TECHNISCHE UNIVERSITÄT MÜNCHEN

Computer Graphics and Visualization Group
Computer Games Laboratory WS 16/17

Pandemia Munich

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1. Game Proposal

1.1. Game Description

This year's topic of the Computer Games Laboratory course is "Munich", so we decided to make a game that focuses on the infrastructure of that city. The core idea is to fight a deadly virus, which starts spreading in Munich. To accomplish the goal of exterminating the virus before too much of the population has been infected, the player needs to use limited resources in real-time.

The focus of our game is to simulate the spread of the virus as accurately as possible. To achieve this we plan to implement a realistic simulation of the daily life of the inhabitants of Munich. The graphics will be rather simple so that the player can easily keep track of the simulation. We are planning to visualize the city in bird's eye view. Neutral areas are displayed in white while areas with a high infection rate are colored red.

1.1.1. Gameplay

In the beginning of the game, the player doesn't know anything about the virus, but there are already infected inhabitants. It takes some time, until symptoms appear and infected persons can be detected. Using a variety of measures like test stations at public places, this process can be accelerated. To reduce the spread of the virus, the player can take several actions. These actions can affect the whole city, e.g. improving hygiene rules, starting an information campaign or enforcing a curfew, a single block or a special place, e.g. Marienplatz or München Hauptbahnhof. It is also possible to restrict the dispersal of the virus via public transport by closing lines.

As restricting the spread of the virus is not sufficient to extinct it, we plan to integrate the possibility for the player to research medicines and vaccines. The more patients have already been examined, the faster the research progresses. Also, it will be possible to upgrade research facilities and hospitals to improve healing chances, make healing go faster, be able to accommodate more patients, as well as to increase their area of influence.

In addition to fighting the virus, the player must ensure that the popularity is sufficiently satisfied. A core concept of the game is to weigh the effectiveness of a player's actions against their effect on satisfaction. For instance, an information campaign has little consequences on satisfaction, but is less effective than a curfew, which on the other hand has a big impact on satisfaction. The players need also to get by with a fixed income of money.

To keep track with what is happening, we implement a event system, which notifies players of important incidents. Examples for such events are first identifications of infected persons

and first events of death in Munich or a specific district. Notifications are also triggered, when infection rate or death rate exceeds a threshold, satisfaction drops below a threshold, a hospital has reached its capacity and research has been completed.

The game is won, if the virus is completely exterminated or the population is immunized. It is lost, when too many people have died, the virus spread to far or the satisfaction level reached zero.

1.1.2. Inspiration

One of our main inspiration was the board game "'Pandemie"'. In the classical "'Pandemie"' game four player fight cooperatively to try to stop a global pandemic to happen. Each player has different abilities, which are needed to stop all possible viruses, which could cause a pandemic.
As already describes above, our game idea is now to transport this idea to fight a pandemic in a big city like Munich. The inspirations to do this in real time is mostly based on the game "'Plague Inc"', in which the player is evolving a virus to eliminate the world. Instead of copying this, we wanted to change the perspective and let the player control the people, which would stop such a virus.
Furthermore, it was interesting to think about what would happen if a virus like Ebola would spread in a city in Germany. What possibilities, we would have here in a developed country and what might be happening.

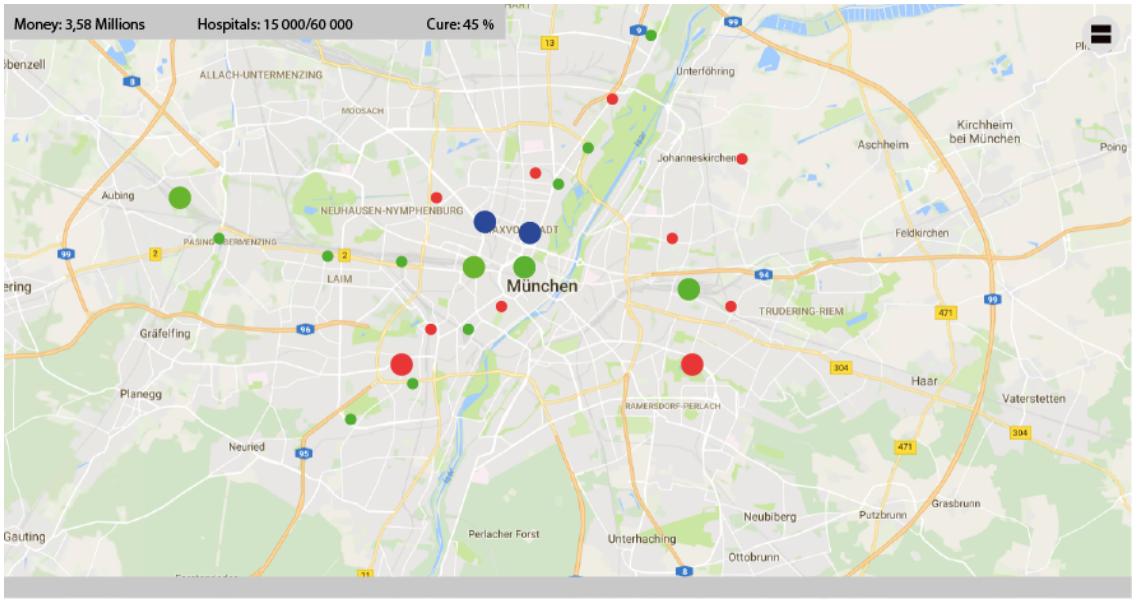


Figure 1 General game concept in 2D view

Figure 2 Visualization of special buildings in 2D view

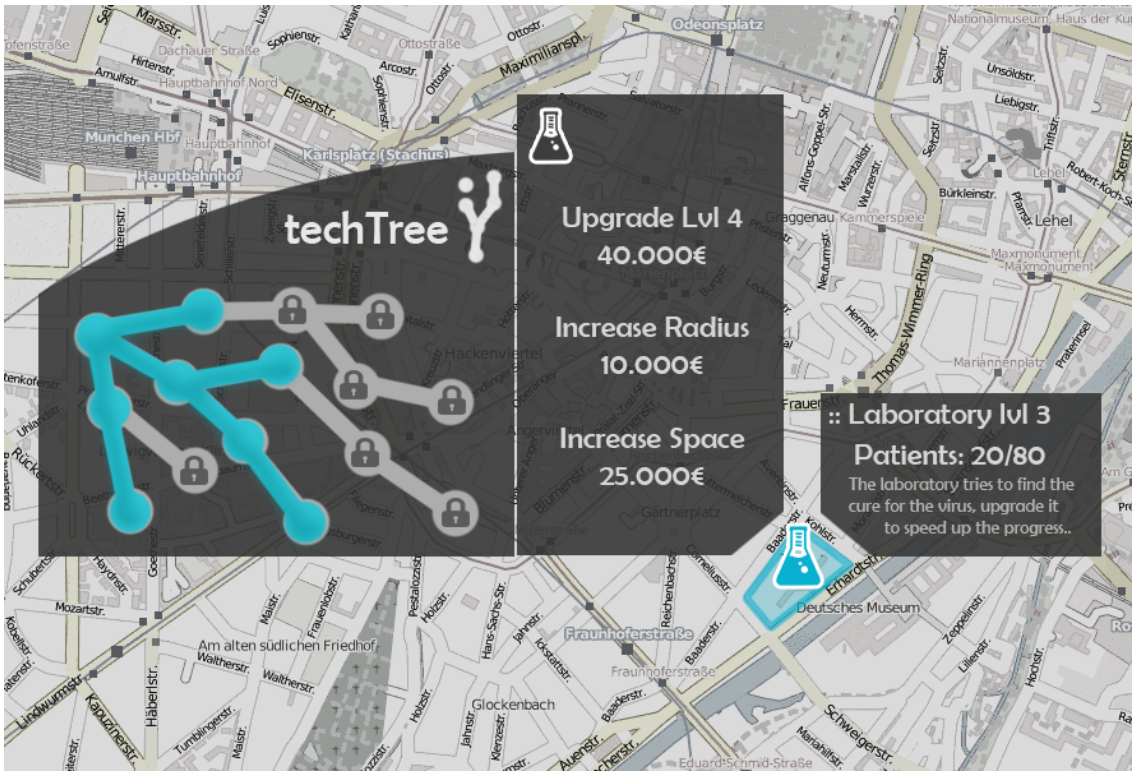


Figure 3 Concept: Upgrade options for laboratory and TechTree

1.2. Technical Achievement

For the game implementation we want the employ Unity as the underlying game engine. There are two major technical challenges for our Munich simulation we will focus on during development: a realistic crowd simulation coupled with an intelligent virus.

The crowd simulation should be scalable for several hundreds or thousands citizens and model their daily behavior. The players can take directly influence on crowd behavior (e.g quarantine areas restricting the walking areas). A large factor for the success of our game will be virus AI. Therefore we are aiming for an adaptive spreading algorithm, which has some sort of randomness to keep the players motivated and prevent finding easily winning strategies. The spreading will be further coupled with the crowd simulation to infect the citizens on contact.

Beside these we will have to deal with additional challenges like generating a virtual 3D model of Munich (or a subset) from existing data of map services and visualizing the game data (e.g infection rate) to guide the players and support them in their decision making.

Figure 4 Early Concept: View of the Marienplatz with infected citizens and buildings

1.3. Schedule

1.3.1. Development Layers

In total, five development layers are described in the following subsection. They describe the different stages of the game, starting with the functional minimum and ending with the high target. The fifth layer is composed of extras that could be added after the project ended.

The individual items are mostly described in an iterative manner. In the functional minimum we will create the first iteration of the item. In the following stages this item will be improved and enhanced with new functionalities. A good example would be the crowd simulation.

Functional Minimum

The functional minimum is the set of minimal items to make our project called a game. There are five main items that we want to finish in this layer. They are described in the following list:

- 2D Card of Munich: Street Layout of Munich including simple visualization of the spread of the virus.
- Simple Crowd Simulation: Entities are going directly from one place to another. No simulation of daily routines.
- Simple Virus Simulation: Virus is spreading more or less randomly. Mostly based on probability.

Figure 5 UI mockup: Visualizing the infection rate with colors and a few HUD elements

- Basic Player Interaction: Player can identify virus via the user interface and fight it with limited options.
- Simple Resource Management: Money is implemented and can be spend for player actions.
- User Interface: Main interfaces are done and can be used. Style is not final in this stage.

Low Target

The low target is absolute minimum we want to achieve during the semester. It contains items that should improve the fun of playing the game and the overall user experience. Five main areas are addressed in this layer:

- Simple 3D Representation of Munich: Munich should be recognizable. Some key building should be identifiable.
- Enhanced Crowd Simulation: Crowd should follow streets/transportation lines. Realistic traffic speed.
- Enhanced Virus Simulation: First steps to a realistic spread of virus should be finished. Virus should spread from one person to another with some probability if they meet.
- Enhanced Player Interaction: Style of User Interface should be done and more player actions implemented.
- Research Ladder: Player should be able to research upgrades and finally able to find a cure/vaccination.

- Upgrades: Certain buildings like hospitals or stations should be upgradeable.

Desirable Target

This layer is the target layer. This layer we want to achieve during the project time. Based on this our development schedule was created. Most of items listed here are based on earlier implementations described in the two layers before.

- Realistic Crowd Simulation: Crowd should have daily routines. Not just only moving between work and home, but also to other destinations like the gym or supermarket. Especially a day-night-cycle should be implemented.
- Realistic Virus Simulation: Virus should adapt to player actions and spread realistically, especially over public transportation and places.
- Enhanced Resource Management: Player should be able to control the flow of the money and manage it. Implementation of statistics.
- Difficulty Levels: Player should be able to choose between different difficulties.
- Mini Missions: Small missions to guide the player especially in early stages of the game. Show them what they can do and what would be reasonable.

High Target

The High Target contains items that might be implemented if everything goes really well. The items would be nice to have and would enhance gameplay and as well the graphical representation of the game.

- Enhanced 3D Representation: Detailed modelling of special buildings like Allianz Arena.
- Research Tree: Enhanced research possibilities with different ways to get the cure.
- Advanced Story Arc: Make the player more aware of the danger of the virus, maybe introduction trailer.
- Tutorial Mode: Implement a little tutorial for the player.
- Dynamic Sound and Graphic Adaptation: Sound and graphic should react on state of the game.
- Highscore: Online highscore to compare with other players.
- Achievements: Player can earn achievements if they master special challenges.

Extras

Some additional features that could be implemented as extras would be a cooperative gameplay. So player could work together to fight the virus. It would be also fun if another player could play the virus and therefore we would have a more competitive aspect in the game.

Another area would be to create a better atmosphere with the help of cut scenes and special events. Therefore, the player might be more engaged with the game. Furthermore, educational aspects on better hygiene and healthcare could be an interesting addition to the game.

1.3.2. Development Schedule

This schedule presents how we plan to implement the game. At the end of the implementation phase our target is to have all desirable target items to be finished. The schedule includes assignment of the team members to different tasks. This is still work-in-progress and can change during the implementation phase.

Vorgan	Vorgangsname	Dauer	Anfang	Ende
	Game Proposal	**11 Tage**	**Mit 12.10.16**	**Mit 26.10.16**
	Brainstorming	3 Tage	Mit 12.10.16	Fre 14.10.16
	Find Game Idea	4 Tage	Mit 12.10.16	Mon 17.10.16
	Finalize Game Idea	2 Tage	Die 18.10.16	Mit 19.10.16
	Write Game Proposal Chapter	**5 Tage**	**Don 20.10.16**	**Mit 26.10.16**
	Bullseye	1 Tag	Don 20.10.16	Don 20.10.16
	Technical Achievement	5 Tage	Don 20.10.16	Mit 26.10.16
	Development Schedule	5 Tage	Don 20.10.16	Mit 26.10.16
	Assesment	5 Tage	Don 20.10.16	Mit 26.10.16
	Game Description	5 Tage	Don 20.10.16	Mit 26.10.16
	Make Presentation	3 Tage	Mon 24.10.16	Mit 26.10.16
	Game Proposal Presentation	0 Tage	Mit 26.10.16	Mit 26.10.16

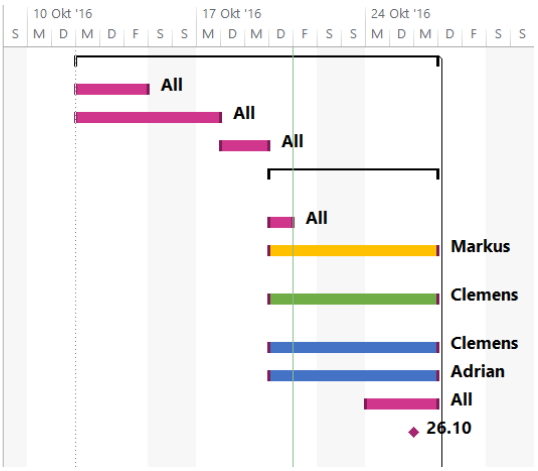
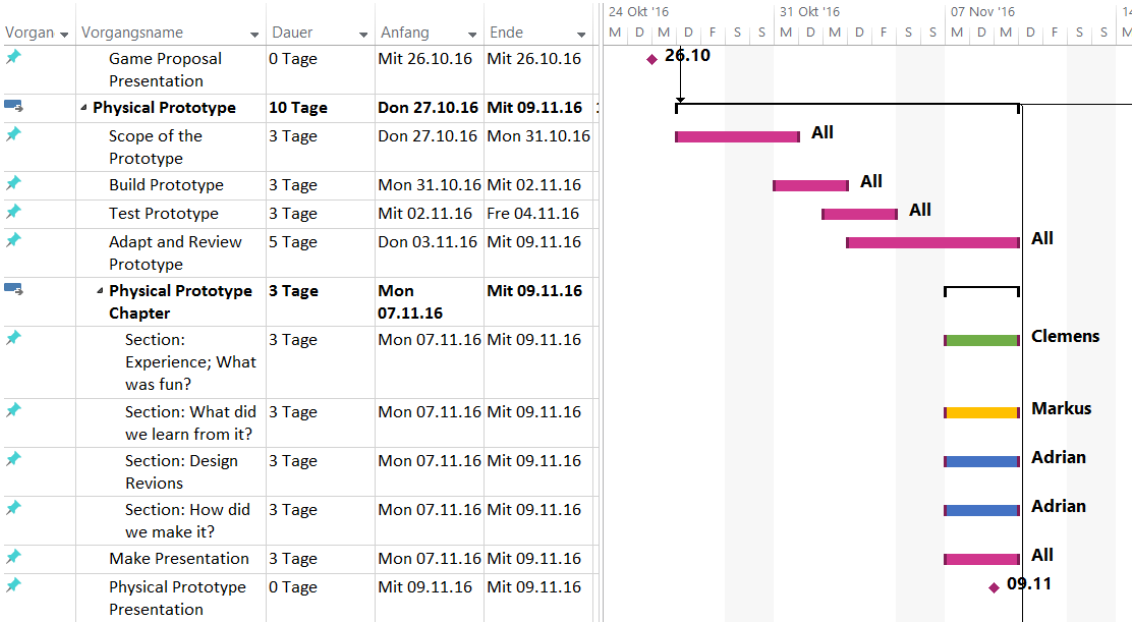
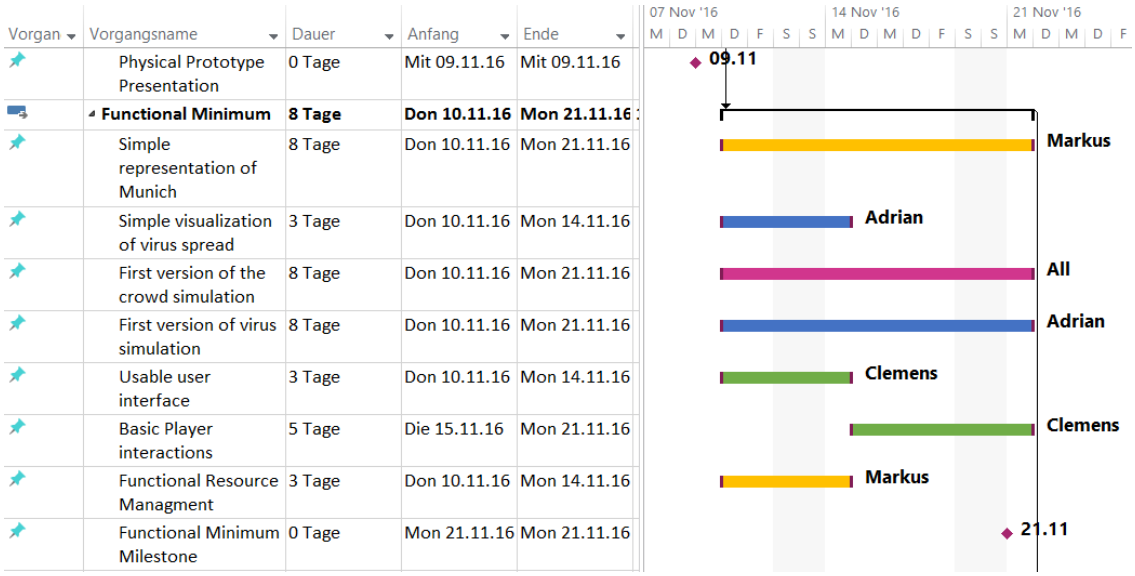


Figure 6 Schedule until the game proposal mile stone.



Vorgan	Vorgangsname	Dauer	Anfang	Ende
	Game Proposal Presentation	0 Tage	Mit 26.10.16	Mit 26.10.16
	Physical Prototype	**10 Tage**	**Don 27.10.16**	**Mit 09.11.16**
	Scope of the Prototype	3 Tage	Don 27.10.16	Mon 31.10.16
	Build Prototype	3 Tage	Mon 31.10.16	Mit 02.11.16
	Test Prototype	3 Tage	Mit 02.11.16	Fre 04.11.16
	Adapt and Review Prototype	5 Tage	Don 03.11.16	Mit 09.11.16
	Physical Prototype Chapter	**3 Tage**	**Mon 07.11.16**	**Mit 09.11.16**
	Section: Experience; What was fun?	3 Tage	Mon 07.11.16	Mit 09.11.16
	Section: What did we learn from it?	3 Tage	Mon 07.11.16	Mit 09.11.16
	Section: Design Revions	3 Tage	Mon 07.11.16	Mit 09.11.16
	Section: How did we make it?	3 Tage	Mon 07.11.16	Mit 09.11.16
	Make Presentation	3 Tage	Mon 07.11.16	Mit 09.11.16
	Physical Prototype Presentation	0 Tage	Mit 09.11.16	Mit 09.11.16

Figure 7 Schedule from the game proposal until the physical prototype mile stone.



Vorgan	Vorgangsname	Dauer	Anfang	Ende
	Physical Prototype Presentation	0 Tage	Mit 09.11.16	Mit 09.11.16
	Functional Minimum	**8 Tage**	**Don 10.11.16**	**Mon 21.11.16**
	Simple representation of Munich	8 Tage	Don 10.11.16	Mon 21.11.16
	Simple visualization of virus spread	3 Tage	Don 10.11.16	Mon 14.11.16
	First version of the crowd simulation	8 Tage	Don 10.11.16	Mon 21.11.16
	First version of virus simulation	8 Tage	Don 10.11.16	Mon 21.11.16
	Usable user interface	3 Tage	Don 10.11.16	Mon 14.11.16
	Basic Player interactions	5 Tage	Die 15.11.16	Mon 21.11.16
	Functional Resource Managment	3 Tage	Don 10.11.16	Mon 14.11.16
	Functional Minimum Milestone	0 Tage	Mon 21.11.16	Mon 21.11.16

Figure 8 Schedule from the physical prototype until the functional minimum layer.

Vorgan	Vorgangsname	Dauer	Anfang	Ende
	Functional Minimum Milestone	0 Tage	Mon 21.11.16	Mon 21.11.16
	Low Target	**7 Tage**	**Die 22.11.16**	**Mit 30.11.16**
	Modelling of special buildings in Munich	7 Tage	Die 22.11.16	Mit 30.11.16
	Adapative Virus Simulation	7 Tage	Die 22.11.16	Mit 30.11.16
	Second Version of the Crowd Simulation	7 Tage	Die 22.11.16	Mit 30.11.16
	Research Ladder	4 Tage	Die 22.11.16	Fre 25.11.16
	Upgrading of buildings	3 Tage	Mon 28.11.16	Mit 30.11.16
	More player actions	3 Tage	Mon 28.11.16	Mit 30.11.16
	Low Target Milestone	0 Tage	Mit 30.11.16	Mit 30.11.16
	Interim Demo	**3 Tage**	**Mon 28.11.16**	**Mit 30.11.16**
	Make Presentation/Live Demo	3 Tage	Mon 28.11.16	Mit 30.11.16
	Interim Demo Chapter	**3 Tage**	**Mon 28.11.16**	**Mit 30.11.16**
	Section: State of the game	3 Tage	Mon 28.11.16	Mit 30.11.16
	Section: Difficulties	3 Tage	Mon 28.11.16	Mit 30.11.16
	Interim Demo Presentation	0 Tage	Mit 30.11.16	Mit 30.11.16

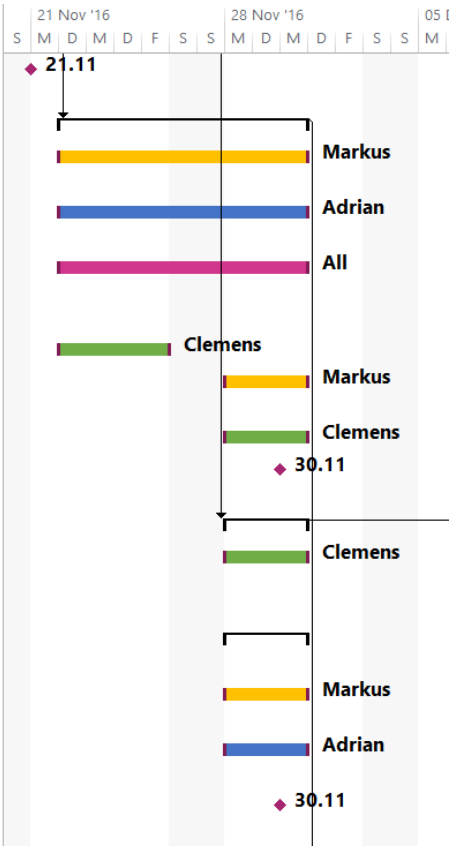


Figure 9 Schedule from the functional until the interim demo mile stone.

Vorgan	Vorgangsname	Dauer	Anfang	Ende
	Interim Demo Presentation	0 Tage	Mit 30.11.16	Mit 30.11.16
	Desirable Target	**15 Tage**	**Don 01.12.16**	**Mit 21.12.16**
	Mini Missions	5 Tage	Don 01.12.16	Mit 07.12.16
	Different difficulties	5 Tage	Don 08.12.16	Mit 14.12.16
	Realistic day and night-cycle	10 Tage	Don 01.12.16	Mit 14.12.16
	Final crowd simulation	5 Tage	Don 01.12.16	Mit 07.12.16
	Final virus simulation	5 Tage	Don 08.12.16	Mit 14.12.16
	Enhanced resource managment	5 Tage	Don 01.12.16	Mit 07.12.16
	Enhanced city model	15 Tage	Don 01.12.16	Mit 21.12.16
	Desirable Target Milestone	0 Tage	Mit 21.12.16	Mit 21.12.16
	Alpha Version	**3 Tage**	**Mon 19.12.16**	**Mit 21.12.16**
	Make Presentation/Live Demo	3 Tage	Mon 19.12.16	Mit 21.12.16
	Alpha Version Chapter	**3 Tage**	**Mon 19.12.16**	**Mit 21.12.16**
	Section: What is missing?	3 Tage	Mon 19.12.16	Mit 21.12.16
	Section: What is done?	3 Tage	Mon 19.12.16	Mit 21.12.16
	Alpha Release Presentation	0 Tage	Mit 21.12.16	Mit 21.12.16

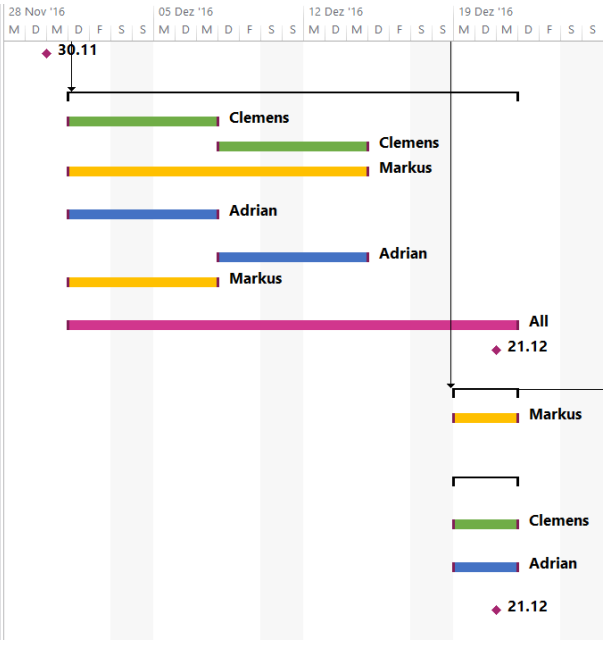


Figure 10 Schedule from the interim demo until the alpha version mile stone.

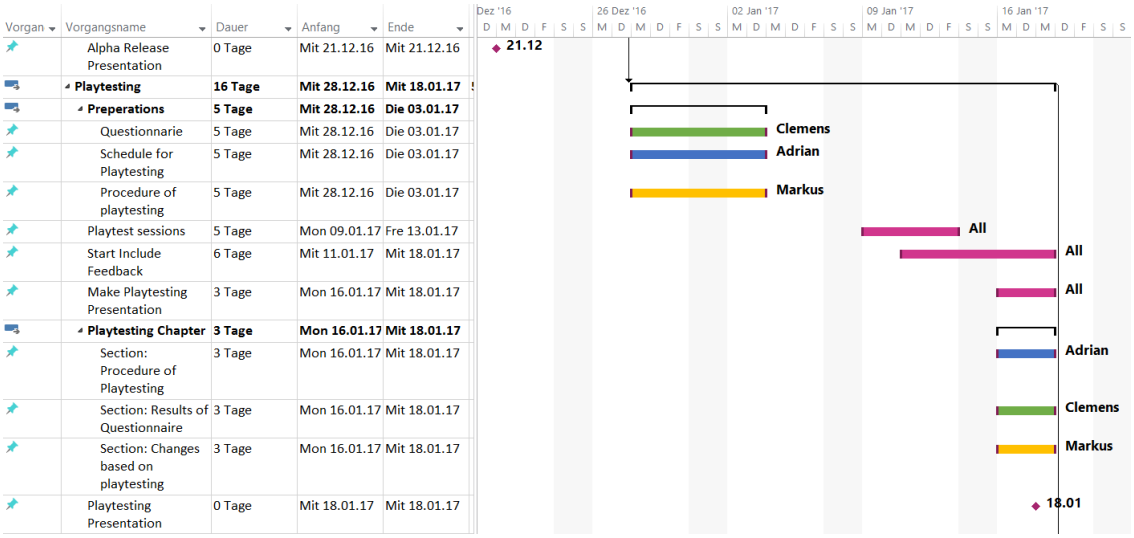


Figure 11 Schedule from the alpha version until the playtesting mile stone.

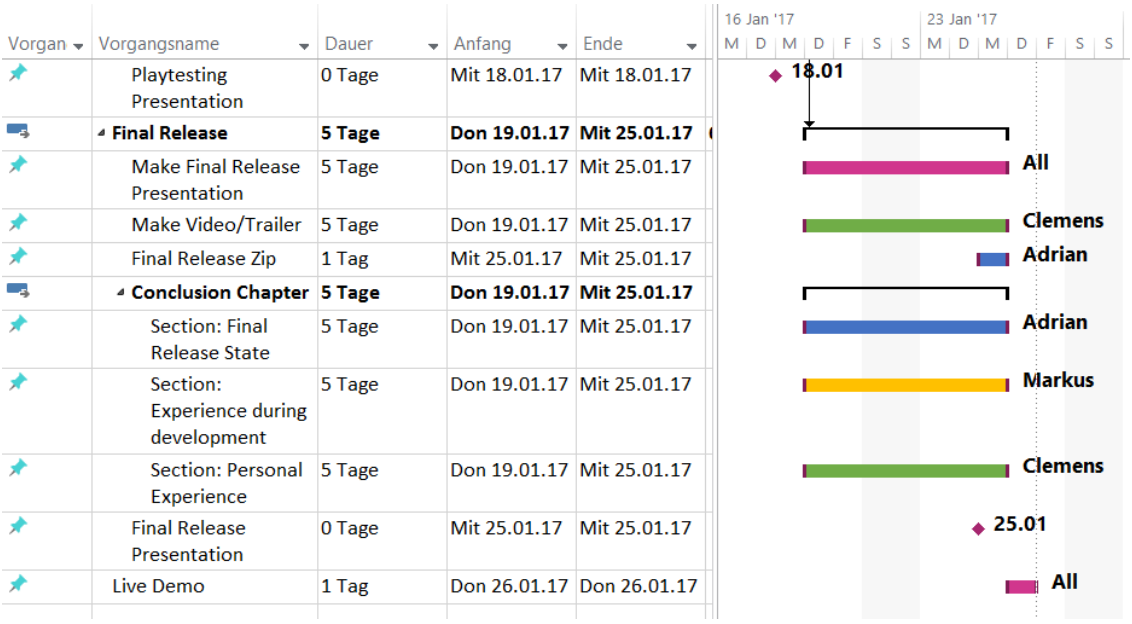


Figure 12 Schedule from the playtesting until the final version mile stone.

1.4. Assessment

The main idea of our game is to have a fast passed, but strategical gameplay. The core game mechanics should feel believable and realistic, especially the spread of the virus and the simulation of the crowd. The thrill to fight the virus and to save the city should be a main focus of the game.
Based on the strategical gameplay, our main focus group are fans of strategy and logic games. Nevertheless, we also want to reach more causal player that like fast-paced games. Additionally, we think that the topic of our game could be attractive to a wide variety of players.
For every player, the main task will be to fight the virus. Different options will be available for them, enabling different game styles. One of the key challenges will to keep the balance between fighting the virus and keeping the citizens of Munich happy.
Therefore, it is very important that Munich and the spread of the virus are simulate in a realistic manner. Citizens should follow daily routines and not only randomly go from one place to another. The virus should spread from one entity to another and not just randomly appear.
In summary, our criteria of success contains four aspects. Firstly, the player should feel the thrill to fight the virus. Secondly, the simulation should work - virus and population. Thirdly, the game should be well balanced. This means that each game feature should have a right to exist and not only be there to be a feature. As well, winning should not be too easy but the player should not lose every time. Lastly, Munich should be recognizable and buildings like the hospitals or the central station should be at the right place. And as every game it should be fun to play.

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