SEMM course final project assignment: AudioNow by MediaFun

In this project, your team will take on the role of a software company that provides development services and has recently taken an assignment from the (fictional) MediaFun Inc. to develop a voice broadcast social media that also sells podcast subscriptions and fan products such as books or coffee mugs. Your team will be required to provide a software design, hardware deployment plan, process plan, and a limited risk analysis, based on which the company will decide if they will order the full software from you.

Read first the general instruction below (Sections 1.1. to 1.3.) and then the case description (Section 2.) Then, read on to Section 3 that describes the design report and other deliverables that your student team must return based on your design work. Appendix 1. describes the grading rubric (to be updated until the start of the 2nd period).

1.1 General Instructions

This project work will cover the 2nd period of the course Software Engineering Models and Modeling. In your team, you are required to design an architecture for the MediaFun podcast, social media and e-commerce system. In addition of this, you are expected to create a pitching slide deck, where you explain your design decisions as a consultant and "sell" your concept to a non-technical leadership and the chief technical officer of MediaFun Inc.

The case is complex by intention since the client would not hire software engineers and designers for a simple application. Create the documents and demonstrations with the mindset that "you are actually proposing a commercial project to a real client corporation." Justify your design decisions from the perspective that you would have to use the document to explain your decisions to a client in a conference room, with some of them being domain or technical experts. The justifications and well-made design decisions are a major part of demonstrating your skills and project grade.

Your team is expected to submit one PDF file via Moodle, with all of the required parts in a single file, including the presentation slide deck attached as an appendix to the main document. The deadline for this project is displayed on the Moodle "course project" tab. The deadline is final.

The maximum size of your team is three and minimum is one.

If necessary, ask for assignment clarifications on the course forum. On other issues, email the course lecturer; if there are some amendments or changes, they will be communicated via course Moodle pages.

1.2. On Cooperation, Plagiarism and References

Discussing your work with other groups is allowed and exchange of ideas is even promoted, but every group must make their own work. External sources can be used, but references must be included in the documentation, in a separate "References"-section and with citations within the text. Not following these rules is a violation of LUT ethical guidelines. For the use of generative AI, see our AI policy (also summarized in Moodle).

Overall, all material in the project documentation must be either A) original products by the submitting group or B) include full references to the original source material, including cases where groups have been discussing potential solutions. Failure to include references or mention cooperation with another group will be considered plagiarism and all cases will be handed forward to the university administration without exceptions.

1.3. Grading

This project work is 100% of the course grade. Each of the 8 items is graded 0-5 based on their conclusiveness (the amount addressed issues from the case description), thoroughness (the amount of details), presented rationale, and on the amount of internal conflicts between diagrams. Additionally, focus will be on the application of the correct UML syntax and sensible design decisions.

At least 50 points are needed to pass the project, with at least 1 point from each separate item. For discussion on how the course exam can replace a maximum of two of course project sections, see the introduction lectures.

1.4. Declaration of AI Use

In a separate chapter at the metadata section of the report, list the following.

1) Name all AI systems that were used in the development of the contents of this document, and for each

2) How and where they were used (illustrations, proofreading, getting ideas for text, to generate diagrams etc.) or

3) Clearly state that no AI assistance or tools were used in this assignment.

This Declaration is mandatory part of the submission and leaving it out means that the work is incomplete and should not be graded. Declaring that no AI was used in the development of the document, but getting high number in TurnItIn AI check is also a valid grounds for failing the work just by itself.

2. Case: Real time audio social media and podcast startup, AudioNow by MediaFun Inc.

MediaFun Inc. is a radio and social media influencer company, providing broadcasts and related fan material (books, comics, posters, sound tracks, collector's editions, promotional items) through their web store and a few selected locations in larger cities in Nordic countries and Europe. Right now, MediaFun is using other media companies platforms for their broadcasts, such as Spotify and iTunes podcasts. Their CEO has decided that it is not a sustainable situation. Their executive board has explained to you that MediaFun is seeking to create a new service in addition to their web store, where users can:

1. Have voice chat based social media, in the style of Discord or Clubhouse. MediaFun has decided to call this service AudioNow. The key idea behind this is that people can listen to podcasts together.
2. Subscribe and listen to podcasts hosted by influencers. Subscribers can listen to advertisements, pay a subscription, and also send tips to podcasters, similar for example to Twitch virtual currency.
3. Buy fan items from influencers, such as books, coffee mugs, or games.

Currently MediaFun has several thousand registered customers in their old e-commerce database, who have bought fan products. To create a user base, MediaFun wants to provide this new service to their existing customers based on their old sales records available in a separate database. MediaFun has identified three different types of customers and two additional user groups:

- Old customers whose e-commerce account is moved to the new system. They are most likely to only buy physical items. If they do listen to podcasts, these users will have advertisements on their podcasts to cover the licensing costs.
- Subscription customers, who will pay a monthly fee of 10 € to be able to listen to any audio podcast in the AudioNow service and have audio rooms of unlimited duration in the social media side.
- Users who have made an account on the system, but only chat with other people in the social media audio rooms or listen to free podcasts. These users have advertisements in podcasts.

- Random users who watch the promotional shows which are open for viewing even without an account. Also, these users are played advertisements.

If the customer has bought the media earlier or has active subscription, they will be able to listen to the media whenever, wherever they want to. This also means that the AudioNow system must be able to handle also other kinds of platforms besides PC browser, such as tablets, game consoles, or smartphones. The users should also be able to buy items or subscriptions with their mobile system or tablet.

Additionally, paying users should be able to download their media to a local system for playing them when they are offline or if AudioNow is not available for any reason. The system should also be able to tell if the network connection is too slow for online playback and in this case suggest downloading option. The users who are using freely available content, a separate advertisement system should be created. This system should have some form of user profiling to gain better revenue per views.

On the maintaining side, MediaFun wants to be able to add (or possibly remove) media from the AudioNow subscription library, and sometimes run specials where certain podcasts are free for everyone. Adding new deals, promotional material and setting different advertisements on the service is a job for advertisement department, which runs all of the ad campaigns for the entire MediaFun corporation.

MediaFun also has to manage subscription plans, and all the transaction and customer data the system collects. For legal reasons, the system has to also be able to provide extensive reports on what media and how many times different things have been watched. Additionally, Internet shopping and ordering must be secure and safe. There must be a reliable authentication mechanism for users of these services, and normal sanity checks are made for all data contents in all functionality.

MediaFun has a separate system for billing and management of sales, which should be synchronized with the AudioNow system and forward customer data and transactions to the accounting department. Similarly, if customer for any reason wants to order a physical version of the bought media, the order is forwarded to the old order management system. AudioNow service should also be able to tell in real time if there are promotional items (posters, soundtrack etc.) available for separate order.

The MediaFun web store is a separate system, which connects to the order management system and billing system. All the data on items and availability is stored in the warehouse database, which is available via order management system. Each sold item has unique ID number, name, short

description, availability information, current amount in stock, price in EUR, and list of items it is related to.

MediaFun wants the default system to be built so that it runs on normal web browsers (Firefox, Chrome, Edge, Safari). For mobile phones, offline viewing, game consoles and tablets the service can be provided by a separate application. The server side of the system for now can be provided by a one large server cluster, but the system must be scalable in the future. The system must be reliable and be able to provide service to hundreds or thousands of users at the same time, but there really are no limitations in selection of development tools or IDE systems. In addition, MediaFun is open for suggestions, additions, or changes to the system definition, should the justifications be convincing enough.

3. Deliverable Requirements

Your delivered submission should include the following items:

1. Use Case Diagram with use case descriptions

2. Domain model of the system as one class diagram.

3. Deployment diagram depicting the entire MediaFun infrastructure and connected services.

4. MVC or BCE-model of the major components of the MediaFun system

5. Activity and communications diagrams depicting the major use cases

6. Limited risk analysis

7. Alpha Project plan and schedule

8. Pitching presentation to the client (slide deck attached to the main PDF, no presentation or recording required)

You are also required to report the time used, per part, per person, in hours. See the metadata section below for information.

In the following segments, each of these parts are described in more detail; it is also advisable that you complete these parts in the presented order, and start working early. (Hint: It is not accidental that this project has 7 main components + presentation, and the 2nd period is seven weeks long. One ECTS is 27 hours of work and 50% of a 6 ECTS course is 81 hours.)

Some general advice for a successful and highly graded project. The advice below makes the difference between rubric level 3 and rubric level 5 projects.

- Think of the work as a logical, beneficial work for the client. It needs to be useful and understandable, and more than a set of diagrams. Explain the diagrams, and detail how they are useful (especially in the introduction). It is expected that this text explanation is few pages in introduction and then at least a page per section later on.
- One part of the work needs to follow from another in a reasonable manner. For example, the solution approach in the introduction leads to requirements engineering process, which leads to use cases. All of these are in turn logical parts of the project plan.
- Provided solutions are connected not only to the assignment, but also to the course literature and material. The project also provides reasons for choosing the specific approaches from course literature.

- Clear communication. Think of the project report as something you'd hand to a client from a software engineering team.

4. Minimum content requirements, in detail

4.0.1 Cover page and teamwork metadata

Start your report with listing team members and their @student.lut.fi email addresses. Then, report the following before the introduction.

- Which group members participated in which part of the project (use cases, domain model, bce/mvc etc.). It is recommended that each group member participates in each step.
    - Activities of each person in each specific step (one or two sentences about who did what).
- Finally, estimated number of hours used, per person, per step.

Do not list your student numbers since they are private data.

4.0.2 Introduction

Write the introduction of your project here and the project concept. Tell at a general level at how you are going to proceed and present a summary of your solution idea. Address any ambiguities or questions by the client or point out in which later section you are going to address them. Provide references or footnote links to proposed technologies or approaches.

Introduce your approach to modelling, including already mention the rationale for selecting a certain process model and how the modelling steps relate to each process model (then introduce the process in depth at a relevant Section below). Remember to refer to the assignment and relevant course literature where possible.

4.1. Use Case Diagram with use case descriptions

Draw a use case diagram(s) of the MediaFun system. Identify the actors and their most important use cases. Remember to add also external systems as actors in the diagram. You do not yet need to take an account on the technical details of the system.

4.1.1. Use cases

Do also a written description of each actor and a description of each use case according to the templates below. Describe all use cases at a level of high abstraction and then a series of detailed use cases based on the number of team members.

Tip: If you find yourself describing more than a dozen high-level use cases, consider reducing or merging them. While normally you describe as many as you discover, having a maximum of dozen (or less) abstract use cases is enough. For number of required detailed use cases, see Section 4.1.2.

Actor: <actor name>

1. Brief Description

A brief description of the actor and their relation to the system.

2 Use Cases

A brief description of the most essential use cases this actor has with the system.

Use Case: <use case name>

1. Brief Description

A brief description of the use case is included here.

2. General Flow of Events

The flow of events of the use case is included here. On this level it is enough if written description of what the actors are doing in the use case is provided.

3. Preconditions and Requirements

Preconditions and the requirements of the use case. These must be true before the use case may be executed.

4.1.2. Detailed use cases

No. of detailed use cases

IN ADDITION of this high-abstraction documentation for each use case, the groups are also expected to provide a number of detailed use cases based on the amount of students in the group. Group of 1 will be required to document 2 cases in detail, groups of 2 students 4 cases and groups of 3 students 6 cases. In detailed documentation, use this template:

Use Case: <use case name>

1. Brief Description

A brief description of the use case is included here.

2. Flow of Events

The flow of events of the use case is included here. Only one level of sub flows is indicated, but you may add more levels if necessary. These descriptions are detailed, concrete and proceed step-by-step.

2.1 Basic Flow of Events

2.1.1 <name of sub flow>

2.2 Alternative Flow of Events

2.2.1 <name of sub flow>

3. Special Requirements

Special requirements of the use case. Typically these are non-functional requirements.

3.1 <name of special requirement> A brief description of the special requirement.

4. Preconditions

Preconditions of the use case. These must be true before the use case may be executed.

4.1 <name of precondition> A brief description of the precondition.

5. Postconditions

Postconditions of the use case. These describe the conditions after the execution.

5.1 <name of postcondition> A brief description of the postcondition.

4.2. Domain model of the system as one class diagram.

Make a conceptual model of the system domain as one class diagram. Describe the most essential concepts as classes, define their relationships and attributes. Examples of these concepts include Measurement, Sensor, User, etc. Especially pay attention to the data attributes these classes should possess.

4.3. Deployment diagram depicting the entire MediaFun infrastructure and connected services

Design a deployment diagram of system's architecture. Use illustrative symbols and present at least the software structure of the system, including the parts of the system at a software level (software structure e.g. with package diagram) and physical structure with hardware (Deployment view, e.g. deployment diagram), including hardware components and their connections. Take into account possible third party connections.

4.4. MVC or BCE-model of the major components of the MediaFun system

Based on your domain model and deployment diagram, further develop your domain model design into a MVC- or BCE-modeled system, where the interfacing, data managing and data manipulating systems are separated from each other. On Entity/Model classes, define what type of information this entity possesses, and where it is stored in the deployment diagram.

4.5. Activity and communications diagrams depicting the major use cases

Based on the major use cases you selected to define in detail in the first part, draw the activity diagrams to depict the user activities, and communications diagrams to depict the internal communications, to

complete them. If your use cases have alternative flows of events, include them in your diagrams.

4.6. Risk analysis

Perform a hardware or faulty data risk analysis with at least five risks presented in a risk table. MediaFun is not a safety critical system, so approach the analysis from the perspective of service interruption and financial losses to the customer or SEIry. Present the findings in a risk table, similar to course materials. Present minimally identified risk description, risk level, and acceptability as columns.

Then, select one medium to high risk that would be caused by the failure of one of the hardware components presented in the deployment diagram. Perform a fault-tree analysis on it. Present the analysis visually and justify your reasoning.

4.7. Alpha-project plan and schedule

Final part of the documentation is the actual project plan and draft for a schedule. Define a process model, which the project would follow, and explain why this model would work best. Define the development deadlines and milestones, the needed tools, resources (human, software and hardware) and schedule you would need to realize this project to an alpha stage, where the system could be tested with a real audience. Make a draft on how you would test and pilot this software with a limited number of test users, and what would be the meaningful information to collect.

4.8. Pitching presentation deck

Based on your design, prepare and create a pitching slide deck, that your team would use to present the designs of the new MediaFun service, the project plan and other requested information. Approach this presentation from the perspective that you are a subcontractor presenting a commercial product to a client, not as a student team to a teacher. Apply the NABC or other good pitching structure.

Attach the slide deck as an appendix to your project report PDF, so that your team is returning only one PDF file.

There is no need to present or record a video, since the project groups already meet and discuss with the lecturer at intermediate check-up meetings.

Appendix 1. Rubric for evaluation criteria

Criteria	Does not meet expectations	Meets some expectations	Partially meets expectations	Nearly meets expectations	Meets all expectations
1. Introduction (6pts)	Is present, but is not clear or does not follow guidelines.	As partially, but with some issues	Covers requirements, but does not present a good rationale for the approach.	Meets expectations, but with some imperfections	Introduces the concept well and motivates the approach. Provides a good overview to the client what is going to happen and why. (and what the document will cover)
2. Use Case Diagram with use case descriptions (10pts)	Is present, but is not clear or does not follow UML or guidelines	As partially, but with some issues	The empirical part is somewhat connected to frameworks and literature. The connection between theory and solutions can be found. The work contains original thinking, self-made solutions, and responds to assignment goals.	Meets expectations, but with some imperfections	Covers all issues relevant to work. Applies the background theory and frameworks thoughtfully. The solutions are believable and connected to literature. Novel, justified, and critical thinking present. The results are well-presented, comprehensive and

Criteria	Does not meet expectations	Meets some expectations	Partially meets expectations	Nearly meets expectations	Meets all expectations
					critical where necessary.
3. Domain model of the system as one class diagram (8pts)	Is present, but is not clear or does not follow UML or guidelines	As partially, but with some issues	The empirical part is somewhat connected to frameworks and literature. The connection between theory and solutions can be found. The work contains original thinking, self-made solutions, and responds to assignment goals.	Meets expectations, but with some imperfections	Covers all issues relevant to work. Applies the background theory and frameworks thoughtfully. The solutions are believable and connected to literature. Novel, justified, and critical thinking present. The results are well-presented, comprehensive and critical where necessary.
4. Deployment diagram depicting the entire MediaFun infrastructure and connected services (10pts)	Is present, but is not clear or does not follow UML or guidelines	As partially, but with some issues	The empirical part is somewhat connected to frameworks and literature. The connection between theory and solutions can be found. The work contains	Meets expectations, but with some imperfections	Covers all issues relevant to work. Applies the background theory and frameworks thoughtfully. The solutions are believable and connected to

Criteria	Does not meet expectations	Meets some expectations	Partially meets expectations	Nearly meets expectations	Meets all expectations
			original thinking, self-made solutions, and responds to assignment goals.		literature. Novel, justified, and critical thinking present. The results are well-presented, comprehensive and critical where necessary.
5. MVC or BCE-model of the major components of the MediaFun system (10pts)	Is present, but is not clear or does not follow UML or guidelines.	As partially, but with some issues and the concept has not been clearly understood	The empirical part is somewhat connected to frameworks and literature. The connection between theory and solutions can be found. The work contains original thinking, self-made solutions, and responds to assignment goals.	Meets expectations, but with some imperfections	Covers all issues relevant to work. Applies the background theory and frameworks thoughtfully. The solutions are believable and connected to literature. Novel, justified, and critical thinking present. The results are well-presented, comprehensive and critical where necessary.
6. Activity and communications diagrams	Is present, but is not clear or does	As partially, but with some issues	The empirical part is somewhat connected to	Meets expectations,	Covers all issues relevant to work. Applies the

Criteria	Does not meet expectations	Meets some expectations	Partially meets expectations	Nearly meets expectations	Meets all expectations
depicting the major use cases (14pts)	not follow UML or guidelines		frameworks and literature. The connection between theory and solutions can be found. The work contains original thinking, self-made solutions, and responds to assignment goals.	but with some imperfections	background theory and frameworks thoughtfully. The solutions are believable and connected to literature. Novel, justified, and critical thinking present. The results are well-presented, comprehensive and critical where necessary.
7. Risk modeling (8pts)	Is present, but does not follow course materials, does not fulfill its purpose, or is not coherent with the documentation.	As partially, but with some issues	The empirical part is somewhat connected to frameworks and literature. The connection between theory and solutions can be found. The work contains original thinking, self-made solutions, and responds to assignment goals.	Meets expectations, but with some imperfections	Covers all issues relevant to work. Applies the background theory and frameworks thoughtfully. The solutions are believable and connected to literature. Novel, justified, and critical thinking present. The results are well-presented,

Criteria	Does not meet expectations	Meets some expectations	Partially meets expectations	Nearly meets expectations	Meets all expectations
					comprehensive and critical where
8. Alpha Project plan and schedule (8pts)	Is present, but is incomplete, does not accurately reflect the, or does not follow the project as described elsewhere.	As partially, but with some issues	The empirical part is somewhat connected to frameworks and literature. The connection between theory and solutions can be found. The work contains original thinking, self-made solutions, and responds to assignment goals.	Meets expectations, but with some imperfections	Covers all issues relevant to work. Applies the background theory and frameworks thoughtfully. The solutions are believable and connected to literature. Novel, justified, and critical thinking present. The results are well-presented, comprehensive and critical where necessary.
9. Pitching deck (8pts)	Is present, but does not reflect the the project.	As partially, but with some issues	Structure that somewhat supports the pitch. Has a structure, with some flaws. Either demo or graphical parts have issues. The focus is occasionally there, but the presentation	Meets expectations, but with some imperfections	Logical structure. Believable pitch that builds on the written work and the diagrams. Applies the NABC or other good pitching structure. Contains well-implemented

Criteria	Does not meet expectations	Meets some expectations	Partially meets expectations	Nearly meets expectations	Meets all expectations
			occasionally wanders from the topic, or is long (over 15min), or contains too much student humor.		graphical and demo parts that support the pitch. Is not overly long or overly humorous.
10. Execution of work and clarity of communication (10pts)	What is returned is a set of schematics with no explanations.	As partially, but with some issues	The structure is logical, the content is balanced and proceeds well, the text is clear with some minor issues.	Meets expectations, but with some imperfections	The structure and language are flawless, the presentation of schematics and textual material support each other, the presentation of tables and figures support the work, the writing is scientific and clear to understand.

Additionally, the intermediate check-up (8pts) in early December is graded as follows:

- Participating in Zoom or FlipGrid (2pts), and being able to present what has been done, what will be done next, and what prevents the team from proceeding (2pts)
- Having a draft or a project structure to demonstrate (2pts) and it follows the assignment (2pts)

Project assignment Q&A

Based on student questions that have been answered.

Q: Can I pick the 2-6 (depending on team size) detailed use cases from the ones that I have already included in the use case diagram and briefly described?
A: Yes. The intention is that you select a number of use cases to detail further.

Q: How many activity and communication diagrams are required?
A: One activity and communication diagram per detailed use case. If you have a full group, this makes for a 6+6 diagrams in this section.

Q: How many detailed use cases do I need to write in the report?
A: See Section 4.1.2.

Q: What should I do, if I have discovered over twenty or thirty potential use cases after case analysis?
A: A dozen text use cases is enough, in the context of our course project. The rest can be listed only in the use case diagram and as bullet points in the report. Make sure to point out in the text that this is intentional.

Q: Can I select the simplest use cases to detail, such as “login?”
A: Please don’t. They are not very interesting to analyse or to demonstrate your modelling skills.