying the search for cinemas program on the go. So the users should be able to easily find an interesting movie and find a screening for it as fast as possible. When it comes to searching for times of screenings, the application should be based on the present time and the application should enable comparison of different cinema places as of right now.

When it comes to the targeted markets, the application should, of course, consider the mobile application market but also the cinema market itself, as this application could be used for companies owning cinemas to promote their events.

To add some numbers into perspective [2]. In 2017 there were 15 233 432 tickets sold in the Czech Republic across 493 900 screenings. This ended up in 2 004 245 132 Czech crowns in total income for the cinemas. In 2018 there seems to be a trend of increase when it comes to the number of tickets sold because for the first three months there is an increase of 301 164 tickets sold.

3.3 Target audience

As of the definition, I would like to split the targeted audience into two. The first would be the users themselves a second group would be the companies owning cinemas.

Firstly I would define the users. The user of the application is a user between 15 - 35 years old and visits the cinema least once every quarter. The definition would

be used during feature design and testing of the application. When defining these values, I took into account that the users must at least visit the cinema once every four months to be faced with a problem this application is looking to resolve. The age range has been chosen like this because users in this range are likely to be used to using their phones on a daily basis and use it for everything.

The second group as mention before where the cinema companies. There are few reasons behind this. First of all the application could simplify the process for looking for screenings and thanks to this some users would buy a ticket instead of being repelled by the searching on the phone. The next thing would propagate their events in the application as the users that are using it are mostly interested in movies and cinemas themselves. The risk for them would be lower traffic on their website but would be balanced by actually bringing more clients to see movies. The advanced part would be to have a partnership to provide the users advanced features that would, even more, simplify the process.

3.4 User Research

As part the application analysis I did a short survey regarding the topic of how people feel about current possibilities when it comes to the options of searching for the program of cinemas.

The survey was taken by 151 people with most of them being between the age 15-25. But the survey also had people in the age between 26 and 30 and one that was older than 41 years. So it mostly covers our targeted audience.

Out of the 151 people, 59,4% are in our targeted audience as they visit the cinema more than once every four months and most of the respondents plan their visit few days before the screening as 61.6% chose this option. But 33.2% plan their visit within a day.

When it comes how respondents choose which cinema to go, the most selected option was the location of the cinema with the time of the screening being on the second place. The survey found out only one person stated that the price is a something they take into account. As other reasons that were chosen, personal preference with 53 people and membership with 20 people.

The respondents pick the film based on the reviews and reference. Both were having been chosen by more than 80 people out of the 151. Other high factors when it comes to picking what film to see is the marketing of the film itself and the cast of the film. The other factors to take into account are also the director of the film and the name itself, as it could be a well-known franchise of films.

Next part of the survey was targeted at the getting of tickets. When it comes to how to buy tickets more favorable option was to get them straight at the cinema, but almost half of the respondents also buy tickets online. 84.1% respondents also use the option to reserve their spot for the screening. And when it comes to in how many people they go to the cinema, most of the people that replied stated that in two, with the second most answered was in a group of more than two.

The last part of the survey was directed to problems that the users may encounter when searching, reserving, purchasing. Three-quarters of the respondents stated they are happy with the current solutions with viewing film in cinema screening time, reservation system and purchasing of tickets on mobile devices. The respondents that were not happy stated it's because of poor optimization for mobile phones. But in the end, 65% would like a mobile application for purchasing tickets, and 77.2% would like an option to reserve a spot.

3.5 Risks

Also, risks are part of this analysis. So I would like to point out a few of them, that could threaten the application in a way that it would have to be terminated or design changes would need to be made.

One of the unlikely once is that people would stop coming to the cinema so they wouldn't have an application for showing them screening times. This outcome is very unlikely due to the trend that cinema has at the moment.

Another risk worth mentioning is that the cinemas would decline to cooperate, this would result in making specific advanced features like in-app purchasing of tickets impossible.

The risks also include the development and maintenance of the application. Software updates and third-party dependencies could make the application behave incorrectly and could lead to crashes. These issues would drastically affect user experience.

But the most significant risk of the development and the application itself is the inexperience of the team. This inexperience could lead to having performance issues, instability the design of the application itself could be wrong. So the users could be affected by all the problems mentioned above and wouldn't be using the application for very long.

3.6 Conclusion

The result of the survey showed us that some users would like an application to display screening information and most of them would like an application for reserving or buying tickets. In my opinion, we could say there is a significant chance that this application would find its users if done correctly.

Defining the market and target audience gave the direction how to design the application and what functionalities would have priority over other.

This was just the first step in an iterative approach to the application development. Next important steps would test the application itself when it is a working prototype to get feedback from tester based on the target audience

Chapter 4

Application design

I've split this chapter into two. The first one would describe the front-end of the application and the second the back-end. In both parts, I would describe the features, decisions behind and design.

4.1 Front-end

The front-end would mean the application that is running on a mobile phone. I've chosen iOS which is the operating system for Apple devices. The reason behind is not just personal preference, but the main reason is testability of the application. Because iOS is exclusive to Apple, there is a low number of devices we would need to test the application on, to be 100% sure that there are no device-specific problems that the user can face. [1] Android the other main mobile OS has phones from many different manufacturers and testing would be costly to ensure the stability.

When it comes to a programming language, there are two options on the platform. First of them being Objective-C and the second is Swift which a new programming language from Apple released in 2014. I've chosen Swift as the more futureproof option as Apple continues to develop and improve the language and it's compatible with all Objective-C libraries. But the drawback with Swift is that updates of the language don't have to be backward compatible, and changes would be needed with an update.

When it comes to UI design, we will be focusing on the mobile, and the app won't be optimized for bigger screens that tables have. Also, to make it familiar to the user we will try to mimic Apple styled apps like Mail and with the first iteration keep the application as simple as possible.

■ 4.1.1 Functions

At first, the application will have only two main functions. And that would be to display screening times for films. The second would be a similar thing and that show screenings for a selected cinema.

For the first, the user would have all the available films on one screen and when he selects one of them he would be presented with all screenings available in chronological order. The user could also see additional information about the film.

The second will be implemented similarly, so the user is not confused when navigating through the application. There will be a list of all available cinemas and when a cinema is selected the user would see all screened times with film also in chronological order.

More advanced functions are planned but are not subject of this project and will be talking more about them in the last chapter.

4.1.2 Inspiration

When designing the application I've tried to stay as close to a stock Apple application look as possible. The reason behind is that the look and feel of the application would be familiar to the user. So this way he could easily navigate the application even without a tutorial or other documentation because he's used similar applications in the past.

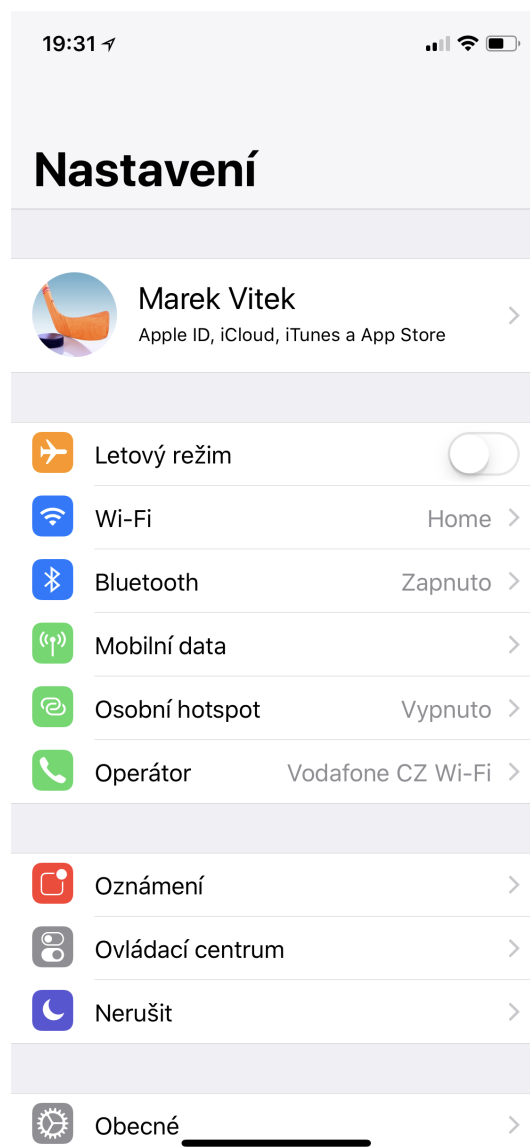


Figure 4.1. Apple settings app (iOS 11)

4.1.3 Wire-frame design

In this part, I would showcase wireframes for all the screens that the application will use and also include the one that won't be used due to a shift of focus of the application or where redesigned.

The application is going to be split into two branches. One is for searching screenings based on films and the second is to search for screenings for a particular cinema. These two screens also have the biggest differences in the app itself, everything else should mimic each other on both branches, so the user feels like he knows what to expect.



Figure 4.2. (left) movie screen, (right) cinema screen

On the left side of the screen is the film selection it will contain a poster for all the films in the cinema currently. In my opinion, the posters are designed in a way to appeal to the user with a clear name visible on them, so any other information seems unnecessary. And the right will function as a selection for cinemas. When a cinema is going to be picked, you will have a list of films.

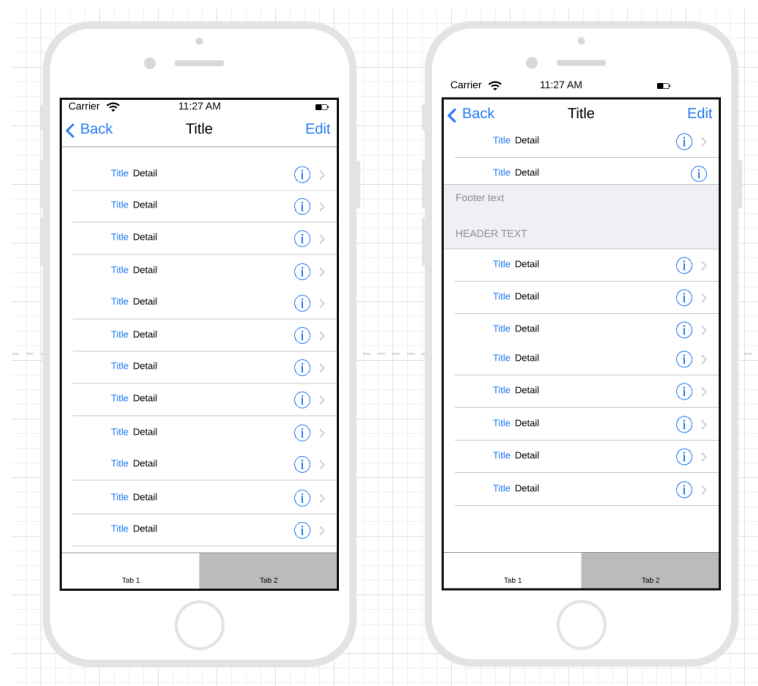


Figure 4.3. (left) list of screenings, (right) expanded list of screenings

As the next screen from both branches mentioned above would this screen. It would be a list of all the screenings for the film or cinema. The style would be the same, but the displayed information would differ. So for a movie, you would see cinemas and screening times, and for cinemas, you would have movies with screening times, but the look and feel of both screens would be the same. Also, there would be an option to expand the individual segments to have more information displayed. The circle with an 'i' would open the next screen with information about film/cinema.

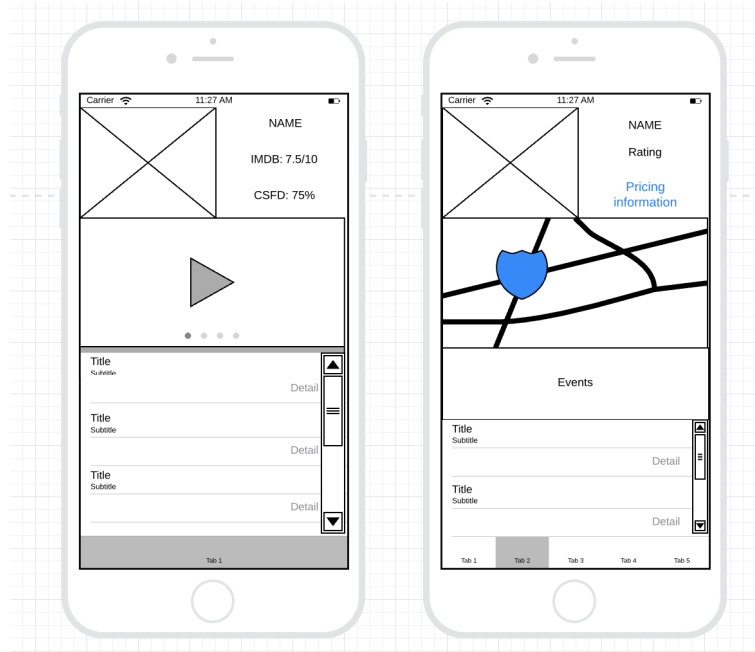


Figure 4.4. (left) film info, (right) cinema info

These two are the last screens that the application will have. They will contain detail information about film or cinema. So for the film, you would have description, actors, director and for cinema, you would have the pricing information and map to help you navigate.

4.2 Back-end

The back-end will have two main functions. The first and more simple is to be the data source for front-end, meaning it will be communicating with front-end via API and all data prepared, so the mobile application itself could be more simple.

The second and more complicated part of it would be the aggregation of all the data. This would mean find a way how to get all the information about cinema and its program and match it with a film. Also get film information like a poster, director artist.

The most important on this is that it has to work dynamically and automated as much as possible. So this way we would have the latest data all the time, and it could be deployed on a cloud server fetching present data on a regular basis.

Chapter 5

Implementation

In this part, I would like to go through a high-level overview of the implementation of the front-end and the back-end of the application.

5.1 Front-end

This segmented would be dedicated mostly to the high fidelity model of the application. All the designs were created in an application called Sketch.

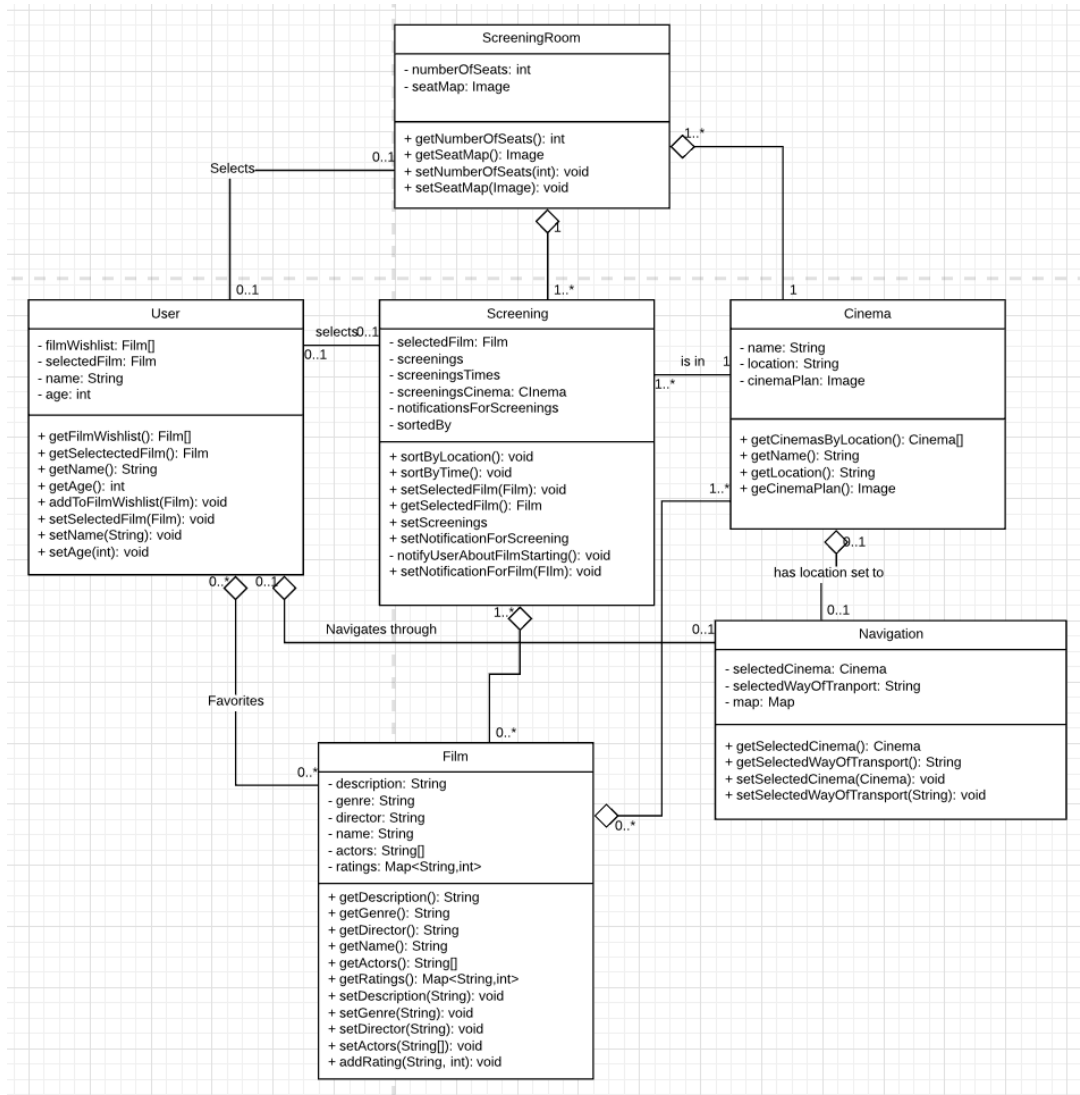


Figure 5.1. Front-end uml diagram

■ 5.1.1 Navigation

When it comes to navigation within in the application the user can expect the same style as in other modern application. This means he could use gestures to go back in the way of swiping from left edge of the screen to the right.

The other thing about navigation is that the application is branched into two ways. The first branch being the movies and second, the cinemas, represented by icons on the bottom of the screen. When switching between branches the application remembers the state of it when left so you can switch branches without losing the last opened screen.

When it comes to ways you can go back, there are three ways. The first was already mentioned the gesture swiping from left to right. The other is in the left corner of each screen is a back button to go one screen back. And the last one is when tapping the navigation icon on the bottom will also return you one screen back

5.1.2 Movie screen

This screen displays all the movies that are currently in the cinema. It will also be the first screen that gets loaded when a user opens the application.

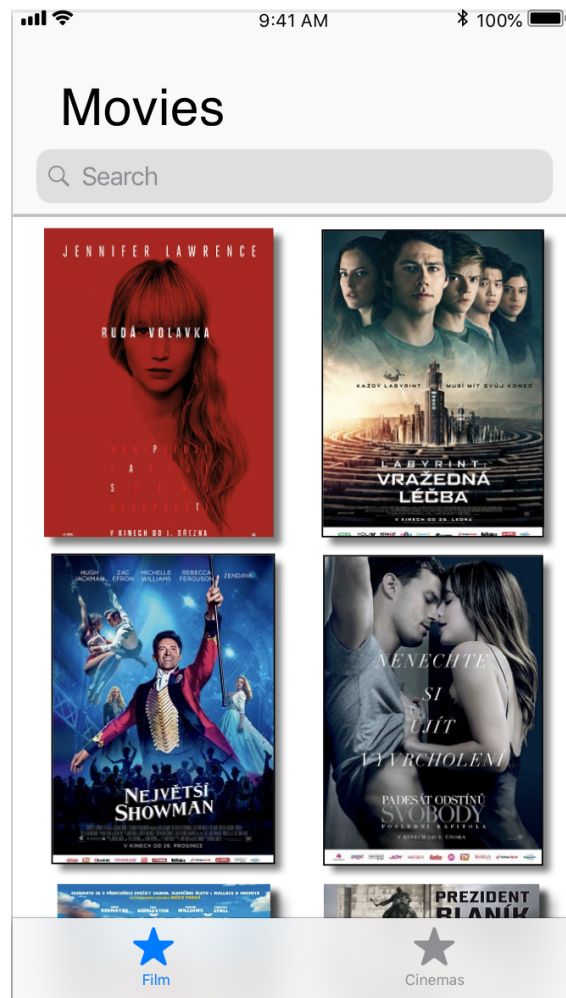


Figure 5.2. Movie screen design

The movies are sorted by their rating (gotten from CSFD) from top to bottom and user has the option to search through them using the search bar. When searching the number of posters displayed narrows by the search and if no film meets the criteria no poster will be displayed.

From this screen, the user has few options to go to. The first one is to pick a certain film this will take the user to a screen that contains information about the screenings for that film. The next would be to on the bottom to select the next tab that is the cinemas. This will take the user to a list of all the cinemas that are available to view.

5.1.3 Cinema screen

The cinema screen will contain a list of all the cinemas available in the app. The user will be able to search to narrow the number of displayed cinemas.

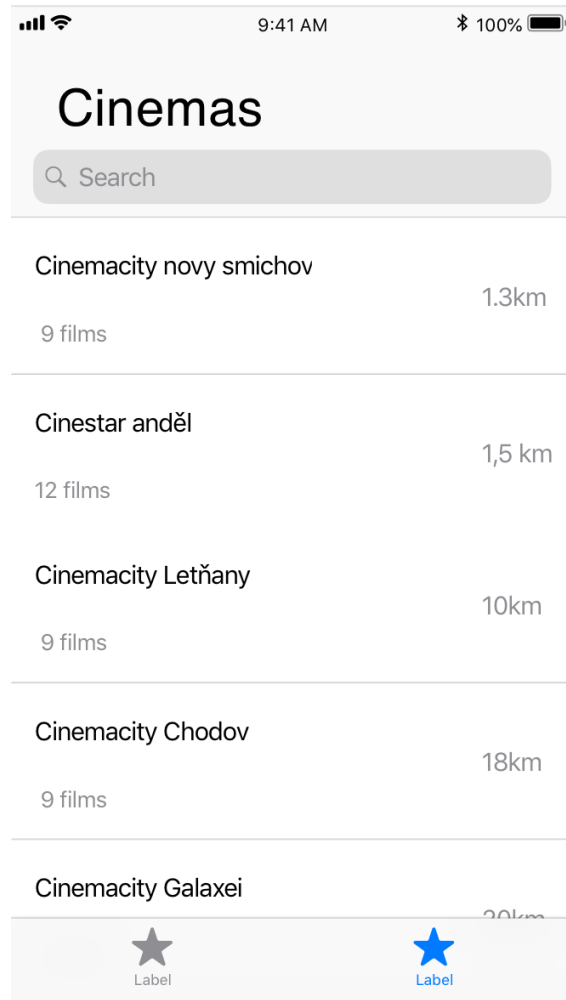


Figure 5.3. Cinema screen design

The list will be ordered based on the name, with a future option to sort by distance to the cinema. Also, the user will see some films in the cinema itself.

When a cinema is selected the user will be redirected to a screen with a list of the screenings in a similar way that would be if he picked a film.

5.1.4 Film screenings screen

This screen will be displayed when a film is selected from the movie screen. It will contain a poster and basic information about the movie itself. Then the user will have an option to move on to a screen with even more information about it.

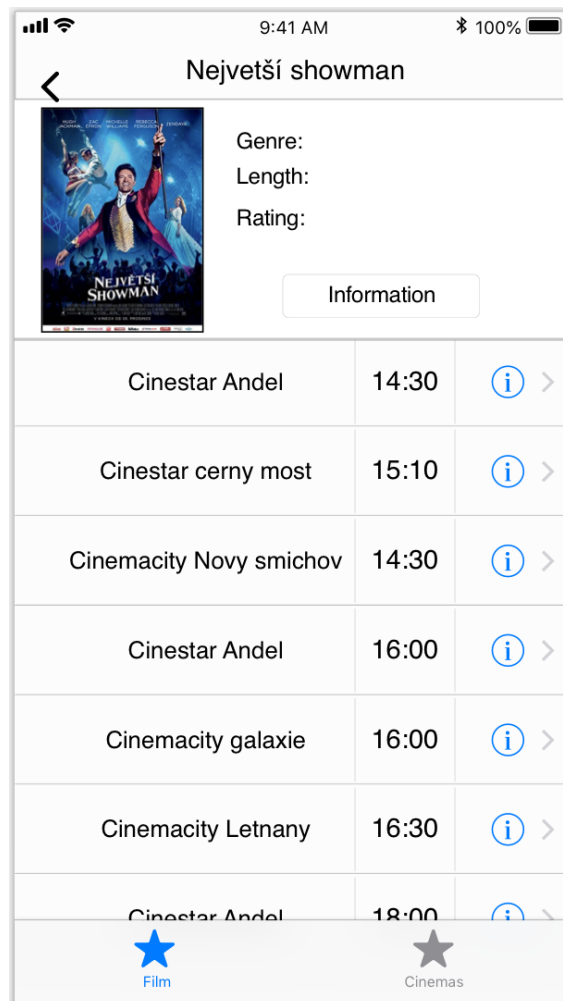


Figure 5.4. Film screenings screen design

The main focus of this screen is the list of all the screenings. They will be ordered in chronological order showing just the screenings that are still available. Each line of the list will contain the cinema name, time and a button to see information about the cinema. When a line is selected, a web browser opens with a reservation.

5.1.5 Cinema screenings screen

The cinema screen has a similar look and feel like the film screening screen. They are representing similar data to user but from a different end. Instead of displaying cinemas it displays film that is being screened in the cinema.

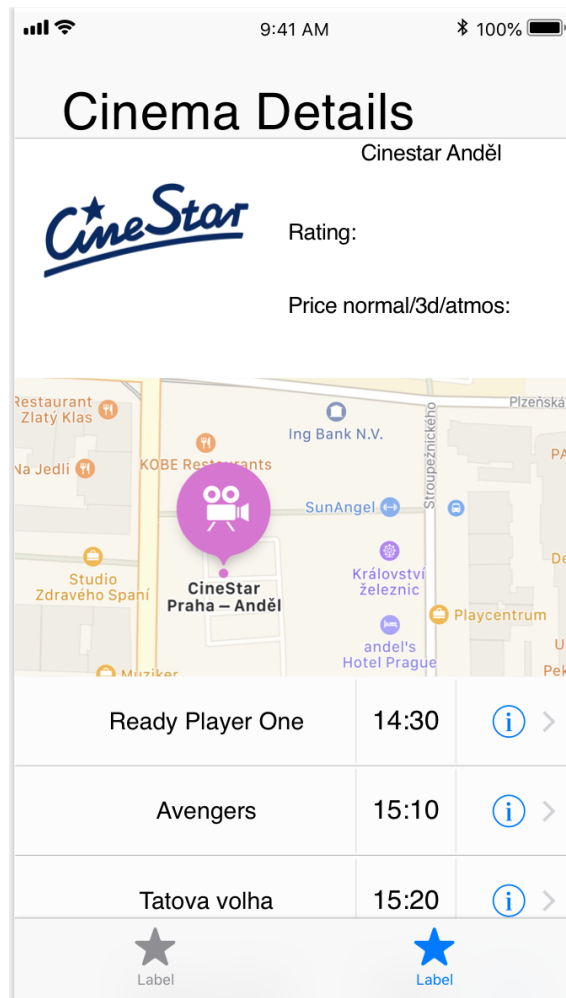


Figure 5.5. Cinema screenings screen design

The navigation is also similar. Displaying the name of the film, time of screening and a button to display more information about the film itself. With the addition of a map with the location of the cinema. With the option to open a navigation application.

5.1.6 Movie detail screen

This screen contains more detail information about a film. At the moment it will contain director name, actors, genre, rating, length, and film description. In the future, there is a possibility to add film trailer and marketing pictures for the film.

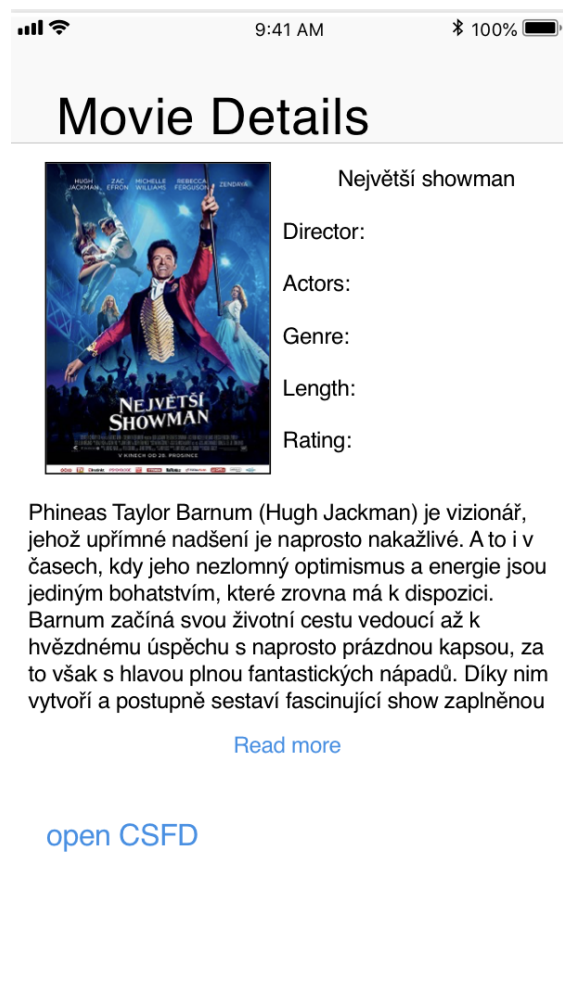


Figure 5.6. Film detail screen design

5.2 Back-end

As mentioned in the design chapter the back end will have two main functions, and that is to provide information to the front end and aggregate data for screenings and films.

For the programming language, I've decided to choose Python as a scripting language it's easier to prototype and quickly iterate on designs, and each segment can be run independently to minimize the overall complexity of the application. As a framework, I've chosen Flask [8] as it makes very easy to implement endpoints and simplifies connection to a database. When it comes to the database, I've chosen MongoDB [9] as a NoSQL database it enables to work with the database programmatically, and when inserting into it, we don't have to always know all the fields.

The first part of the back-end would be a basic API application for the front-end to get information. This would directly get preprepared data from the database.

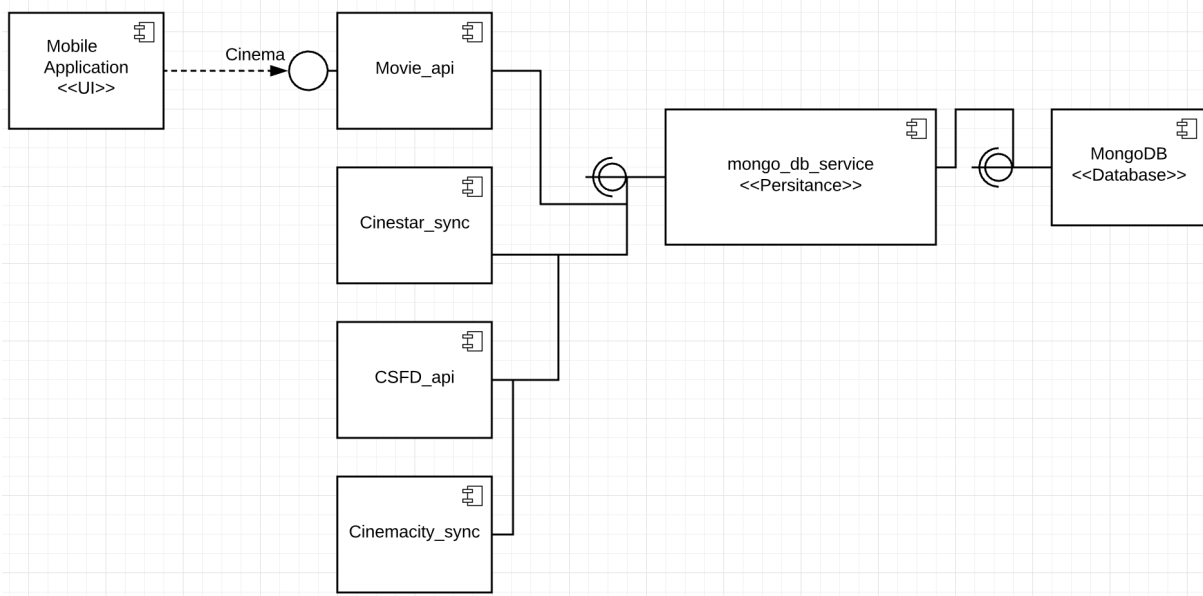


Figure 5.7. Component diagram

The second part is much more complicated because needs to get information about screenings and the films themselves. For that, we have two options. The first is to have an API of the cinema to get all the information, this way it's very easy and quick to go through all the information and map it to films and save into our database. The second way is to parse the website HTML to get all the necessary information a gives us the power to have information for any cinema. The downside of this is not safe, and any change on the side of the cinema will mean a needed change on our end.

In this project, both ways are used. For Cinemacity chain the API approach is used and for Cinestar the HTML parsing approach. The source is different, but the work with data is similar. The data is mapped in the same way for both so after there is everything collected we could merge both cinemas so there would no duplicates, also dates for the cinemas are dynamically set. The films get added information about in Czech.

All of this is automated so if the application gets deployed these scripts can be scheduled to run every day, and we would have up to date data with all the information.

```

_id: ObjectId("5b017e4cc03c3535b8fe5834")
name: "Avengers: Infinity War"
genre: "Akční / Dobrodružný / Fantasy / Sci-Fi"
description: "Snímek Avengers: Infinity War završuje neuvěřitelnou desetiletou cestu..."
director: "Anthony Russo"
▼ actors: Array
  0: "Robert Downey Jr."
  1: "Chris Hemsworth"
ratings: "90%"
release_date: 2018-04-26 02:00:00.000
▼ screening_dates: Array
  ▼ 0: Object
    date: 2018-05-20 02:00:00.000
    ▼ screenings: Array
      ▼ 0: Object
        screening_lang: "en"
        screening_subt: "cz"
        ▼ screening_type: Array
          0: "normal"
        cinema_name: "Cinestar Andel"
        screening_start: "10:45"
        screening_room: "11"
        screening_length: "149 min"
        screening_end: "13:29"
      > 1: Object

```

Figure 5.8. Example of a film in database

5.3 Application sequence

The communication between front-end and back-end will be done via API. All the data will be preloaded into the application when it starts and then no more communication with the back-end would be necessary.

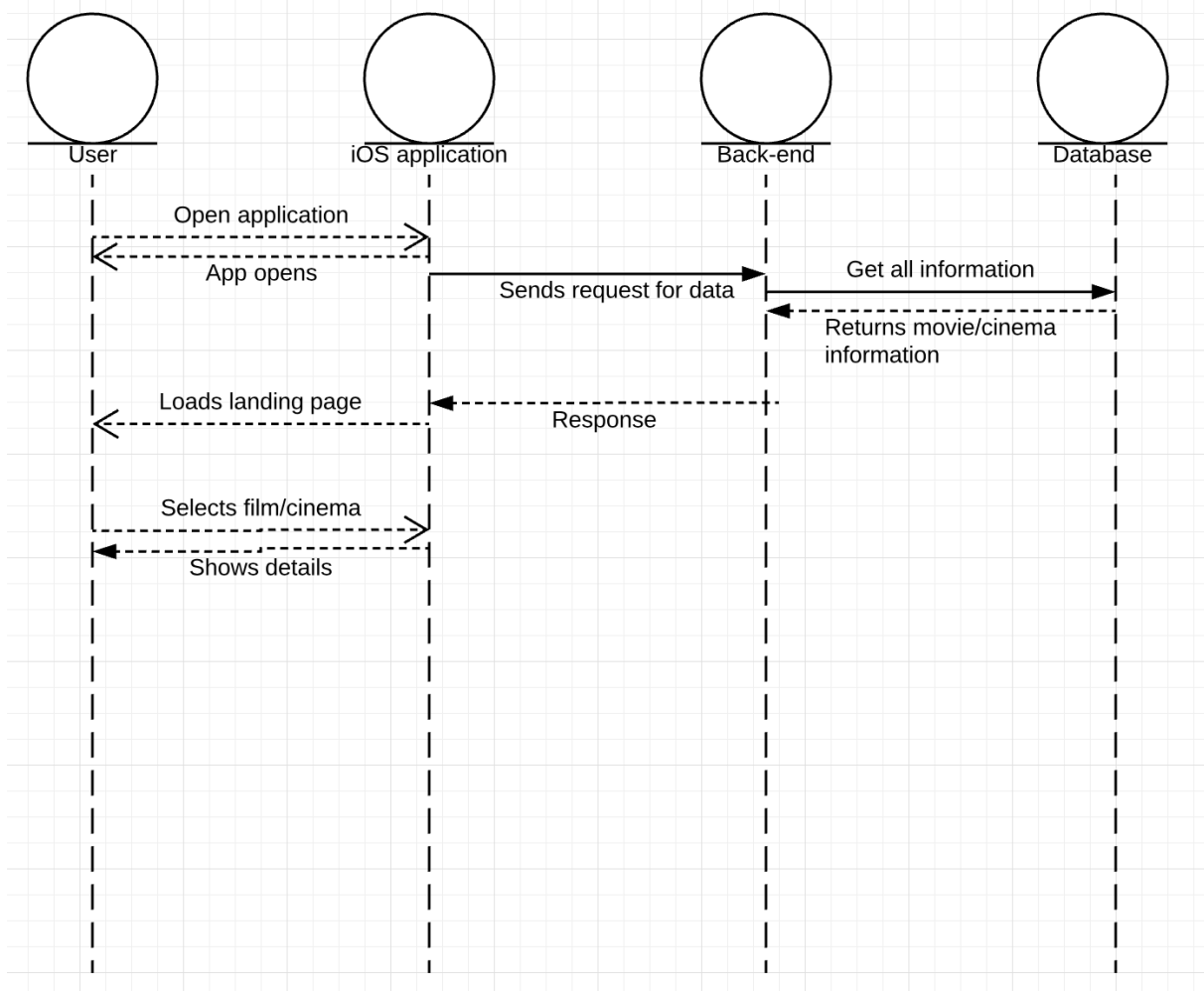


Figure 5.9. Sequence diagram

Chapter 6

Testing

As the main part of testing, I've chosen user testing, as the application has a very high focus on being user-centric.

The front-end part of the application would be tested, with not all features that were mentioned during the design are implemented in the final form as I wanted to make sure that they would bring value to the user and it would be figured out through this testing. But the core features of the application are working and you could use the application.

Each user testing would be split into three parts. The first is a pre-test set of questions focused on experience with the problem and similar applications. The second part is the testing of the application itself. I haven't set any goals for the user I've just let the user use it and let him tell me anything that is missing in his opinion or something that doesn't make sense. The last part would be a post-test set of questions that are focused on the application itself if they think it brings any value to them.

I had five users with various experience with the platform from the targeted audience test the application, and I will summarize the test for each one of them.

6.1 Participant 1

This user has no prior experience with this kind of testing and has limited experience with iOS platform. The user visits the cinema once a month on average and already tried different ways of displaying screenings on a smartphone but found it no optimal with problems with displaying the information on a small screen.

During the testing, the participant had a few things to point out on the design. He missed the feature to search on screens with a list, to limit the number of displayed information. Also, the participant would like to see the films that are coming soon.

The user felt that the application is intuitive and didn't any need any assistance with navigating through the application. But he would like to have an option to reserve or buy tickets through the application and to see more information about the screening itself.

6.2 Participant 2

This participant had already tested application in this form and has no user experience with iOS platform. The user visits the cinema once every three months on average. The participant has experience with searching for screenings on a smartphone and found that the limiting factor is the lack of optimization for smaller screens.

The participant pointed out few missing features during testing. The main missing feature was the lack of search functionality. The other thing was a missing option to have the next step on the display of screenings to reserve the ticket. The last thing the participant pointed out is the lack of details for screenings.

The participant didn't run into any navigation issues, and he always knew the next step in the application and that it felt intuitive. He only missed the detailed information about screenings in that meaning if it has subtitles and if it's for instance in 3D and the option to be redirected to the reservation.

6.3 Participant 3

This participant also has prior experience with user testing and uses iOS-powered devices on a daily basis. This participant goes to the cinema four times a month on average and has only experience with searching screenings using the web browser on a mobile device but states he misses optimization for smaller screen devices.

During testing of the application, the participant pointed out that the application is missing date separation in the screenings list and the ability to search for specific films or cinemas. The participant also suggested displaying the screenings in a scrolling table so you would have everything even easier to navigate.

The participant didn't face any issues with navigation through the application and felt intuitive. He didn't state any lack of information that the application offers to him. He also stated that he feels that it's a better option from that are available.

6.4 Participant 4

This participant has never attended in user testing of any application. He has experience with searching for screenings only using the browser and navigating through websites for cinemas. The problem in this is the lack of optimization for smaller screens devices with a touchscreen interface in his opinion.

During the testing, the participant pointed out few problems he faced or things he missed in the application. The first was the lack of date corresponding with screenings so you would know that time but not the date. The next thing from screenings screen he missed a way to reserve the ticket. The participant also point out few things like localization to an American way of displaying time and a missing title on a screen.

The participant didn't face any navigation issues during the testing and felt the application was self-explanatory and simple. He stated that he would like to have an option to reserve tickets and have more information about the cinema. In the end, he stated that he feels that this application is a better option than the market already has.

6.5 Participant 5

This participant was never part of user testing of an application and also has no experience with the iOS platform. The participant goes to the cinema twice a month on average and has no experience with searching for screenings other than the website on the smartphone. Which by his words is not optimal and unoptimized of touchscreen devices.

During the test, the participant didn't run into any major issues. The participant was missing some features like clicking on screening date to reserve a ticket and on the same screen missed separation into days. Another thing was lack of search functionality and suggested to add more information to the film detail screen.

The participant stated that the application felt intuitive and didn't face any problems navigating through the application. The participant also stated that this is a better option than other currently available that he had experience with.

6.6 Conclusion

As a disclaimer, I would like to state again that the testers didn't test a feature full application but a prototype with core functionality in place. This way we know early on in the development about core problems of the idea behind the application. Also, this gives us the information about next features to priorities.

In conclusion, the participant seems to like the idea, the design and how is information provided. There were common issues across all participant. For instance the lack of search functionality, that is part of the design but was not part of the testing version. This as would make the application a lot more flexible.

The other common problems were issues that were not accounted for in the design itself. But can be easily fixed. For instance the lack of date in the screenings list.

The last major issue all participants faced were the missing option to be redirected to reserve a ticket. This feature would need a change of design because on tap had a different purpose.

Chapter 7

Future work and deployment

In this chapter, I would talk about the future work and features that will the application have during public release and features planned to be added after release. The next part would be different possibilities with the deployment of the front-end and back-end separately.

7.1 Future features

Based on the testing I would say the most critical feature missing that needs to be implemented is the redirection to reservation system of the selected cinema. The other features are simply a quality of life improvements like changing the sorting of the screening lists.

The next big features would come after the initial release. One of the features planned is a cinema visit planner, where you could create an event and invite friends into it. In the screening event, you would have a voting system to help you pick a date of the visit for the group. If we had the ability, a nice thing to have would be that everyone would buy his ticket independently, but the reservation would be organized as a group.

With this feature, a user system needs to be implemented with Google and Facebook integration to make the creation of accounts as simple as possible. The user system was excluded from the initial changes due to the GDPR changes. User Account would give more possibilities with customization within the application and integrated rating system for movies and cinemas.

Also at first, the application will support only Cinemacity and Cinestar chains in Prague to have a soft launch. With expansion across the Czech Republic after release and implementation of new cinema chains.

7.2 Front-end deployment

As front-end being developed for the Apple platform iOS, there is only one way to deploy the application, and that is to make available on the App Store. To make this possible, you have to enroll in the apple developer program [3]. Anyone can enroll the only thing that one needs to do is to pay 99 USD per year get access. Other than this it enables advanced features to be used in the application and the ability to test the application on larger scale to imitate release.

7.3 Back-end deployment

Back-end deployment would be split into two. The first being the Python application and the second being the database. There are multiple options how to deploy, but I would narrow the selection down and use only cloud solutions. For the Python application, I would compare two solutions. AWS EC2 instance and Heroku service.

AWS pricing depends on how powerful machine you have allocated and how many as it can dynamically scale based on usage. The pricing [4] would fully depend on the number of users and how well is our application optimized. And we are just allocating a virtual machine, so all the set-up needs to be done by us.

Heroku [5] is a service that simplifies the process of deploying an application. This means you don't have to setup the environment itself and is one point to manage everything. It also has autoscaling capabilities. But the most beneficial feature is you can easily monitor how is your application performing.

For the database, we could also use Heroku which would be the best option if we choose the platform to deploy our application. Or we could use options directly from Mongo called Atlas [6] which support running on multiple nodes to make the database more stable and fail-safe.

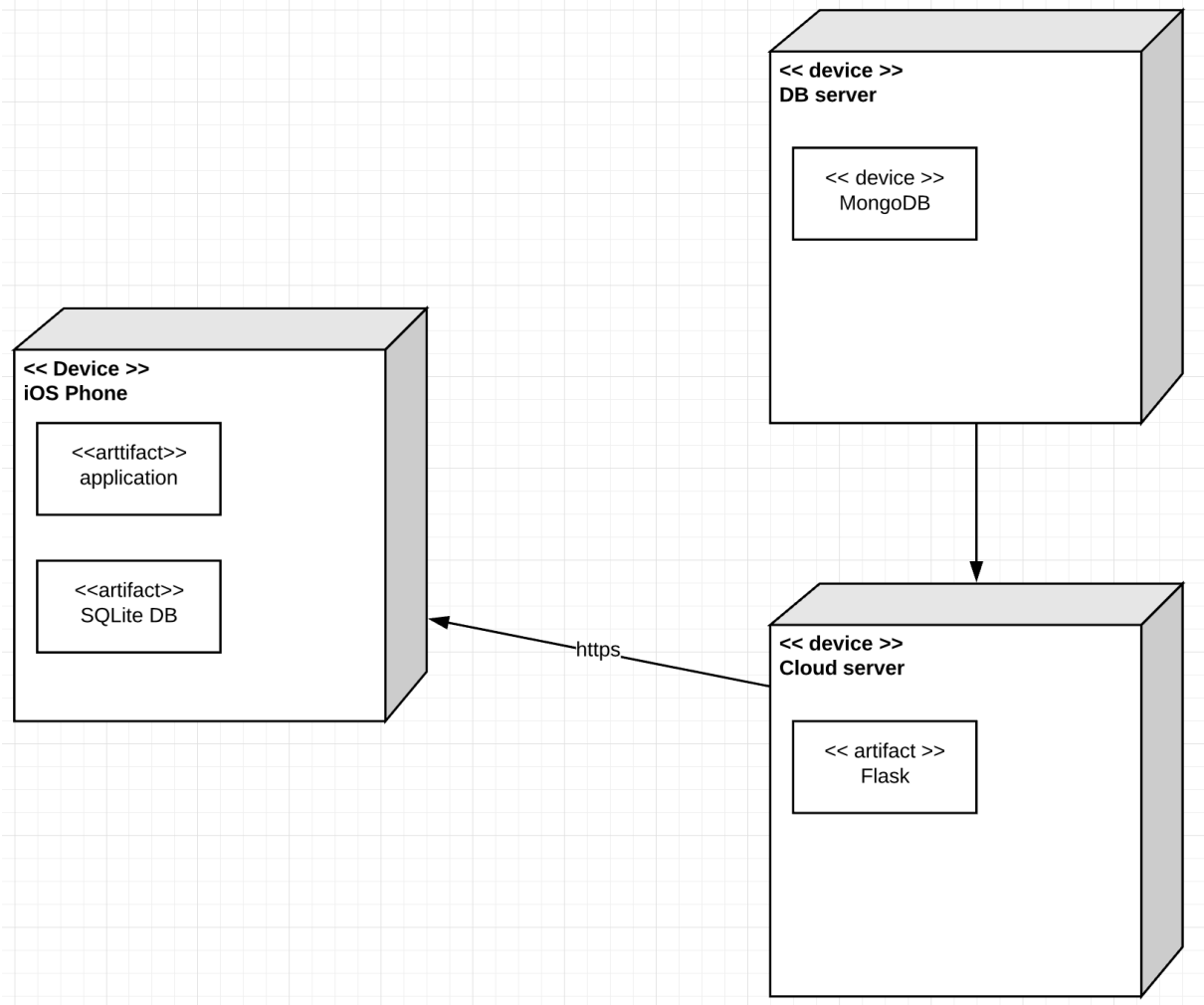


Figure 7.1. Deployment diagram

Chapter 8

Conclusion

The purpose of the bachelor thesis was to analyze, design and implement an application that would display and compare screening times for film in the cinema.

Based on the competitor analysis we found out that there are options on the market but no perfect solution for users looking for an option for their smartphones that would aggregate data from all the cinemas around to one place. So that would mean there is market space for an application that would display this data.

Then we analyzed the market and defined it, which lead to designing the application tailored to users that would be looking for cinemas screenings on the go with all the information displayed in an easy to navigate way.

During implementation, we found a way to automatically get all the necessary information about cinemas and films essential information and everything localized in Czech. And then we created an application prototype that would have all the core features that would be presented for first users to test.

The user testing showed that the designed features are the right way to go and that the participant found these features useful and the application effective for searching for screenings.

In the future, the application would be reiterated based on more user feedback and more features implemented and released to the public on the App Store.



Appendix **A**

Symbols

JSON JavaScript Object Notation
API Application Programming Interface
AWS Amazon Web Services
EC2 Elastic Compute

Appendix B

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