



System Specification

Digital Door Sign

Project Name	Digital Door Sign
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Version	V. 0.5

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1 Initial Situation and Goal

The technical college in Leonding (Upper Austria) is a high school with four departments:

- Informatics
- Media technology
- Medicine technology
- Electronics

Our school has over 1000 students and over 100 teachers.

For a technical college is very important to have a modern design. In the last few years our school has been renovated outside and some rooms on the inside.

It is also very important to be up to date with new technologies that can be used in buildings, that can let our school look more modern and can let people find rooms easier, especially during open-door days for new pupils and people interested in our school.

Our goal is start using a digital signage system which lets people see which rooms are being used and which not, when and where events like tests or seminars are taking place. This means implementing specific views for classrooms, computer rooms and special events is our aim.

This project is based on two preliminary projects, one using tablets as digital door signs and one using E-Papers.

The relevant stake holders are the students and the teachers. Furthermore our visitors also need a simple, efficient way to orientate through the school.

In order to start using a digital signage system we need to use digital signage devices like tablets or E-Paper devices.

1.1 Initial Situation

Currently our school uses paper sheets in order to tag the rooms. These can be damaged very easily and they can not be constantly updated when there are some changes in the regular schedule. These changes can only be seen in the WebUntis smartphone application or on the WebUntis website, which is not very practical if you are looking for a classroom or if you are searching an empty room.

The most common room types are: departments:

- Classrooms

These rooms' signage contains the room number, the main class that is usually in there and the form teacher.

- Computer rooms

The computer rooms' signage currently contains only the room number, the computer room's name and the room's department (e.g. informatics). The schedule is pinned on the door.

- Teachers' rooms

These rooms have multiple teachers with their name and picture.

- Special purpose rooms

The physics and chemistry rooms are used for lessons in these subjects. Furthermore, they are sometimes used as special rooms for holding tests.

- Assembly hall

This room is used for the final exams and special events.

Abbildung 1:
Classroom



Abbildung 2:
Computer room



Abbildung 3:
Workshop rooms



- Workshops

These rooms have a different signage compared to the classrooms. They only contain the room number and the room name. Some of them have symbols for the rules that have to be followed (e.g. wearing work clothing or safety glasses). Other rooms have a special schedule that is divided in morning and afternoon lessons.

- Meeting room (E26, ILB, ...)

Rooms with no regular schedule, booked for single events.

Currently all our rooms and events do not have a concrete signage showing which events are currently taking place. Even worse, one may not rely on the regular schedule shown at the doors.

Moreover, it happens that teachers spontaneously need a computer room, a special purpose room, a workshop, etc. for their lessons. Searching for one in WebUntis is time-consuming and knocking at all the room door to see if the room is occupied is pretty disturbing during regular lessons, not to mention situations where tests or exams take place. The preliminary project has made progress regarding the classroom views, the computer and teacher rooms views.

1.1.1 Application Domain

Our so-called application 'Digital Door Sign' is used for digitalising the door signs in our school. This means using technical devices like tablets or E-Papers to show which lessons are taking place and which class/teacher is in this room. These digital signs will be hanged next to the door.

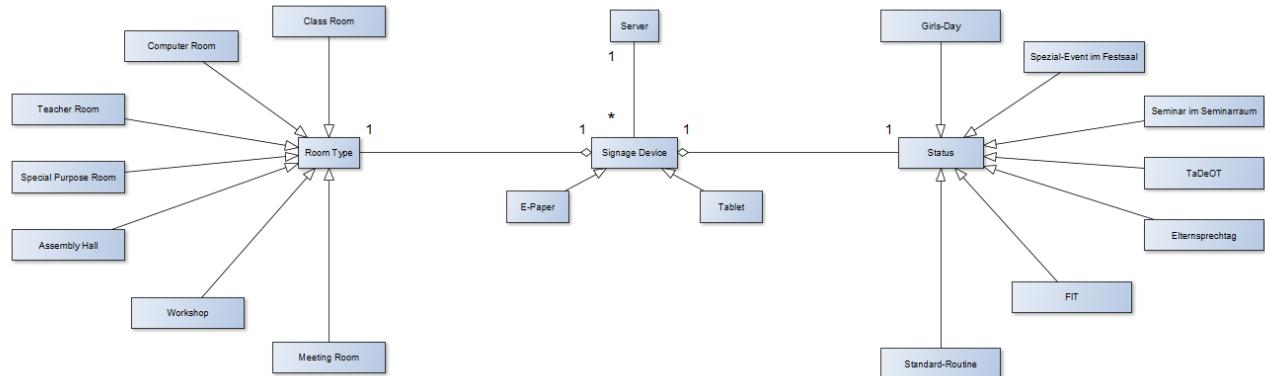
If somebody is looking for an empty room, our system will speed up the searching process since you don't have to manually search rooms on the WebUntis website or disturb people in occupied classes by knocking at their doors. People can immediately see if a room is empty by only looking at the digital sign next to the room's door.

Furthermore there are many events that take place in our school where we have a lot of visitors coming in. For each one of these events we plan to create a few templates that can be adapted to each event by an administrator. These templates will then be shown as events on the digital door signs and simplify the orientation for new pupils or visitors.

1.1.2 Glossary

Term	Explanation
Digital Signage	Tablet or E-Paper, used for displaying the different type of schedules and events
Sign	The same as tablet or E-Paper
View	The display of the tablet as a signage
Event	Events taking place in our school (meetings, workshops seminars included), e.g. open-doors' day
Room Type	Class/teacher/computer/workshop/chemistry/physics rooms
Assembly hall	May be also named 'banquet hall' or 'multi-purpose hall'
WebUntis	Service used by our school to show the classes'/teachers'/rooms' schedules
ILB	stands for 'Individuelle Lernbegleitung'
FIT	stands for 'Firmeninformationstag'
TaDeOT	stands for 'Tag der offenen Tür'

1.1.3 Model of the Application Domain



Class diagram

1.2 Goal

Our project wants to simplify and speed up the searching process of looking up for free rooms and for teachers. By updating the views every 10 minutes, our students/teachers/visitors will always have updated schedules of each room. Tables for the final exam schedules won't have to be printed and glued onto the doors

since our signs will also be able to illustrate them. The lists with consultation hours during the parents-teachers-meeting will also be shown on the digital signs.

A similar process applies to the computer, physics and chemistry rooms' schedule. The current lesson will be shown, followed by the weekly schedule.

Classes that are taking tests won't be disturbed during tests because our tablets will show a 'Don't disturb' sign.

Classes that are divided in multiple classes will be easier to find since we will show their current location on the signage of their main class.

Teacher rooms will also have a digital sign. The sign will show the teachers' current location and the consultation hours.

2 Functional Requirements

1. New special event

If there is a new event that will take place, the administrator should be able to register a new event.

2. Schedule time-frame

New events may have special timeframes that should be scheduled. These should be done by adding a .pdf file and displaying it on the digital signage.

3. Unregister sign

A sign should be unregistered by removing it from the admin page or by shutting the digital signage device down.

4. Register sign

A new sign should be registered by turning it on. The administrator has to choose from a list which room the sign should show. If there already is a digital signage device registered for this room, the old signage device will be removed and the new one will show the proper signage.

If the sign isn't new, our application will ask the administrator through the signage device if this is still the digital signage for the room that it previously signed.

5. Define default

Through the admin page, the administrator should define if a room should be signed normally (default), which means showing the current lesson. Otherwise, he should choose which type of event he wants to display.

6. Define FIT

If the FIT is taking place, the admin page should define which rooms will have special signage for this event.

In addition to that, the administrator should be able to manually put in which companies have presentations in which rooms and also their time schedule with a .pdf file. The logos of the companies should also be able to be uploaded as a picture.

Also, in the banquet hall, there is always a greeting event in the morning for the companies and afterwards a buffet. The time schedule should also be logged onto the banquet hall's signage.

7. Define special event: banquet hall

Special events that take place in the banquet hall should be defined by the administrator.

8. Define parent-teachers-meeting

The time schedules with the parents for each teacher should be uploaded for the room the teacher is in and then displayed.

9. Define special event: seminar room

The same like special events in the banquet hall.

10. Edit view layout

If the administrator wants to add something to the view (e.g. pictures), he should be able to change it himself.

11. Define TaDeOT

The different rooms and events must be defined by the administrator. For example, if the Roboterführerschein takes place in room 120, he should be able to log that change.

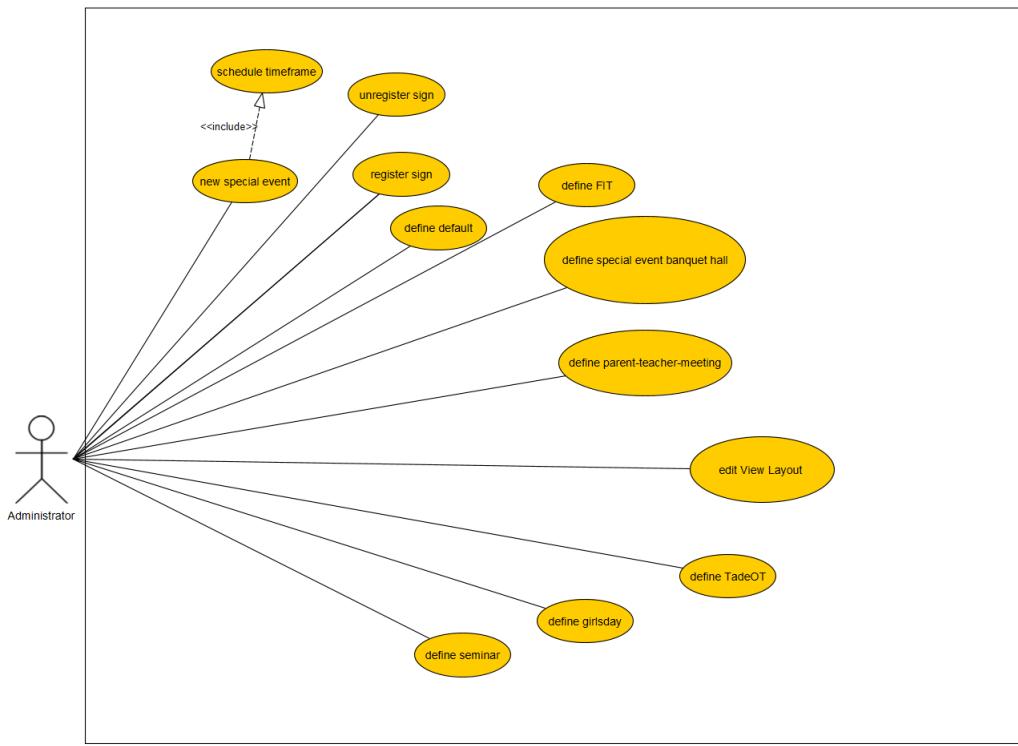
12. Define girls' Day

A room for girls' Day should be provided by the administrator.

13. Define seminar

Seminars that take place in our school should be defined by the administrator. Their title, the lecturer and their duration can be typed in by the administrator. All this information could also be displayed by adding a .pdf file. If there are any other things to display like pictures or logos, the administrator should be able to upload them to the view.

2.1 Overview



2.2 Use Case 1: New special event

Goal:	Create a new event for a digital signage device.
Precondition:	the administrator want to create a new event
Postcondition:	The creation of the new special event.
Involved Users:	teachers, administrator, students, visitors (parents, companies,...)

2.2.1 The Standard Use

- The administrator creates/describes the new event. The event can now be run at any time when it is needed.

2.2.2 The Non-Standard Use

- Creating the event could throw an error because it may not be inserted correctly into the database. Another error could be that the event will be not displayed

correctly in terms of layout or information.

2.2.3 Use Case 1.2: Schedule time-frame

Goal:	New events with special timeframes should be scheduled. These should be done by adding a .pdf file and displaying it on the digital signage.
Precondition:	When an event needs a time-frame.
Postcondition:	The time-frame is shown properly on the tablet.
Involved Users:	teachers, administrator, students, visitors (parents, companies,...)

2.2.4 The Standard Use

- The administrator enters uploads a specific .pdf file to the view.

2.2.5 The Non-Standard Use

- The .pdf file may not be shown properly and this will lead to a not so good-looking view.

2.3 Use Case 2: Unregister sign

Goal:	Unregister a signage device.
Precondition:	The tablet is no longer needed and/or has to be taken off the wall.
Postcondition:	The tablet is no longer connected to the server and therefore no longer receives commands. There is no timetable or anything else displayed and it no longer exists in the system.
Involved Users:	administrator

2.3.1 The Standard Use

- The tablet is unregistered and removed from the wall. It also no longer appears in the system

2.3.2 The Non-Standard Use

- The tablet shows an error when unregistering or if it still is in the system.

2.4 Use Case 3: Register sign

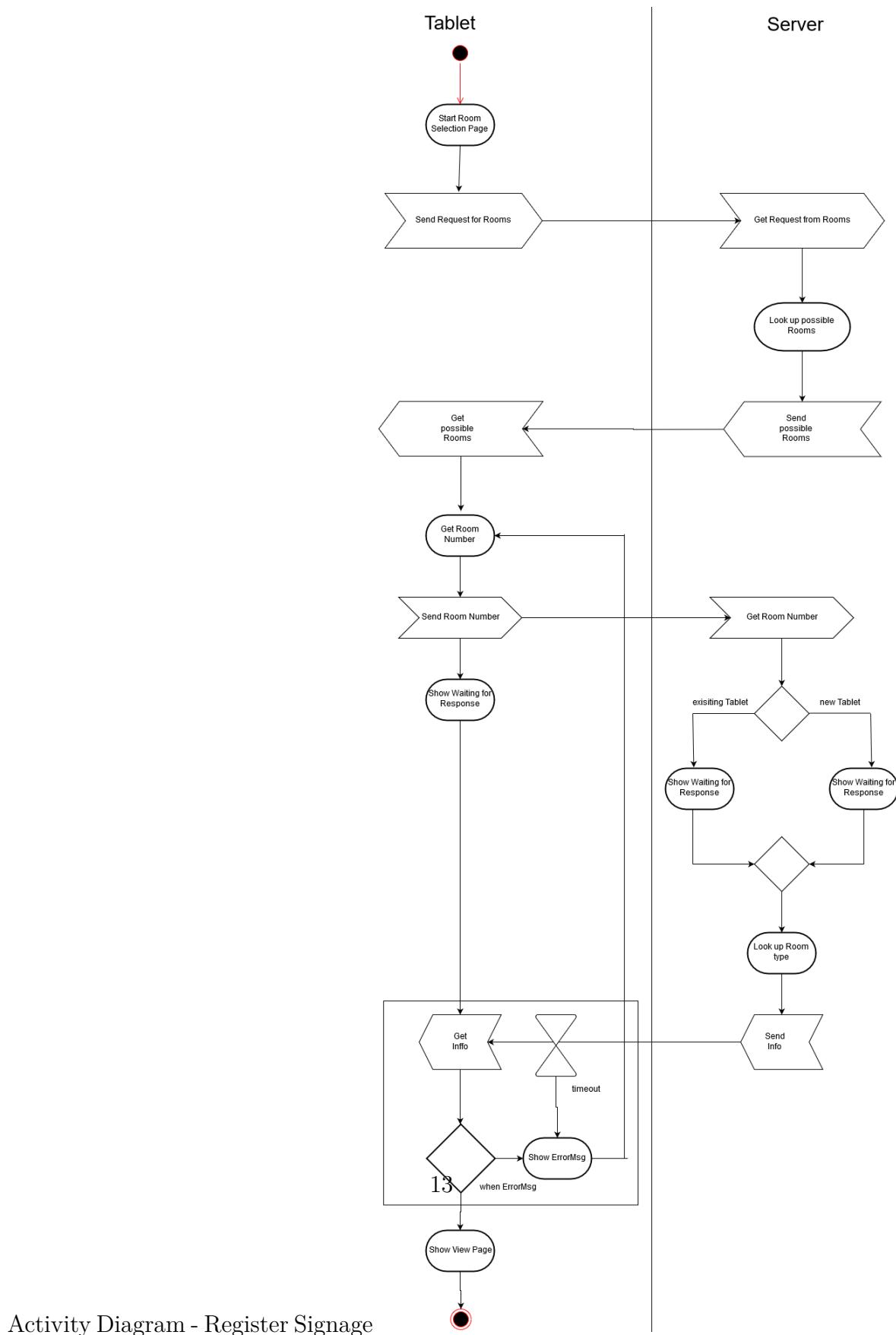
Goal:	Register a new signage device in our system.
Precondition:	A new signage device is needed and ready to be registered.
Postcondition:	A room is provided with a new digital signage. The signage is registered in our system.
Involved Users:	Administrator

2.4.1 The Standard Use

- The administrator registers the signage by selecting which room's schedule it should display. If there already is a signage registered to display the selected room, it will be overwritten by the new digital sign.

2.4.2 The Non-Standard Use

- If the internet is not working, the signage should throw an error.
- After a timeout, other errors occurring should be shown.



Activity Diagram - Register Signage

2.5 Use Case 4: Define default

Goal:	The UI / timetable for the respective class should be displayed-
Precondition:	If the timetable should be displayed on a school day without events.
Postcondition:	The normal display of the timetable for the respective class.
Involved Users:	teachers, administrator, students, visitors (parents, companies,...)

2.5.1 The Standard Use

- UI Classroom



The signage displays the current schedule of a class. It is also updated every 10 minutes. The current subject that takes place, the teacher and the class that is currently in the room is displayed. If the main class is in another room, this will also be displayed. The main teacher is also displayed.

- UI Computer/physics/chemistry room

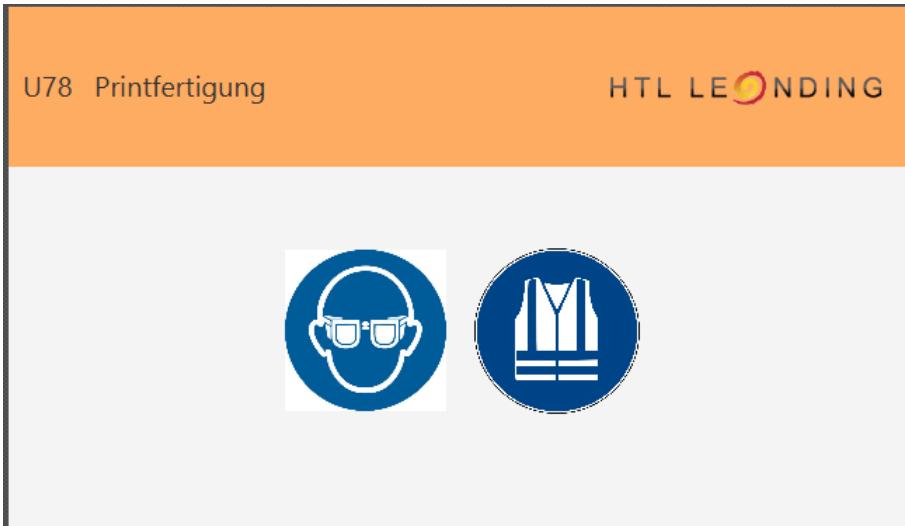


The signage displays the current teacher and lesson taking place. The schedule for the whole week should also be displayed. The computer, physics and chemistry rooms should have the same layout.

- Workshop room



For the workshop rooms, a .pdf file should be added with their own schedule.



There are workshop rooms that also have specific rules to be followed. Icons of these rules should be able to be added to the view.

2.5.2 The Non-Standard Use

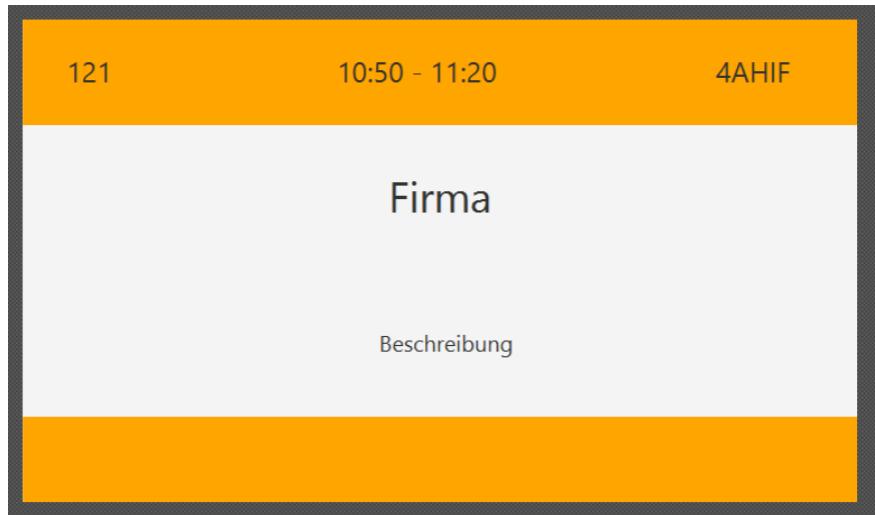
- Power failure, the server does not work or WebUntis does not work could be reasons for errors. When the digital signage will try to update the view, it will show the error and the cause of it.

2.6 Use Case 5: Define FIT

Goal:	Define in which rooms the FIT presentations from companies are taking place and uploading their time-schedule.
Precondition:	The FIT is about to take place.
Postcondition:	Pupils, teachers and company representatives can find the presentation rooms easier.
Involved Users:	administrator, pupils, teachers, company representatives

2.6.1 The Standard Use

- UI



- The right company and time schedule is shown on the signs that are affected by FIT. The schedule should be uploaded as a .pdf file.

2.6.2 The Non-Standard Use

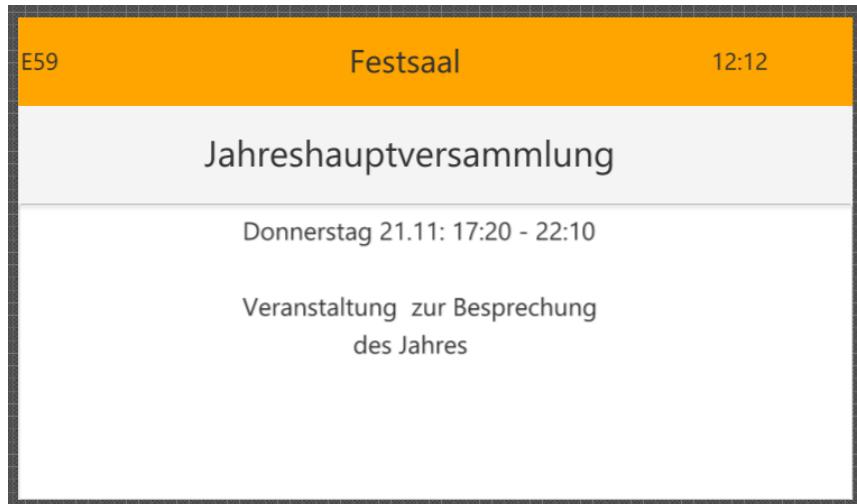
- The administrator may confuse the rooms when inserting the infos into the admin page. The schedule could also be displayed wrongly. There may be troubleshooting displaying the .pdf file correctly.

2.7 Use Case 6: Define special event banquet hall

Goal:	Define which event are taking place and writing their time-schedule.
Precondition:	The special event is about to take place.
Postcondition:	Pupils, teachers, company representatives, ... can find the banquet hall easier.
Involved Users:	Pupils, teachers, company representatives

2.7.1 The Standard Use

- UI



Depending on which event is currently taking place, the respective UI is displayed with time-schedule.

2.7.2 The Non-Standard Use

- If there is no internet connection, server doesn't work, there will be an error displayed.

2.8 Use Case 7: Define parent-teacher-meeting

Goal:	Defines the rooms in which the teachers are and shows the time-schedule for the parents
Precondition:	The special event is about to take place.
Postcondition:	Pupils and parents find the rooms in which the teachers are easier.
Involved Users:	Pupils, teachers, parents

2.8.1 The Standard Use

- A time-schedule should be displayed with the parents and their consultation time. This should be added as a .pdf file.

2.8.2 The Non-Standard Use

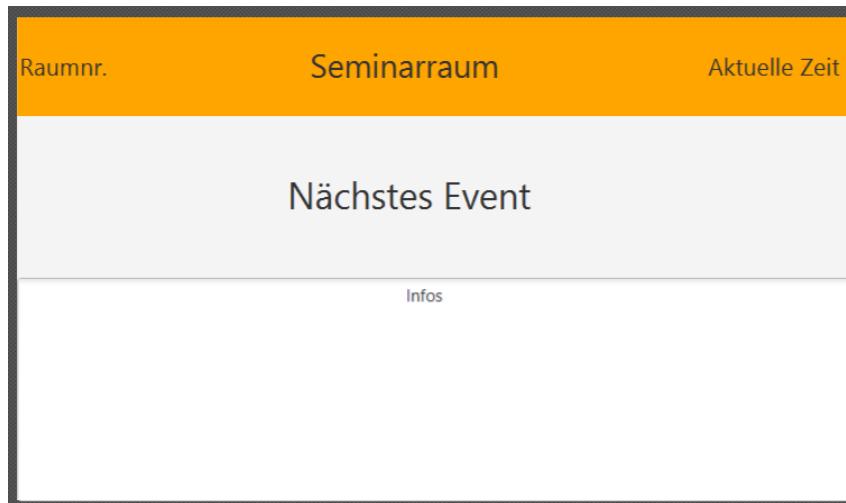
- If there is no internet connection, server doesn't work, the UI won't be displayed. Consultation times of some parents could be missing because the .pdf is not displayed correctly.

2.9 Use Case 8: Define special event seminar room

Goal:	Defines the room in which the seminars take place and also special events
Precondition:	The special event is about to take place.
Postcondition:	Teachers and company representatives can find the seminar room easier.
Involved Users:	teachers, company representatives

2.9.1 The Standard Use

- UI



If there currently is no event, the next event should be displayed.

2.9.2 The Non-Standard Use

- If there is no internet connection or the server doesn't work, an error will be thrown. The wrong next event may be displayed. If that's the case, only people knowing the next events will notice this error.

2.10 Use Case 9: Edit view Layout

Goal:	If the administrator wants to add something to the view or edit something, he should be able to do that. This means, he should be able to add .png or .pdf files.
Precondition:	The administrator thinks that there is something that has to be changed in a view.
Postcondition:	The view will have other elements in it and will look slightly different.
Involved Users:	administrator

2.10.1 The Standard Use

- The signage displays the changes that occurred.

2.10.2 The Non-Standard Use

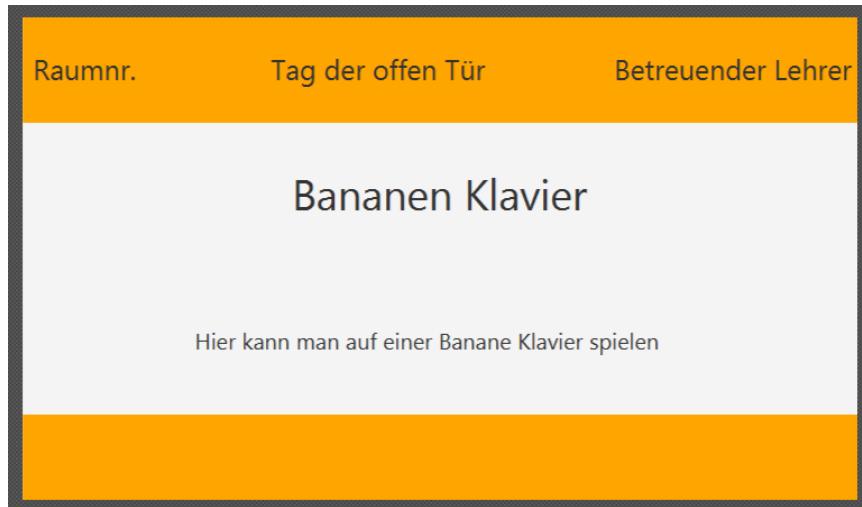
- The changes are not shown or shown wrongly because of a problem in our system.

2.11 Use Case 10: Define TaDeOT

Goal:	Many rooms have different purposes during the TaDeOT. These rooms have to be properly signed depending on what is happening inside them. For example, there are some rooms with presentations, while others have projects made by our pupils or graduates.
Precondition:	The TaDeOT is about to take place.
Postcondition:	The rooms affected by the TaDeOT have proper signage and help visitors and pupils in our school orientate.
Involved Users:	administrator, teachers, students, visitors (parents, companies,...)

2.11.1 The Standard Use

- UI



- The signages display the proper views. Rooms with presentations display the schedule for the presentations, rooms with projects should also have a short description of what's inside the rooms.

2.12 Use Case 11: Define girls' day

Goal:	The administrator should use a room for girls' day. This room should stop showing the default view and start showing the girls' day view.
Precondition:	The girls' day is about to take place.
Postcondition:	The room affected by the girls' day das proper signage and helps visitors and pupils in our school orientate.
Involved Users:	administrator, teachers, students, girls participating to the girls' day

2.12.1 The Standard Use

- UI



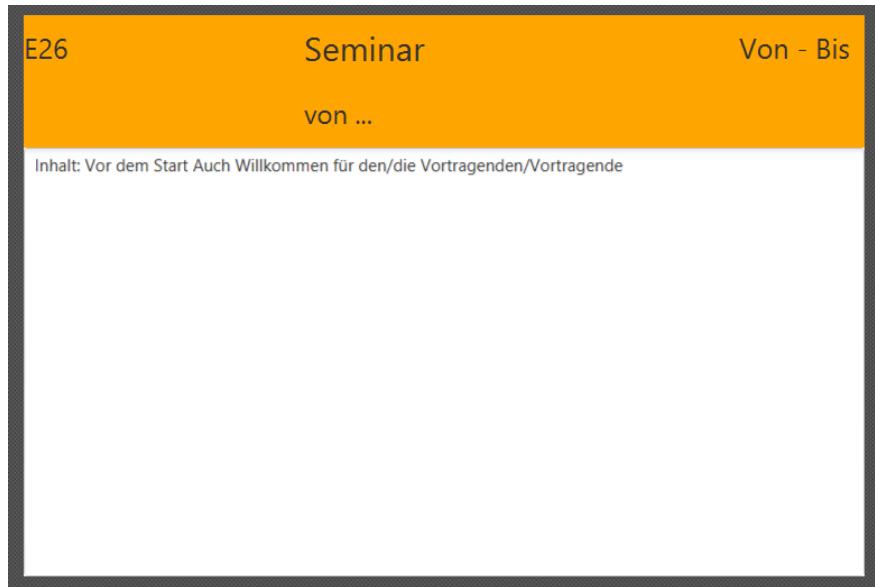
- The signage displays the proper view made for girls' day. If there is a schedule available, it should also be displayed.

2.13 Use Case 12: Define seminar

Goal:	The administrator should be able to define a seminar taking place in a room in our school. The room doesn't have to be the seminar room since this one may already be occupied.
Precondition:	A seminar is planned to take place in our school.
Postcondition:	The room in which the seminar takes places has the right signage and it shows all the information needed, e.g. the name of the seminar, the lecturer or a description about the seminar.
Involved Users:	administrator, teachers, students

2.13.1 The Standard Use

- UI



- The signage displays the proper view made for the seminar. If there is a schedule available, it should also be displayed. Logos of companies should also be able to be displayed if needed.

3 Non-Functional Requirements

3.1 NFR 1: Starting of digital sign

ID:	01
Name:	Starting of digital sign
Type :	Availability
Description:	Time required for the system to become available in normal recovery mode.

3.2 NFR 2: Registering of digital sign at door

ID:	02
Name:	Registering of digital sign at door
Type :	Usability
Description:	The digital sign shall ask the user its current location and provide basics informations about current lesson.

3.3 NFR 3: System resistance to adverse conditions

ID:	03
Name:	System resistance to adverse conditions
Type :	Robustness
Description:	The digital sign should be able to withstand and overcome adverse conditions or rigorous testing.

3.4 NFR 4: Systems performance and capability

ID:	04
Name:	Systems performance and capability
Type :	Maintainability
Description:	The digital sign must be capable of performing a successful repair action within a given time. In other words, it measures the ease and speed with which a system can be restored to operational status after a failure occurs.

3.5 NFR 5: Moving of digital sign

ID:	05
Name:	Moving of digital sign
Type :	Portability
Description:	The digital sign should have possibility to be transferred or adapted in special circumstances from one place to another.

3.6 NFR 6: Reusing of systems equipment

ID:	06
Name:	Reusing of systems equipment
Type :	Reusability
Description:	Authorized users shall be able to reuse available gadgets like tablets and e-paper in order to maintain performance and quality of digital sign system.

3.7 NFR 7: Ensuring digital sign

ID:	07
Name:	Ensuring digital sign
Type :	Testability
Description:	The digital sign must test system with various tests to ensure the system performances running without major fallacies.

4 Quantity Structure

- Memory**

We are going to save a few MBs; therefore, we don't need much disc space on our server and tablets.

- Updating**

We want to update the views on our digital signage devices every 10 minutes.

- **Costs**

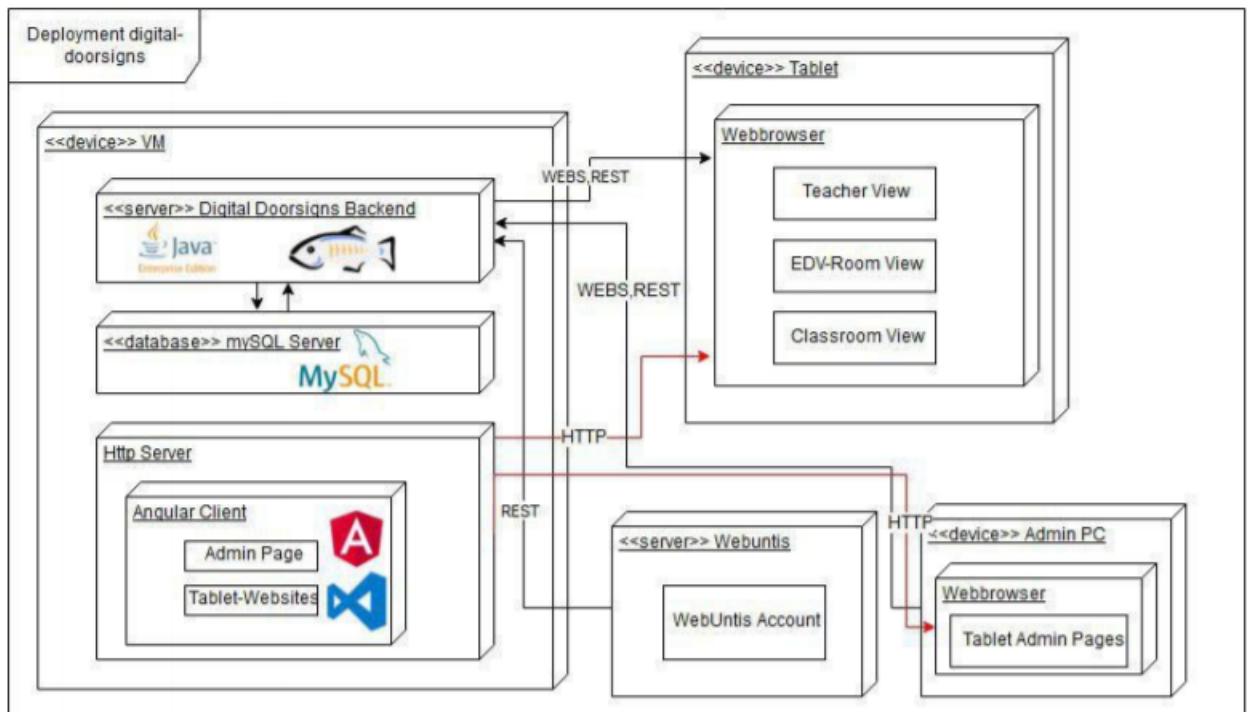
One tablet with frame and installation should cost us about 60-80€. Costs for power supply could be at about 4€ per year per tablet.

- **Rooms**

We have 33 classrooms, 12 EDV-rooms, 31 teacher-rooms, 22 Labour's and workshops, 6 gyms and other rooms.

For the standard rooms we will have costs between 4.560€ and 6.080€. Additionally, for the other rooms between 1.680€ and 2.240€. Furthermore, we need more than 365€ to supply the tablets with power for one year.

5 System Architecture and Interfaces



6 Acceptance Criteria

6.1 Acceptance Test 1: New special Event

User Story: If there is a new event that will take place, the administrator should be able to register a new event.

Scenario: New event has to be included.

Given: The user navigated to the admin page.

When: The user selected 'Add New Event'.

And: Entered the new design for the event.

Then: The system saved the design in database.

6.2 Acceptance Test 2: Schedule Time-frame

User Story: New events may have special timeframes that should be scheduled. These should be done by adding a .pdf file and displaying it on the digital signage.

Scenario: New schedule has to be added.

Given: The user navigated to the admin page.

When: The user selected 'Add New Schedule for Event'.

And: Entered the new schedule for the event.

Then: The system saved the schedule in database.

6.3 Acceptance Test 3: Unregister Sign

User Story: A sign should be unregistered by removing it from the admin page or by shutting the digital signage device down.

Scenario: Sign gets removed

Given: The user navigated to the admin page.

When: The user selected 'Edit Signs'.

And: Pressed delete button for the sign.

Then: The system should delete the sign from adminpage.

6.4 Acceptance Test 4: Register Sign

User Story: A new sign should be registered by turning it on. The administrator has to choose from a list which room this is. If there already is a digital signage device registered for this room, the old signage device will be removed and the new one will show the proper signage.

If the sign isn't new, our application will ask the administrator through the signage if this is still the digital signage for the room that it previously signed.

Scenario: New sign is getting setup.

Given: The user gets navigated to put in the room number.

When: The user gives in the room number.

And: Pressed 'Ok'.

Then: The system checks the sign in and returns the needed informations.

6.5 Acceptance Test 5: Define Default

User Story: Through the admin page, the administrator should define if a room should be signed normally (default), which means showing the current lesson. Otherwise, he should choose which type of event he wants to display.

Scenario: User chooses sign mode.

Given: The user navigated to the admin page.

When: The user selected 'Choose Sign Mode' for the wanted sign.

And: Chose the sign mode.

Then: The system tell the sign which mode it has now.

6.6 Acceptance Test 6: Define FIT

User Story: If the FIT is taking place, the admin page should define which rooms will have special signage for this event.

In addition to that, the administrator should be able to manually put in which companies have presentations in which rooms and also their time schedule with a .pdf file. The logos of the companies should also be able to be uploaded as a picture.

Also, in the banquet hall, there is always a greeting event in the morning for the companies and afterwards a buffet. The time schedule should also be logged onto the

banquet hall's signage.

Scenario: New event has to be included.
Given: The user navigated to the admin page.
When: The user selected 'Add New Event'.
And: Entered the new design for the event.
Then: The system saved the design in database.

6.7 Acceptance Test 7: Define Special Event: Banquet Hall

User Story: Special events that take place in the banquet hall should be defined by the administrator.

Scenario: Event in banquet hall has to be added.
Given: The user navigated to the admin page.
When: The user selected 'Add New Event'.
And: Entered the new design for the event in the banquet hall.
Then: The system saved the design in database.

6.8 Acceptance Test 8: Define Parent-Teacher-Meeting

User Story: The time schedules with the parents for each teacher should be uploaded for the room the teacher is in and then displayed.

Scenario: New time schedule has to be uploaded.
Given: The user navigated to the admin page.
When: The user selected 'Upload Time Schedule'.
And: Entered the time schedule for the parent-teacher-meeting.
Then: The system saved the schedule in database and informs the right signs about it.

6.9 Acceptance Test 9: Define Special Event: Seminar Room

User Story: The same like special events in the banquet hall.

Scenario: New event in the seminar room has to be included.

Given: The user navigated to the admin page.

When: The user selected 'Add New Event for Seminar Room'.

And: Entered the new design for the event in the Seminar room.

Then: The system saved the design in database.

6.10 Acceptance Test 10: Edit View Layout

User Story: If the administrator thinks that there's something wrong with the layout or if he wants to add something, he should be able to change it himself.

Scenario: Existing design has to be redesigned.

Given: The user navigated to the admin page.

When: The user selected 'Edit Designs'.

And: Reworks the design.

Then: The system saved the design in database.

6.11 Acceptance Test 11: Define TaDeOT

User Story: The different rooms and events must be defined by the administrator. For example, if the 'Roboterführerschein' takes place in room 120, he should be able to log that change.

Scenario: TaDeOT takes place.

Given: The user navigated to the admin page.

When: The user selected 'Add TaDeOT rooms'.

And: Entered the rooms used and the designs needed.

Then: The system saved the rooms and their designs.

6.12 Acceptance Test 12: Define Girls' Day

User Story: A room for girls' Day should be provided by the administrator.

Scenario: The Girls' day takes place.

Given: The user navigated to the admin page.

When: The user selects the Girls' Day design.

And: Selects a room.

Then: The system saves the design and room for the time the event takes place.

6.13 Acceptance Test 13: Define Seminar

User Story: Seminars that take place in our school should be defined by the administrator. Their title, the lecturer and their duration must be typed in by the administrator. If there are any other things to display like pictures or logos, the administrator should be able to upload them to the view.

Scenario: Seminar takes place.

Given: The user navigated to the admin page.

When: The user selected 'Add Seminar'.

And: Entered the needed data for the seminar.

Then: The system saved the data in database.