Bürgerbus mConcAppt Interaction Concept Documentation

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1 Introduction

This document includes the results from the requirements workshop with the customer and the following updates on requirements about the development of a mobile system for the local Bürgerbus on the 22.04.2016. The Bürgerbus system consists of 2 mobile applications, the BusDriveApp for the Bus Driver and the BürgerApp for the citizens. It is intended, that the system will be used within the project Digitale Dörfer (for further information see www.digitale-doerfer.de) in cooperation with the Fraunhofer IESE.

The chapters are structured as follows. The chapters 2 to 4 are covering the before stage, which means they describe the usage context, the people who will be influenced by the project and the current as-is situations with scenarios for a better understanding of how the Bürgerbus works today. And then in chapter 5 possible corresponding to-be situations are explained and a detailed example for a future scenario is described. From Chapter 6 to 8 this document explains how the finished product should function seen in the detailed system functions (chapter 7), interaction cases and screens of the finished apps (chapter 8). In the very end you find a glossary with some used vocabulary.

2 Usage Context

Weilerbach is a small city near Kaiserslautern. It has a very good infrastructure, but the distance between points of interest for the normal citizens is normally very far. Let us imagine Emma Meier (see in persona section 3.2). She has been living in Weilerbach all her life. She is living at the beginning of Weilerbach and wants to go shopping at the local supermarket. Mrs. Meier cannot walk properly and has no car instead she uses the Bürgerbus to get to the supermarket, but has problems with the time schedule of the bus and sometimes she needs to get picked up at her house. The Bürgerbus system wants to ease her life and make her a more satisfied stakeholder.

3 Stakeholder Description

3.1 Stakeholders and Goals

Table Stakeholders and Goals

Stakeholder Name	Stakeholder Role	Stakeholder Main Goals
Bus Driver	The Bus Driver drives a given bus route and stops at bus stations where passengers are waiting.	His main goal is to get people to their destination and be on time according to the schedule.
Citizen	Main User	Mobility, possibility to transport the goods, socialization (meet other people). /*See where the bus actually is to get on.*/
Developer	Developing the BürgerApp, the BusDriveApp or the backend	Developing the system good time effort high quality results.
Customer	Wants the System to be developed	High quality system all use cases covered reliability.
Administrational Bus App Community Members	Evaluates the system Distributes the app	Continuous improvement of the system and service, paths optimization. /*See statistics.*/

Author: Marcel Müller, Erik Gruener
Status: Complete
Reviewer: Dominik Skalnik
Review status: Complete

3.2 User Personas

Table #P01: Persona Bus Driver

Helmut Schmidt

- Age: 55
- Role: Bus Driver for the community (drives 4-5 times a month)
- Family background: married, 2 children

Main characteristics
- He has lived in Weilerbach all his life.
- He works from home for an IT Company and knows how to use a smartphone.
- He is also involved in other community project.

Main Goals
- to drive the route through Weilerbach and pick up people.
- be on time so the passengers do not have to wait for long time.
- Have an easy system that does not distract him too much.

Typical Challenges
- There is a schedule but as of now it does not work perfectly.
- If he has to pick up a person from their home his schedule will change.

Prospective concrete usage context:
- The system should be running during the time the bus is driving around.
- The Bus Driver can interact with the device during breaks or at stops.

Author: Erik Gruener
Status: Complete
Reviewer: Sascha Müller
Review status: Complete

Table #P02: Persona Citizen

Emma Meier

- Age: 70
- Role: Citizen (uses the Bürgerbus 1-2 times a week)
- Family background: married, children, grandchildren

Main characteristics

- She has lived in Weilerbach all her life.
- Manages the household, is in charge of the groceries purchases.
- Owns a (low end) smartphone that confuses her most of the time.
- Is involved in other senior oriented communities.

Main Goals

- Uses the Bürgerbus for trips to and from the grocery store and the community center
- Does not want to wait too long on the street for a ride.
- Sometimes needs to get picked up from her house.
- Have a well readable, simple system that provides her the information

Typical Challenges

- There is a schedule but as of now it does not work perfectly.
- She may needs assistance with the purchases (From the store to the bus and from the bus to my home) which changes the schedule of the Bürgerbus

Prospective concrete usage context:

- The citizen app will be used inside and outside of buildings mostly with mobile low bandwidth data

Author: Steffen Holzer
Status: Complete
Reviewer: Marcel Müller
Review status: Complete

4 As-is Situation

4.1 As-is Situation Scenarios

Table #AIS_01: Picking up at bus stations

Item	Description
Context	The Bus Driver is driving around town and picking up people at the bus stations.
Precondition	There are free seats in the bus. There is a person at the bus stop. If no person is at the bus station the bus will continue driving.
Step 1	The Bus Driver gets close to a bus stop on the route.
Step 2	A Citizen signals that he wants to get picked up.
Step 3	The Bus Driver pulls over and stops.
Step 4	The Citizen enters bus.
Step 5	The Bus Driver continues route.
Postcondition	There is one less seat available on the bus.

Author: Dominik Skalnik, Erik Gruener
Status: Complete
Reviewer: Marcel Müller
Review status: Complete

Table #AIS_02: Picking up at home

Item	Description
Context	The Office in Weilerbach receives a call from a Citizen that wants to get picked up at home due to health-problems etc.
Precondition	There are free seats in the bus. The Citizen is at home and ready at a specific time.
Step 1	The Bus Driver gets informed by phone call

	to pick up a new person at a certain place.
Step 2	The Bus Driver takes a detour and arrives at the Citizen's door
Step 3	The Bus Driver honks to tell the person that he is there.
Step 4	The Citizen comes out the door and enters the bus OR decides not to join the bus.
Step 5	The Bus Driver continues to his old route.
Postcondition	The Citizen is picked up from home and bus is on his usual route.There is one less seat available on the bus.

Author: Dominik Skalnik, Erik Gruener
Status: Complete
Reviewer: Marcel Müller
Review status: Complete

4.2 Problems in As-is Situation

- Sometimes it happens that a bus is full with Citizens and no more can fit in the bus. The Citizens waited only to see that they cannot take this bus but have to wait for the next one. When this scenario occurs it also possible for the Bus Driver to drive the Citizens to their destination, if they all want to go to the same place, and then return to pick up the waiting Citizens to minimize their waiting time.
    - How it is addressed: The Bus Driver documents the number of Citizens riding the bus (#IC_B2: Document number of Citizens) and then the Citizens are able to see how much seats are free in the bus they are waiting for (#IC_C2 next iteration). So they can see if it may not be worth to wait for the bus.
- A Problem with a Citizen calling to get picked up is that the office has to call the Bus Driver that day or the next day to tell him where to go at what time which disturbs the schedule. It is also possible that the Citizen is not at home and the Bus Driver's time would get wasted. Also for now there is no confirmation that the Bus Driver is informed and the Citizens will be picked up.
    - Solution: With the new Custom Stop Request (#IC_C4) the requests of the Citizens can immediately be propagated to the Bus Drivers and they can directly answer if they will include the stop on their route (#IC_B5: Receiving a Custom Stop Request) and the Citizens will be notified
- Of course it is possible that due to obstacles or detours the set schedule for the bus to arrive at a station cannot be met. In this Situation the Citizen does not know when the bus is coming or if it has already past.
    - Solution: With the BusDriveApp sending the GPS position the Citizens can check the status of the bus and its estimated arrival time (#IC_C2)

Author: Erik Gruener, Sascha Müller
Status: Complete

Reviewer: Marcel Müller
Review status: Complete

5 To-be Situation

5.1 To-be Situation Scenarios

Table #TBS_01: Picking up at bus stations

Item	Description
Context	The bus is on its route around the town and sends information about its current status.
Precondition	The Bus Driver's phone and the BusDriveApp are running. The phone is connected to the internet. Citizens are waiting at the bus stations.
Step 1	The Bus Driver drives on his route from stop to stop.
Step 2	The BusDriveApp sends the GPS location to the server.
Step 3	The Citizens at the bus stations can see the status of the bus with the BürgerApp (#IC_C2, #IC_C3)
Step 4	The bus stops, Citizens leave and enter the bus, the Bus Driver sets the number of available seats on the BusDriveApp (#IC_B2: Document number of Citizens)
Step 5	Bus continues its route.
Postcondition	Citizens are satisfied because they know the current location of the bus and when it will arrive.

Author: Erik Gruener, Sascha Müller
Status: Complete
Reviewer: Hafiz Ahsan Raza
Review status: Complete

Table #TBS_02: Picking up Citizens at their homes

Item	Description
Context	The bus drives around town and on request it takes a detour to pick a person up at their house. The arrival time at the next stops will change.

Precondition	The BusDriveApp is running and is connected to the internet. Citizens are waiting at bus stations and custom stops (their homes).
Step 1	The Bus Driver receives information about a Custom Stop (#IC_B5: Receiving a Custom Stop Request)
Step 2	The Bus Driver decides that he will include the stop on his tour (#IC_B5: Receiving a Custom Stop Request)
Step 3	The bus drives to the requested stop to pick up the Citizen
Step 4	The Bus Driver marks the stop request as completed (#IC_B6: Completing a Custom Stop)
Step 5	Bus continues driving its regular route.
Step 6	The App sends information about current status and the Citizens waiting for bus can see that the arrival time has changed (#IC_C2)
Postcondition	Citizens are satisfied because: they can be picked up at their house and other Citizens know where the bus currently is and when it will arrive.
Refined in system functions	#SF_B5, #SF_B9, #SF_B10, #SF_S6, #SF_S7; #SF_S8, SF_S9 (later iteration)

Author: Sascha Müller
Status: Complete
Reviewer: Hafiz Ahsan Raza, Erik Gruener
Review status: Complete

5.2 Example Scenario for the To-Be-Situation

It's Monday morning and Emma Meier (#P02: Persona Citizen), a 70-year-old Citizen of Weilerbach, who has lived there all her live with her husband and raised her children there, wants to go to the supermarket today to buy the groceries for the week.

In another part of the city Helmut Schmidt (#P01: Persona Bus Driver), a 55-year-old IT worker is on his way to the Bürgerbus Central in Weilerbach to start his community service as a Bus Driver today. He does this about four times a month to contribute to his community Weilerbach, where he also has been living all his live.

So when he reaches the central he shortly visits the office to inform the people working there that he is here to start his tour. He is handed the keys to one of the busses in the nearby parking lot and after that Helmut is ready to start.

He enters the bus and turns on the stationary smartphone, which is attached to the windshield and connected to the cigarette lighter. He taps the BusDriveApp on the Homescreen of the device and after start up the Start Screen (#SC_B0) of the BusDriveApp is shown. Because Helmut doesn't need to change any major settings he taps the 'START TOUR' button to set up the app for driving (#IC_B1: Setting up for driving). The BusDriveApp is ready, Helmut can start driving now, but before that he wants to get a quick overview of all the stops on his route (#IC_B4: See stops) and how it looks on the map (#IC_B3: See route). With that being done, he starts the motor and drives towards the first stop, where an older man is waiting. The man enters the bus – he needs to get to the next stop and can't walk that fast so he decided to wait for the bus – and Helmut can increase the displayed number of Citizens riding the bus (#IC_B2: Document number of Citizens).

Back to Emma Meier: Of course she will be also using the Bürgerbus to get to the supermarket today. She used to drive on her own but now she doesn't feel up to the task due to her age. So she takes out her smartphone, which her oldest daughter gave her last year, and starts the BürgerApp. In the Citizen Application Emma can see all available bus stops on a map and she can see when the bus arrives where (#IC_C1). Unfortunately the bus route is very far away from her position. Nevertheless she has the possibility to request a custom stop for the bus next tour right at her position (#IC_C4). She decides to request a stop right where she is.

A Notification on Helmut Schmidt's Bus Driver phone appears, which displays that new Custom Stop Requests are pending (#IC_B5: Receiving a Custom Stop Request). He is standing at a traffic light so taps the notification and sees that Emma Meier wants to be picked up at her home at 11am. It's close to his tour and he can pick her up later so he decides to accept the request. Again he checks the map to have an overview of where the Custom Stop exactly is (#IC_B3: See route).

It's 11am and Helmut arrives in front of Emma's home, she looks out of the window and recognizes the bus, so she leaves her house and enters the bus. The Custom Stop is reached

and the Citizen entered the bus, so Helmut denotes the stop as ‘completed’ on his list (#IC_B6: Completing a Custom Stop) and the tour goes on.
After a rather long way the supermarket is reached and Emma Meier leaves the bus. She is at her destination and she is happy that everything worked fine and that she is able to start shopping now. Helmut Schmidt continues his tour and after her purchase Emma Meier will be using the Bürgerbus again.

Everyone in Weilerbach is satisfied that it is easy to participate in community services and that the Bürgerbus is a way of transportation you can count on.

Author: Sascha Müller
Status: Complete
Reviewer: Marcel Müller
Review status: Complete

6 Non-Functional Requirements

Easy to use: The apps should be easy to use. No instruction or help manual should be needed to use the functionality of the applications.

7 Solution

7.1 Assumptions

The device running the BusDriveApp is stationary in all busses.

7.2 Key Solution Concepts

The Bus Driver uses BusDriveApp to communicate with server about current tour status and updates. Citizens use BürgerApp to check on the busses and request Custom Stops.

Author: Sascha Müller
Status: Complete (BusDriveApp)
Reviewer: Charel Irrthum
Review status: complete

7.3 Traceability between System Functions

Table #SF_Traceability

Bus Driver App	Server	Citizen App
#SF_B0.2: Request line list	#SF_S1: Send List of Lines	#SF_C9 : Show schedule for current stop (partially)
#SF_B0.1: Request bus list	#SF_S2: Send List of Busses	#SF_C3: Get information about the Bus #SF_C9
#SF_B0.3: Request route and stops	#SF_S3: Send list of Stops	#SF_C10: Show list of Stops
	#SF_S4: Send List of Routes	
-	#SF_S6: Send GPS-Data of Bus	#SF_C1: Get current Bus position
#SF_B3.1: Send Bus Status Data to server	#SF_S7: Store bus and line	-
#SF_B3.2: Send Real Time Data to Server	#SF_S8: Store GPS-Data	-
	#SF_S9: Send latest timestamps	Implicit in most system functions
#SF_B5: Receive Custom Stop Request	#SF_S10: Notification of custom stop request	#SF_C11: Request a stop at a given location
#SF_B3.3: Send Custom Stop status update to server	#SF_S11: Response to custom stop request	
-	#SF_S14: Send number of available seats	#SF_C6: Show number of free seats
#SF_B3.2: Send Real Time Data to server	#SF_S15: Store number of available seats	-
-	#SF_S16: Send status of custom request	#SF_C11

7.4 System Functions for the BusDriveApp

Table #SF_B: Overview

Identifier	Name
#SF_B0.1	Request bus list
#SF_B0.2	Request line list
#SF_B0.3	Request route and stops
#SF_B1	Select Bus
#SF_B2	Select Busline
#SF_B3.1	Send Bus Status Data to server
#SF_B3.2	Send Real Time Data to server
#SF_B3.3	Send Custom Stop status update to server
#SF_B4	Change number of taken seats
#SF_B5	Receive Custom Stop Request
#SF_B6	Show map of current position
#SF_B7	Show Line Stops
#SF_B8	Cycle through Line Stops
#SF_B9	Respond to Custom Stop Request
#SF_B10	Complete Custom Stop

Author: Sascha Müller
Status: Complete
Reviewer: Oliver Säger
Review status: Complete

Table #SF_B0.1: Request bus list

Item	Description
ID	#SF_B0.1
Name	Request bus list
Input Data	-

Precondition	The Bus Driver starts the BusDriveApp.
Description	The current list of all busses is requested from the server (#SF_S2: Send list of busses)
Exception	No connection to server;
Business rules	-
Quality Management	-
Output Data	request
Postcondition(s)	After receipt of data (#SF_S2: Send list of busses) the Bus Driver is able to select the bus he will drive (#SF_B1: Select bus)

Author: Sascha Müller
Status: Complete
Reviewer: Oliver Säger
Review status: Complete

Table #SF_B0.2: Request line list

Item	Description
ID	#SF_B0.2
Name	Request line list
Input Data	-
Precondition	The Bus Driver selects bus
Description	The current list of all lines is requested from the server (#SF_S1: Send list of lines)
Exception	No connection to server;
Business rules	-
Quality Management	-
Output Data	request
Postcondition(s)	After receipt of data (#SF_S1: Send list of lines) the Bus Driver is able to select line (#SF_B2: Select bus line)

Author: Sascha Müller
Status: Complete
Reviewer: Oliver Säger

Review status: Complete

Table #SF_B0.3: Request route and stops

Item	Description
ID	#SF_B0.3
Name	Request route and stops
Input Data	-
Precondition	The Bus Driver selects line
Description	The according route and stops are requested from the server (#SF_S3: Send list of stops, #SF_S4: Send list of routes)
Exception	No connection to server;
Business rules	-
Quality Management	-
Output Data	request
Postcondition(s)	After receipt of data (#SF_S3: Send list of stops, #SF_S4: Send list of routes) the Bus Driver is able to see his route and stops (#SF_B6: Show map of current position, #SF_B7: Show Line Stops)

Author: Sascha Müller
Status: Complete
Reviewer: Oliver Säger
Review status: Complete

Table #SF_B1: Select Bus

Item	Description
ID	#SF_B1
Name	Select bus
Input Data	List of busses
Precondition	Successful receipt of data (#SF_S2: Send list of busses)
Description	The Bus Driver selects the bus he will be driving that day.
Exception	-

Business rules	-
Quality Management	-
Output Data	Selected bus
Postcondition(s)	Bus was selected by the Bus Driver, information will be sent to the server (#SF_B3.1: Send Bus Status Data to server and #SF_B3.2 Send Bus Status Data to server)

Author: Erik Grüner, Sascha Müller
Status: Complete
Reviewer: Charel Irrthum
Review status: Complete

Table #SF_B2: Select Busline

Item	Description
ID	#SF_B2
Name	Select Busline
Input Data	List of lines
Precondition	Bus was selected (#SF_B1: Select bus), successful receipt of data (#SF_B2: Send list of busses)
Description	The Bus Driver selects the line that he will be driving that day.
Exception	-
Business rules	-
Quality Management	-
Output Data	Selected line
Postcondition(s)	Line was selected, Information will be sent to the server (#SF_B3.1: Send Bus Status Data to server and #SF_B3.2 Send Bus Status Data to server)

Author: Erik Grüner, Sascha Müller
Status: Complete
Reviewer: Charel Irrthum
Review status: complete

Table #SF_B3.1: Send Bus Status Data to server

Item	Description

ID	#SF_B3.1
Name	Send Bus Status Data to server
Input Data	Bus and Line Information
Precondition	connection to the server, Bus and Line selected
Description	After the Bus Driver has selected bus and line the app sends this information (and that he started driving, later iteration) to the server
Exception	no server connection
Business rules	-
Quality Management	-
Output Data	bus and line
Postcondition(s)	data is sent to server and stored (#SF_S7: Store bus and line), the tour starts

Author: Sascha Müller,
Status: Complete
Reviewer: Charel Irrthum
Review status: complete

Table #SF_B3.2: Send Real Time Data to server

Item	Description
ID	#SF_B3.2
Name	Send Real Time Data to server
Input Data	Bus, GPS coordinates, current time
Precondition	connection to the server, GPS connection, the tour has started
Description	While driving the app sends bus, current GPS coordinates and a timestamp to the server (later iteration: also the number of seats taken)
Exception	no server connection, no GPS signal
Business rules	Data is sent every 60 seconds or if the GPS position has changed by at least 75 metres
Quality Management	-
Output Data	Bus, GPS coordinates, timestamp
Postcondition(s)	data is sent to server and stored (#SF_S8: Store GPS data)

Author: Sascha Müller,
Status: Complete
Reviewer: Charel Irrthum
Review status: complete

Table #SF_B3.3: Send Custom Stop status update to server

Item	Description
ID	#SF_B3.3
Name	Send Custom Stop status update to server
Input Data	New custom stop status (accepted, declined, completed)
Precondition	connection to the server, the tour has started, receipt of Custom Stop Requests
Description	When the Bus Driver accepts or declines a Custom Stop Request or when a custom stop request has been completed, the app sends a status update of this Custom Stop Request to the server
Exception	no server connection
Business rules	-
Quality Management	-
Output Data	Custom Stop ID, status, timestamp
Postcondition(s)	data is sent to server (#SF_S11: Response to custom stop request)

Author: Sascha Müller,
Status: Complete
Reviewer: Patrick Pschorn
Review status: Complete

Table #SF_B4: Change number of taken seats

Item	Description
ID	#SF_B4
Name	Change number of taken seats
Input Data	-
Precondition	The tour has started
Description	A Citizen enters (leaves) the bus and the Bus Driver increases (decreases) the displayed number of passengers on the bus.

Exception	-
Business rules	-
Quality Management	The numbers go from 0 to max. number of seats according to used bus.
Output Data	The number of seats available
Postcondition(s)	The number of seats has changed to current situation, (later iteration: information will be sent to server in #SF_B3.2,) driver continues tour.

Author: Sascha Müller, Erik Grüner
Status: Complete
Reviewer: Patrick Pschorn
Review status: Complete

Table #SF_B5: Receive Custom Stop Request

Item	Description
ID	#SF_B5
Name	Receive Custom Stop Request
Input Data	Data of the location where the Citizen wants to be picked up plus additional information (#SF_S10: Notification of custom stop request)
Precondition	connection to the server, Bus Driver selected the line (#SF_B2: Select bus line)
Description	The BusDriveApp receives a request to pick up a Citizen at a stop that is not on the stops list and shows a notification to the Bus Driver.
Exception	no connection to server
Business rules	The notification will disappear after a certain time
Quality Management	Only the requests relevant to the Bus Driver are displayed
Output Data	-
Postcondition(s)	The Bus Driver will be able to accept or decline the request (#SF_B9: Respond to Custom Stop Request)

Author: Sascha Müller
Status: Complete
Reviewer: Patrick Pschorn
Review status: Complete

Table #SF_B6: Show map of current position

Item	Description
ID	#SF_B6
Name	Show map of current position
Input Data	Current Position, Custom Stops, Line Stops
Precondition	GPS signal, internet connection
Description	The Bus Driver can see his position on a map, markers for the Custom Stops and a line for his route including markers for the Line Stops.
Exception	Lost internet connection and/or GPS signal
Business rules	-
Quality Management	The position should be realtime
Output Data	-
Postcondition(s)	-

Author: Erik Grüner, Sascha Müller
Status: Complete
Reviewer: Charel Irrthum, Oliver Säger
Review status: Complete

Table #SF_B7: Show Line Stops

Item	Description
ID	#SF_B7
Name	Show Line Stops
Input Data	List of Line Stops provided by the server
Precondition	Successful receipt of data (#SF_0.3: Request route and stops)
Description	A list of all stops of the chosen line is shown
Exception	-
Business rules	The arrival time for each Line Stop is shown according to schedule (possibly, in a later iteration it will be updated when the bus is delayed)
Quality Management	stops ordered

Output Data	-
Postcondition(s)	-

Author: Erik Grüner, Patrick Pschorn, Sascha Müller
Status: Complete
Reviewer: Charel Irrthum, Patrick Pschorn
Review status: Complete

Table #SF_B8: Cycle through Line Stops

Item	Description
ID	#SF_B8
Name	Cycle through Line Stops
Input Data	-
Precondition	The tour has started
Description	When passing a stop the Bus Driver presses a button so the app shows the next Line Stop or another button to go back to the previous Line Stop.
Exception	-
Business rules	
Quality Management	
Output Data	next (previous) Line Stop
Postcondition(s)	The next (previous) Line Stop is shown on the Drive Screen

Author: Sascha Müller
Status: Complete
Reviewer: Patrick Pschorn
Review status: Complete

Table #SF_B9: Respond to Custom Stop Request

Item	Description
ID	#SF_B9
Name	Respond to Custom Stop Request
Input Data	-
Precondition	Receipt of a Custom Stop Request (#SF_B5: Receive Custom Stop Request)

Description	The Bus Driver chooses to accept or decline Custom Stop Requests. If he accepts, the Custom Stop will be shown on the #SC_B3.1: Drive Screen - Main Tab. If he declines it will disappear.
Exception	-
Business rules	The Custom Stops are ordered by requested pickup time
Quality Management	-
Output Data	Custom Stop marked as ‘accepted’ or ‘declined’
Postcondition(s)	The response will be sent to server (#SF_B3.3: Send Custom Stop status update to server)

Author: Sascha Müller
Status: Complete
Reviewer: Patrick Pschorn
Review status: Complete

Table #SF_B10: Complete Custom Stop

Item	Description
ID	#SF_B10
Name	Complete Custom Stop
Input Data	-
Precondition	Tour has started and contains Custom Stops
Description	When a Custom Stop has been reached the Bus Driver selects it and denotes it as ‘completed’ and it will disappear from the list. The Custom Stop can also be marked as ‘not shown up’ if the Citizen is not there.
Exception	-
Business rules	The Custom Stops are ordered by requested pickup time
Quality Management	-
Output Data	Custom Stop marked as ‘completed’ or ‘not shown up’
Postcondition(s)	The updated status of the Custom Stop will be sent to server in (#SF_B3.3: Send Custom Stop status update to server)

Author: Sascha Müller
Status: Complete
Reviewer: Patrick Pschorn, Oliver Säger
Review status: Complete

7.5 System Functions for the BürgerApp

Table #SF_C: Overview

Identifier	Name
#SF_C1	Get current bus position
#SF_C2	Get estimated arrival time
#SF_C3	Get information about the bus
#SF_C4	Request a stop
#SF_C5	Notify the user about changes in the schedule
#SF_C6	Show number of free seats
#SF_C7	Request help for shopping
#SF_C8	Schedule way back
#SF_C9	Show schedule for current stop
#SF_C10	Show List of Stops
#SF_C11	Request a stop at a given location

Author: Steffen Holzer
Status: Complete
Reviewer: Marcel Müller
Review status: complete

Table #SF_C1: get current bus position

Item	Description
ID	#SF_C1
Name	get current bus position
Input Data	-
Precondition	the bus is driving on its route
Description	shows the citizen where the bus actually is on a map
Exception	no connection to the internet
Business rules	the position is transmitted once it is requested
Quality Management	the location should be accurate (delta 20 m)

Output Data	the current location of the bus
Postcondition(s)	the location is transmitted to the citizen

Author: Dominik Skalnik,
Status: Complete
Reviewer: Marcel Müller
Review status: Complete

Table #SF_C2: Get estimated arrival time for stop / current position

Item	Description
ID	#SF_C2
Name	Get estimated arrival time for stop / current position
Input Data	Bus Position, bus station
Precondition	#SF_C1 is successful
Description	Estimates the time of arrival of the bus at the selected bus station
Exception	-
Business rules	
Quality Management	Time to arrival in h:mm, mean estimation error <= 20%
Output Data	Time of arrival at bus station, time to arrival
Postcondition(s)	Estimated t.o.a. Is presented to the citizen

Author: Dominik Skalnik,
Status: Complete
Reviewer: Marcel Müller
Review status: Complete

Table #SF_C3: Get information about the bus (line/color/bus photo)

Item	Description
ID	#SF_C3
Name	Get information about the bus (line/color/bus photo)
Input Data	-
Precondition	Bus is driving on the route
Description	Provides detailed information about the bus on the route

Exception	Bus information doesn't exists (e.g. a bus that is not in the database has to be used because of reasons)
Business rules	One successful transmission per bus line
Quality Management	Information should match the used bus (color matches the bus photo, bus photo shows the used bus)
Output Data	Information about the bus
Postcondition(s)	Citizen knows how the bus looks like

Author: Dominik Skalnik,
Status: Complete
Reviewer: Marcel Müller
Review status: Complete

Table #SF_C4: Request a stop at a stop /iteration 2

Item	Description
ID	#SF_C4
Name	Request a stop at a stop /iteration 2
Input Data	Bus station, time of departure
Precondition	Bus is scheduled
Description	Requests a stop of the bus at the selected bus station
Exception	Bus is on it's last round and already passed the bus station
Business rules	Retry transmission every 5-10s
Quality Management	Transmission state is visible, notify user about the planned schedule (15 min before t.o.d.)
Output Data	Answer to the request (accepted, declined)
Postcondition(s)	Citizen know if the bus stops at her station

Author: Dominik Skalnik,
Status: Complete
Reviewer: Marcel Müller
Review status: Complete

Table #SF_C5: Notify the user about changes in the schedule /iteration 2

Item	Description
ID	#SF_C5

Name	Notify the user about changes in the schedule /iteration 2
Input Data	Schedule changes
Precondition	App is running on the citizen device
Description	Inform the citizen about changes in the schedule
Exception	-
Business rules	Check at least once per (minimal driving time between two successive bus stations) for changes or push notifications
Quality Management	Display changes in an easy to understandable form (e.g. - The bus will be xy minutes too late - The bus will skip station xy)
Output Data	Notification with schedule changes
Postcondition(s)	The citizen knows about the changes in the schedule

Author: Dominik Skalnik,
Status: Complete
Reviewer: Marcel Müller
Review status: Complete

Table #SF_C6: Show number of free seats

Item	Description
ID	#SF_C6
Name	Show number of free seats /iteration x
Input Data	-
Precondition	Bus drives on the route
Description	Shows the number of free seats in the bus
Exception	-
Business rules	Check no more than the minimal driving time between two successive bus stations
Quality Management	Different text design for 100-50%, 49-25% and 24-0% free seats
Output Data	Number of free seats in the bus
Postcondition(s)	Citizen knows if the bus currently has a free seat for her

Author: Dominik Skalnik,
Status: Complete

Reviewer: Marcel Müller
Review status: Complete

Table #SF_C7: Request help for shopping /iteration x

Item	Description
ID	#SF_C7
Name	Request help for shopping /iteration x
Input Data	-
Precondition	Bus is driving on the route, #FC04 is successful
Description	Requests help for shopping
Exception	-
Business rules	See #SF_C4
Quality Management	See #SF_C4
Output Data	See #SF_C4
Postcondition(s)	Citizen knows if she will have help with the shopping trip

Author: Dominik Skalnik,
Status: Complete
Reviewer: Marcel Müller
Review status: Complete

Table #SF_C8: Schedule wayback /iteration x

Item	Description
ID	#SF_C8
Name	Schedule wayback /iteration x
Input Data	Time of departure
Precondition	Bus is on the route
Description	Schedules the return of the citizen from the current destination to the start destination
Exception	T.o.d. is in the working time of the Bürgerbus
Business rules	Manage via predated #FC04
Quality Management	See #SF_C4
Output Data	See #SF_C4

Postcondition(s)	Citizen planned her way back

Table #SF_C9: Show schedule for current stop

Item	Description
ID	#SF_C9
Name	Show schedule for current stop
Input Data	Stop identifier
Precondition	none
Description	Shows the schedule for the current stop
Exception	No data
Business rules	
Quality Management	
Output Data	Schedule data for the current stop
Postcondition(s)	Citizen knows when a bus arrives at the current stop

Author: Steffen Holzer,
Status: Complete
Reviewer: Marcel Müller
Review status: Complete

Table #SF_C10: Show List of Stops

Item	Description
ID	#SF_C10
Name	Show List of Stops
Input Data	none
Precondition	none
Description	Shows all available stops
Exception	No data
Business rules	
Quality Management	
Output Data	List of all available stops

Postcondition(s)	Citizen knows where the bus stops

Table #SF_C11: Request a stop at a given location /iteration 2

Item	Description
ID	#SF_C11
Name	Request a stop at a given location /iteration 2
Input Data	Current location, time of departure
Precondition	Bus is scheduled
Description	Requests a stop of the bus at the selected location
Exception	Bus is too far away from the user, user is going to be picked up during the next round.
Business rules	Retry transmission every 5-10s
Quality Management	Transmission state is visible, notify user about the planned schedule (15 min before t.o.d.)
Output Data	Answer to the request (accepted, declined)
Postcondition(s)	Citizen know if the bus stops at its position

Author: Dominik Skalnik,
Status: Complete
Reviewer: Steffen Holzer
Review status: Complete

Table 25:System Function for BürgerApp#10
Author: Steffen Holzer,
Status: Complete
Reviewer: Marcel Müller
Review status: Complete

7.6 System Functions for the server

Table #SF_S1: Send list of lines

Item	**Description**
ID	#**SF_S1**
Name	Send List of lines
Input Data	http-Get-Request

Precondition	*CitizenApp* or *DriverApp* sends http-GET-Request
Description	**Server:** 1. Queries the database for all lines contained in it 2. Sends list of all lines to requesting App
Exception	No data available
Business rules	
Quality Management	Response time <=5s
Output Data	List of all lines with their properties
Postcondition(s)	The client app has access to all line data

Author: Ricarda Rosemann
Status: Complete
Reviewer: Mohammad Baniasad
Review status: Complete

Table #SF_S2: Send list of busses

Item	Description
ID	#**SF_S2**
Name	Send List of busses
Input Data	http-GET-Request
Precondition	*CitizenApp* or *DriverApp* sends http-GET-Request
Description	**Server:** 1. Queries the database for all busses contained in it 2. Sends list of all busses to requesting App
Exception	No data available
Business rules	
Quality Management	Response time <= 5s
Output Data	List of all busses with their properties
Postcondition(s)	The client app has access to all bus data

Author: Ricarda Rosemann
Status: Complete
Reviewer: Mohammad Baniasad
Review status: Complete

Table #SF_S3: Send List of stops

Item	Description
ID	#**SF_S3**
Name	Send List of stops
Input Data	http-GET-Request
Precondition	*CitizenApp* or *DriverApp* sends http-GET-Request
Description	**Server:** 1. Queries the database for all stops contained in it 2. Sends list of all stops to requesting App
Exception	No data available
Business rules	
Quality Management	Response time <= 5s
Output Data	List of all stops with their properties This include schedules of a stop
Postcondition(s)	The client app has access to all stop data

Author: Ricarda Rosemann
Status: Complete
Reviewer: Mohammad Baniasad
Review status: Complete

Table #SF_S4: Send List of routes

Item	Description
ID	#**SF_S4**
Name	Send List of routes
Input Data	http-GET-Request
Precondition	*CitizenApp* or *DriverApp* sends http-GET-Request

Description	**Server:** 1. Queries the database for all routes contained in it 2. Sends list of all routes to requesting App
Exception	No data available
Business rules	
Quality Management	Response time <= 5s
Output Data	List of all routes with their properties
Postcondition(s)	The client app has access to all route data

Author: Ricarda Rosemann
Status: Complete
Reviewer: Mohammad Baniasad
Review status: Complete

Table #SF_S5: Send properties of bus: *Deprecated*

Author: Ricarda Rosemann
Status: Complete
Reviewer: Mohammad Baniasad
Review status: Complete

Table #SF_S6: Send GPS-Data of Bus

Item	Description
ID	#**SF_S6**
Name	Send GPS-Data of Bus
Input Data	http-GET-Request including bus reference
Precondition	*CitizenApp* or *DriverApp* sends http-GET-Request
Description	**Server:** 1. Queries the database for the GPS position of the referenced bus 2. Sends GPS position along with timestamp
Exception	No data available, referenced bus does not exist
Business rules	
Quality Management	Response time <= 5s

Output Data	GPS position of bus with timestamp
Postcondition(s)	The client has access to bus position and can trace it to time

Author: Ricarda Rosemann
Status: Complete
Reviewer: Mohammad Baniasad
Review status: Complete

Table #SF_S7: Store bus and line

Item	Description
ID	#**SF_S7**
Name	Store bus and line
Input Data	Received http-POST with parameters: **lineId:** integer **busId:** integer
Precondition	*DriverApplication* sends bus and line information to server
Description	**Server:** 1. Receives bus and line data 2. Stores lineId in bus table in column of bus with id busId
Exception	Referenced bus or line do not exist
Business rules	
Quality Management	
Output Data	-
Postcondition(s)	Line and bus information are stored

Author: Ricarda Rosemann
Status: Complete
Reviewer: Mohammad Baniasad
Review status: Complete

Table #SF_S8: Store GPS data

Item	Description
ID	#**SF_S8**

Name	Store Location data of the Bus
Input Data	Received http-POST with parameters: **busId:** integer **GPS data:** [double, double]
Precondition	*DriverApp* sends GPS data to server
Description	**Server:** 1. Receives GPS data 2. Stores the GPS data in the data base for the given bus.
Exception	Bus does not exist
Business rules	
Quality Management	
Output Data	-
Postcondition(s)	GPS data is stored

Author: Ricarda Rosemann
Status: Complete
Reviewer: Hafiz
Review status: Complete

Table #SF_S9: Send latest timestamp

Item	Description
ID	#**SF_S9**
Name	Send latest timestamp
Input Data	Http-GET-request
Precondition	*CitizenApp* or *DriverApp* sends http-GET-request
Description	**Server:** 1. Retrieves the time of latest updates of bus, route, line and stop information from database 2. Sends latest update times to the client app.
Exception	No data available
Business rules	

Quality Management	Response time<=5s
Output Data	Last timestamps for bus, route, line and stop
Postcondition(s)	Client app has access to latest timestamps

Author: Ricarda Rosemann
Status: Complete
Reviewer:
Review status:

Table #SF_S10: Notification of custom stop request

Item	Description
ID	#**SF_S10** - Iteration 3
Name	Notification of custom stop request
Input Data	Received http post request with following parameters: **Position:** JSON object **Departure Time:** Timestamp
Precondition	*CitizenApplication* sends a stop request
Description	**Server:** 1. Receives stop request from *CitizenApplication.* 2. Saves the position, departure time, user name, number of passengers to the database. 3. Sends request ID as confirmation to *CitizenApplication.* 4. Sends notification to the *DriverApplication*, notifying the driver serving the corresponding line.
Exception	No driver available to check requests.
Business rules	
Quality Management	
Output Data	*DriverApplication* receives a notification with location and departure time. **Position:** JSON object **Departure Time:** Timestamp
Postcondition(s)	Request sent to Bus Driver.

Author: Ricarda Rosemann

Status: Complete
Reviewer: Sriram kumar Srinivasan
Review status: Complete

Table #SF_S11: Response to custom stop request

Item	Description
ID	#**SF_S11** - Iteration 3
Name	Response to custom stop request
Input Data	Received http POST request with following parameters: **requestId:** integer **reqResponse**: integer
Precondition	Custom Stop request has been sent to the Bus Driver, *DriverApp* sends response to custom stop
Description	**Server:** 1. Receive response for the custom stop request from *DriverApp*. 2. Update response (Accepted/Declined) in Database.
Exception	
Business rules	
Quality Management	Response should be given within 30 min
Output Data	-
Postcondition(s)	Driver's response is saved in the Database.

Author: Ricarda Rosemann
Status: Complete
Reviewer: Sriram kumar Srinivasan
Review status: Complete

Table #SF_S12: Transferring received help request
Included in #SF_S10: Notification of custom stop request

Author: Ricarda Rosemann
Status: Complete
Reviewer: Mohammad Baniasad
Review status: TODO

Table #SF_S13: Send help request response
Included in #SF_S11: Response to custom stop request

Author: Ricarda Rosemann

Status: Complete
Reviewer: Mohammad Baniasad
Review status: TODO

Table #SF_S14: Send number of available seats

Item	Description
ID	#**SF_S14** - Iteration 4
Name	Send number of available seats
Input Data	Http-GET-request with parameter: **busId:** integer
Precondition	Number of available seats has been provided by the *Driver*App
Description	**Server:** 1. Queries database number of available seats of bus against busId 2. Sends Number of available seats of the referenced bus to the Client app
Exception	No seat number available
Business rules	
Quality Management	Response time <=5s
Output Data	Number of available seats on bus
Postcondition(s)	Client received driver's response

Author: Ricarda Rosemann
Status: Complete
Reviewer: Hafiz
Review status: Complete
Remarks: I'm not sure about the QM aspect

Table #SF_S15: Store number of available seats

Item	Description
ID	#**SF_S15** - Iteration 4
Name	Store number of available seats
Input Data	Http-POST-request with parameters: **busId:** integer **Number of seats:** integer
Precondition	*DriverApp* sends number of available seats to server

Description	**Server:** 1. Receives number of available seats for bus with busId 2. Number of available seats on the referenced bus is stored in the database
Exception	Bus does not exist
Business rules	
Quality Management	Response time <=5s
Output Data	-
Postcondition(s)	Number of available seats is stored in database

Author: Ricarda Rosemann
Status: Complete
Reviewer: Hafiz
Review status Complete

Table #SF_S16: Send status of Custom Stop request

Item	Description
ID	#**SF_S16** - Iteration 3
Name	Send status of Custom Stop request
Input Data	Receive http get request with following parameters: **requestID**: Integer
Precondition	Custom Stop request has been sent to Bus Driver, *CitizenApplication* sends a http-GET-request
Description	**Server:** 1. Queries database for custom Stop with id requestId 2. Sends the status of the request to the client app. 3. A default value is sent if there is no status (eg. “Status Unknown”, “Status Pending”)
Exception	No response was received from the driver
Business rules	

Quality Management	
Output Data	Custom Stop request's status is sent to the *CitizenApplication* **reqResponse**: String
Postcondition(s)	*CitizenApp* received the status of his Custom Stop request.

Author: Sriram kumar Srinivasan
Status: Complete
Reviewer: Ricarda Rosemann
Review status: Complete

FUT_S1: Communicate schedule changes

Author: Ricarda Rosemann
Status: Complete
Reviewer:
Review status:

8 App Functionality

8.1 Interaction Cases BürgerApp

Table IC_C1

Item	Description
ID	**IC_C1**
Usage Context	**The user wants to check when the bus arrives**
Screen Arrangement 1	**The screen shows:** ● The select stop screen shows the available stops **The screen includes:** ● A scroll view with the available bus stops ● A search input box ● A button to set the current location as the bus stop
Human Action 1	**The user starts the application** **Usage type: single tap**
System Action 1	**The application is started,**

	1. **the system fetches the bus stop data (SF_S3: Send list of stops)** 2. **shows the "select stop" screen (SC_bbv)**
Human Action 2	**The user selects the stop or current location**
System Action 2	**The system fetches the detail data about the location / stop and shows the "stop detail" screen**
Post conditions	**The system shows the "stop detail" screen**
Reference to Systemfunction	**SF_S3: Send list of stops**

Author: Dominik Skalnik,
Status: Complete
Reviewer: Marcel Müller
Review status: Complete

Table IC_C2

Item	Description
ID	**IC_C2**
Usage Context	**The user wants to see more information about the bus**
Screen Arrangement 2	**The screen shows:** ● Detailed information about the bus **The screen includes:** ● Estimated arrival of the bus ● Bus line number / color ● Map with the position of the bus (fixed, without zoom or pan option) (#SF_S6: Send GPS-Data)
Pre conditions	**User is at the "stop detail" screen**
Human Action 1	**User clicks at the show bus details button**
System Action 1	**System switches the view to the "bus information" screen**
Post conditions	**The system shows the "bus information" screen**
Reference to System function	**#SF_S6: Send GPS-Data, #SF_S14: Send number of available seats**

Author: Dominik Skalnik,
Status: Complete
Reviewer: Marcel Müller

Review status: Complete

Table IC_C3

Item	Description
ID	**IC_C3**
Usage Context	**The user wants to get detailed information about the position of the bus**
Screen Arrangement 1	**The screen shows:** ● Detailed information about the position of the bus **The screen includes:** ● A full feature native mapview with option to pan and zoom
Pre conditions	**User is now at the "bus information" screen**
Human Action 1	**User taps on the map**
System Action 1	**System switches the view to the "bus position" screen**
Post conditions	**The system shows the "bus position" screen**
Reference to System function	**#SF_S6: Send GPS-Data, #SF_S14: Send number of available seats**

Author: Dominik Skalnik,
Status: Complete
Reviewer: Marcel Müller
Review status: Complete

Table IC_C4

Item	Description
ID	**IC_C4**
Usage Context	**The user request a stop.**
Screen Arrangement 2	**The screen shows:** ● Request stop wish **The screen includes:** ● Place where to get picked up ● Line ● Time when to be picked up ● Amount of persons to be picked up ● Users Name ● Users Adress

	● Options for required help (baggage, wheelchair, support at shopping tasks)
Pre conditions	**Request a stop wish clicked**
Human Action 1	**The Citizen User customizes his request and presses accept.**
System Action 1	**The system shows the Start screen**
Post conditions	**-**
Reference to System function	**#SF_S10: Notification of custom stop request**

8.2 Interaction Cases BusDriveApp

Table #IC_B1: Setting up for driving

Item	Description
ID	**#IC_B1**
Usage Context	**The Bus Driver wants to set up for driving**
Pre conditions	**Application is installed on device**
Human Action 1	**The Bus Driver starts the BusDriveApp**
System Action 1	**The system shows the #SC_B0: Start Screen**
Screen Arrangement 1	**The screen shows:** ● #SC_B0: Start Screen **The screen includes** ● A ‘START TOUR’ button
Human Action 2	**The Bus Driver tabs the ‘START TOUR’ button**
System Action 2	**The system receives a list of busses provided by the server (#SF_B0.1: Request bus list, #SF_S2: Send list of busses)**
Screen Arrangement 2	**The screen shows:** ● #SC_B1: Select Bus Screen **The screen includes:**

	● A list of available busses
Human Action 3	**The Bus Driver selects a bus**
System Action 3	**The system remembers the choice of the Bus Driver and shows the #SC_B2: Select Line Screen (SF_B1: Select bus)**
System Action 4	**The system receives a list of line provided by the server (#SF_B0.2: Request line list, #SF_S1: Send list of lines)**
Screen Arrangement 3	**The screen shows:** ● #SC_B2: Select Line Screen **The screen includes:** ● A list of available lines
Human Action 4	**The Bus Driver selects a line**
System Action 5	**The system remembers the choice of the Bus Driver, shows the #SC_B3.1: Drive Screen - Main Tab (#SF_B2: Select Busline)**
System Action 6	**The system sends the selected bus and line to the server (#SF_B3.1: Send Bus Status Data to server)**
Screen Arrangement 4	**The screen shows:** ● #SC_B3.1: Drive Screen - Main Tab **The screen includes:** ● Next Stop ● Number of passengers
Post conditions	**The system is set up for driving and shows the #SC_B3.1: Drive Screen - Main Tab**
System Functions	**#SF_B0.1: Request bus list, #SF_B0.2: Request line list, #SF_B1: Select bus, #SF_B2: Select Busline, #SF_S1: Send list of lines, #SF_S2: Send list of busses, #SF_B3.1: Send Bus Status Data to server**

Author: Oliver Säger, Sascha Müller
Status: Complete
Reviewer: Charel Irrthum, Patrick Pschorn
Review status: Complete

Table #IC_B2: Document number of Citizens

Item	Description

ID	#IC_B2
Usage Context	**The Bus Driver wants to document the number of Citizens riding the bus**
Screen Arrangement	**The screen shows:** ● #SC_B3.1: Drive Screen - Main Tab **The screen includes:** ● Next Stop ● Number of passengers ● Options to increase and decrease the number of people riding the bus ● Options to cycle through displayed Stops
Pre conditions	**The Bus Driver sets up the BusDriveApp and is shown the #SC_B3.1: Drive Screen - Main Tab**
Human Action 1	**1. The Bus Driver taps the "Increase" button** **2. The Bus Driver taps the "Decrease" button**
System Action 1.1	**The displayed number of passengers is increased by one (#SF_B4: Change number of taken seats)**
System Action 1.2	**The displayed number of passengers is decreased by one (#SF_B4: Change number of taken seats)**
Post conditions	**The number of Citizens inside the bus is displayed on the screen and the next time real time data is sent to the server it includes the updated number (#SF_B3.2: Send Real Time Data to server)**
System Functions	**#SF_B3.2: Send Real Time Data to server, #SF_B4: Change number of taken seats**

Author: Oliver Säger, Sascha Müller
Status: Complete
Reviewer: Patrick Pschorn
Review status: Complete

Table #IC_B3: See route

Item	Description
ID	**#IC_B3**
Usage Context	**The Bus Driver wants to see the route of the line he selected**

Pre conditions	**The Bus Driver sets up the BusDriveApp and is shown the #SC_B3.1: Drive Screen - Main Tab**
Screen Arrangement 1	**The screen shows:** ● #SC_B3.1: Drive Screen - Main Tab **The screen includes:** ● Next Stop ● Number of passengers
Human Action 1	**The Bus Driver selects the Map tab**
System Action 1	**The BusDriveApp shows the #SC_B5: Map Screen (#SF_B6: Show map of current position)**
Screen Arrangement 2	**The screen shows:** ● #SC_B5: Map Screen **The screen includes:** ● Map that displays ○ The position of the bus ○ Markers for each Line Stop ○ Markers for each Custom Stop ○ A route that connects the Line Stops
Post conditions	**The BusDriveApp shows the #SC_B5: Map Screen where the route is displayed on the map**
System Functions	**#SF_B6: Show map of current position**

Author: Oliver Säger, Sascha Müller
Status: Complete
Reviewer: Patrick Pschorn
Review status: Complete

Table #IC_B4: See stops

Item	Description
ID	**#IC_B4**
Usage Context	**The Bus Driver wants to see an overview of the line**
Pre conditions	**The Bus Driver sets up the BusDriveApp and is shown the #SC_B3.1: Drive Screen - Main Tab**
Screen Arrangement 1	**The screen shows:** ● #SC_B3.1: Drive Screen - Main Tab **The screen includes:**

	● Next Stop ● Number of passengers
Human Action 1	**The Bus Driver taps the Stops tab**
System Action 1	**The BusDriveApp shows the #SC_B4: Stops screen (#SF_B7: Show Line Stops)**
Screen Arrangement 2	**The screen shows:** ● #SC_B4: Stops Screen **The screen includes:** ● A List of all stops of the line (including arrival time)
Post conditions	**The BusDriveApp shows the #SC_B4: Stops Screen where a list of all stops is displayed**
System Functions	**#SF_B7: Show Line Stops**

Author: Oliver Säger, Sascha Müller
Status: Complete
Reviewer: Patrick Pschorn
Review status: Complete

Table #IC_B5: Receiving a Custom Stop Request

Item	Description
ID	**#IC_B5**
Usage Context	**Receiving a Custom Stop Request**
Pre conditions	**The Bus Driver sets up the BusDriveApp and is shown the #SC_B3.1: Drive Screen**
Screen Arrangement 1	**The screen shows:** ● #SC_B3.1: Drive Screen - Main Tab **The screen includes:** ● Next Stop ● Number of passengers
System Action 1	**The BusDriveApp receives a Custom Stop Request and shows a notification that new Custom Stop Requests are pending (#SF_B5: Receive Custom Stop Request)**
Human Action 1	**The Bus Driver taps the notification or the #SC_B3.2: Drive Screen - Custom Stops Tab**

System Action 2	**The BusDriveApp shows the #SC_3.2: Drive Screen - Custom Stops Tab**
Screen Arrangement 2	**The screen shows:** ● #SC_3.2: Drive Screen - Custom Stops Tab **The screen includes:** ● A List of all pending Custom Stop Requests (if you swipe an element there are buttons that say 'accept' and 'decline')
Human Action 2	**The Bus Driver swipes an element of the list and taps the option 'accept'**
System Action 3	**The element of the list will disappear and will be moved to the 'SC_B3.1: Drive Screen - Main Tab (#SF_B9: Respond to Custom Stop Request)**
System Action 4	**The BusDriveApp sends the status update of the Custom Stop ('accepted') to the server (#SF_B3.3: Send Custom Stop status update to server)**
Human Action 3	**The Bus Driver taps the Drive Screen - Main Tab**
System Action 5	**The BusDriveApp shows the #SC_B3.1: Drive Screen - Main Tab**
Screen Arrangement 3	**The screen shows:** ● #SC_B3.1: Drive Screen - Main Tab **The screen NOW includes:** ● Next Stop ● Number of passengers ● A List of all accepted Custom Stops
Post conditions	**The Custom Stop is displayed on the Drive Screen - Main Tab and the server received the updated status of the Custom Stop (#SF_S11: Response to custom stop request)**
System Functions	**#SF_B5: Receive Custom Stop Request, #SF_B9: Respond to Custom Stop Request, #SF_B3.3; Send Custom Stop status update to server, #SF_S11: Response to custom stop request**

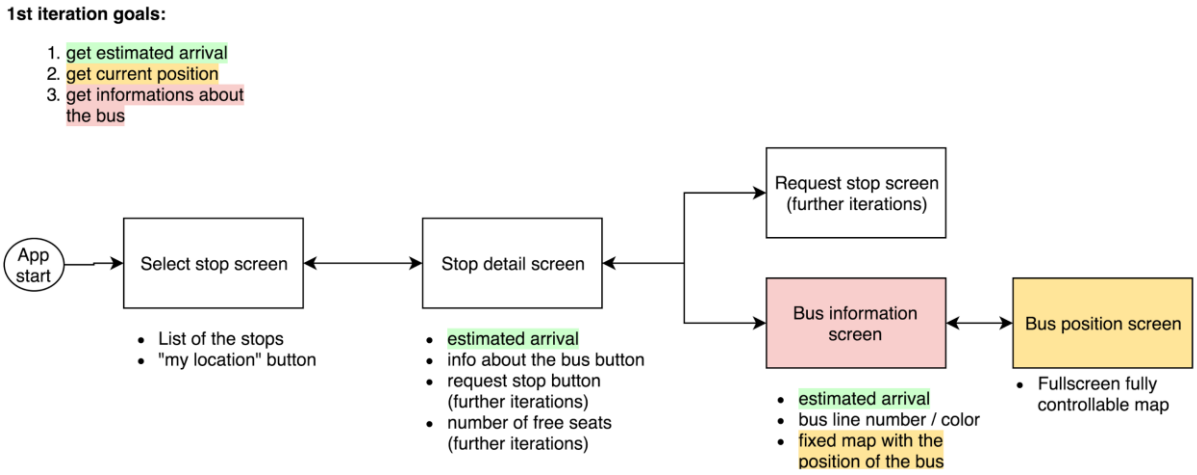
Author: Sascha Müller
Status: Complete
Reviewer: Patrick Pschorn
Review status: Complete

Table #IC_B6: Completing a Custom Stop

Item	Description
ID	**#IC_B6**
Usage Context	**Completing a Custom Stop**
Pre conditions	**The Bus Driver accepted at least one Custom Stop Request and the app shows the #SC_B3.1: Drive Screen - Main Tab**
Screen Arrangement 1	**The screen shows:** ● #SC_B3.1: Drive Screen - Main Tab **The screen includes:** ● Next Stop ● Number of passengers ● List of all accepted Custom Stops
Human Action 1	**(After the Citizen enters the bus) The Bus Driver swipes the corresponding element of the Custom Stop list and taps the option 'completed'**
System Action 1	**The element of the list disappears (#SF_B10: Complete Custom Stop)**
System Action 2	**The BusDriveApp sends the status update of the Custom Stop ('completed') to the server (#SF_B3.3: Send Custom Stop status update to server)**
Post conditions	**The Custom Stop is completed, the Bus Driver continues his tour and the server received the updated status of the Custom Stop (#SF_S11: Response to custom stop request)**
System Functions	**#SF_B10: Complete Custom Stop Request, #SF_B3.3: Send Custom Stop status update to server, #SF_S11: Response to custom stop request**

Author: Sascha Müller
Status: Complete
Reviewer: Oliver Säger
Review status: Complete

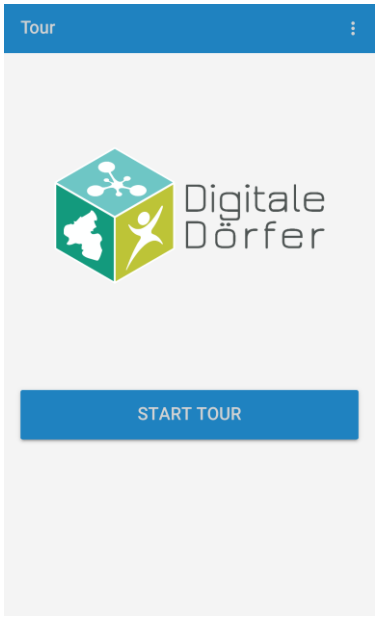
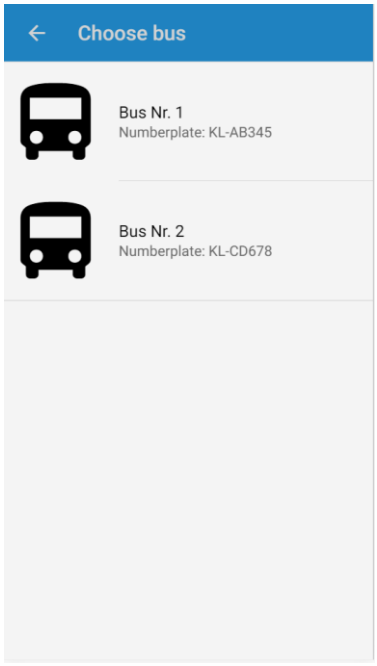
8.3 Screenflow BürgerApp

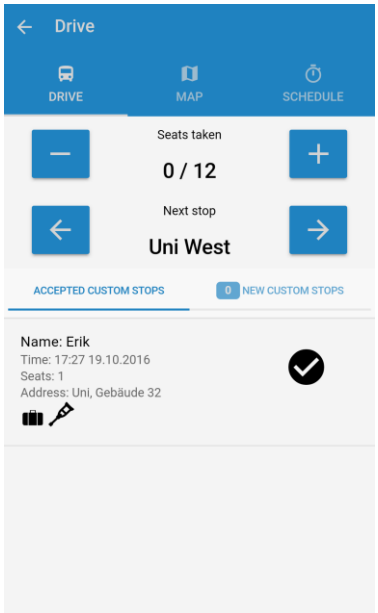


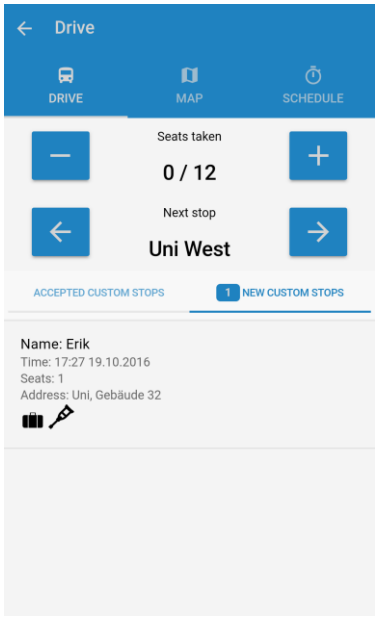
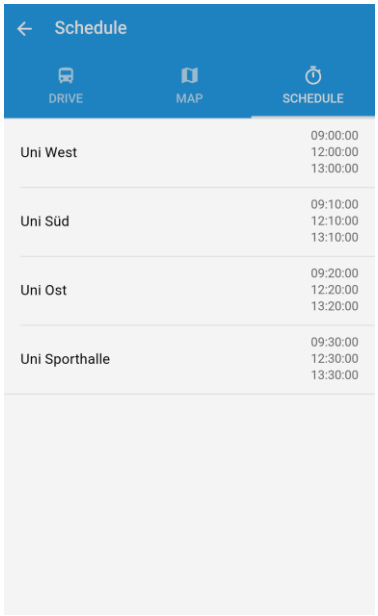
Author: Dominik Skalnik,
Status: Complete

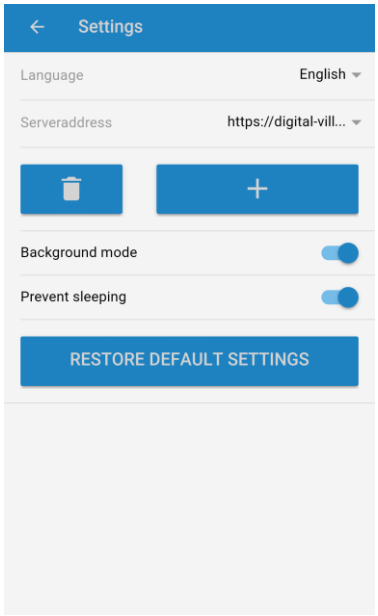
Figure xx: Screenflow of the citizen application

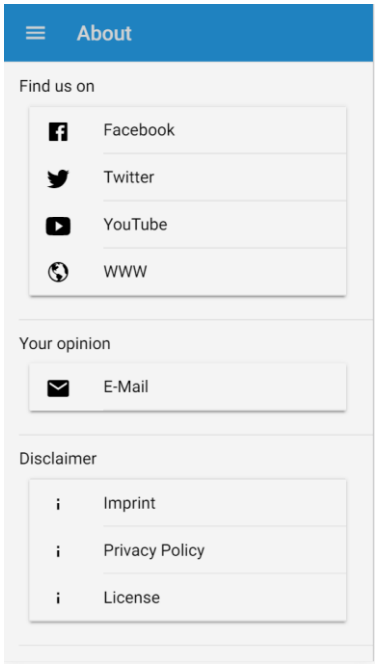
8.4 BusDriveApp Screens (Screenflow)

#SC_B0: Start Screen This is the screen which is displayed when the Bus Driver starts the app. He can press the button ‘START TOUR’ to be forwarded to the Select Bus Screen. On the symbol on the upper left corner he can switch to the Settings Screen (or the About Screen).	
#SC_B1: Select Bus Screen The screen shows a list of the busses available including number plate and a picture. The bus is chosen by tapping the element and the app changes to the Select Line Screen.	

#SC_B2: Select Line Screen The screen shows a list of the lines. A Line is chosen by tapping the element and the app changes to the Drive Screen.	
#SC_B3.1: Drive Screen - Main Tab On this Tab of the Drive Screen screen the Bus Driver can adjust the number of passengers on his bus by pressing the '+'/'-' buttons. On the top of the screen he can go back to the Start Screen by pressing the '<' button. The next Line Stop of his route is shown and the Bus Driver can cycle through the Line Stop by pressing the '<-'/'->' buttons. On the bottom of the screen all accepted Custom Stops are displayed. The Bus Driver can swipe the elements to mark them as 'completed'. Via the lower tab bar the screen can be changed to the Drive Screen - New Custom Stops Tab. Via the upper tab bar the screen can be changed to the Map Screen and Stops Screen.	

#SC_B3.2: Drive Screen - New Custom Stops Tab The screen shows a list of all pending Custom Stop Requests relevant to the Bus Driver. If he swipes an element he can choose to accept or decline the request. Via the lower tab bar the screen can be changed to the Drive Screen - Main Tab. Via tab bar the screen can be changed to the Map Screen and Drive Screen.	
#SC_B4: Stops Screen On this screen the Bus Driver can see the list of all Line Stops on his current route. Via tab bar the screen can be changed to the Map Screen and Drive Screen.	

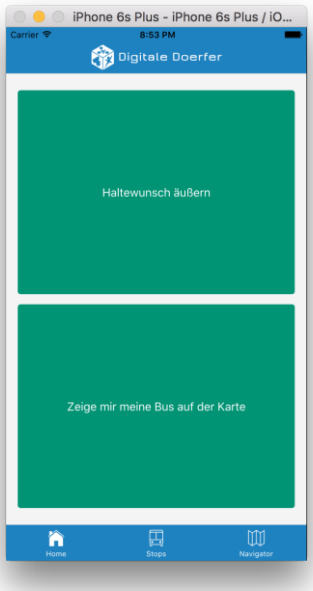
#SC_B5: Map Screen The screen shows the map of the area of the chosen route including connected markers for the Line Stops, Custom Stops and the Bus Driver's current position. Via tab bar the screen can be changed to the Stops Screen and Drive Screen.	
#SC_B6: Settings Screen The screen shows several options to configure the app so the Bus Driver can: ● Change the language ● Set the server address ● Change additional settings	

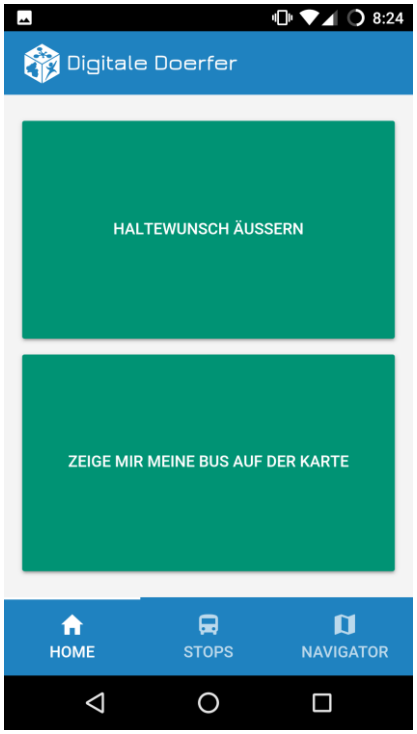
(#SC_BX: About Screen) The screen shows several addresses and by tapping them the browser will open and show the corresponding web address. Also includes Imprint, Privacy Policy and License	

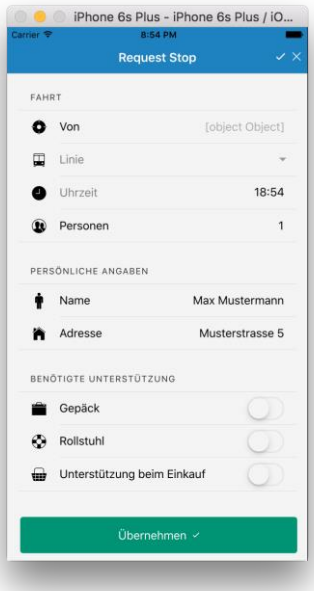
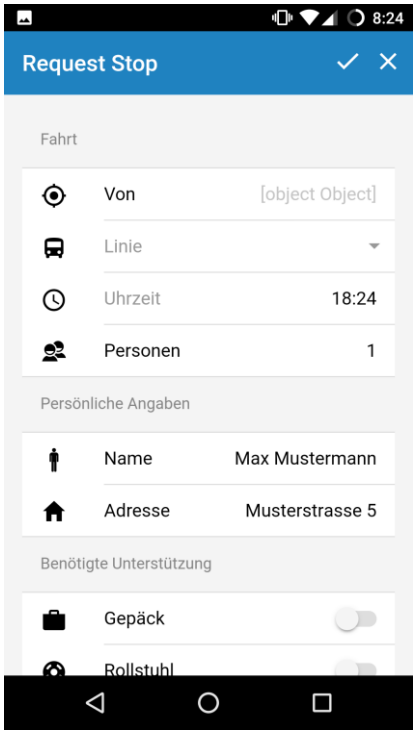
Author: Sascha Müller
Status: Complete
Reviewer: Patrick Pschorn, Oliver Säger
Review status: Complete

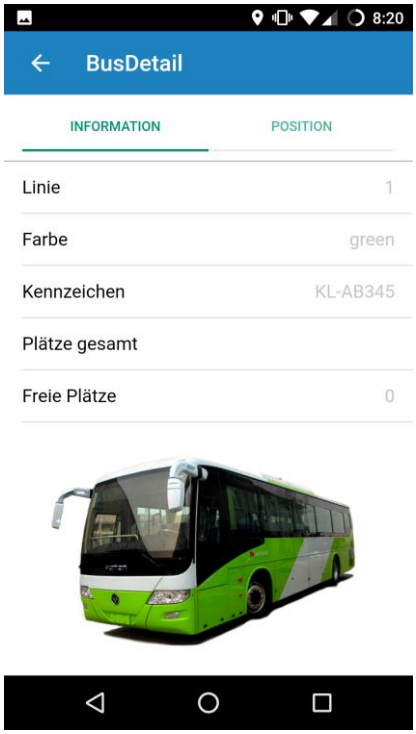
8.5 BuergerApp Screens

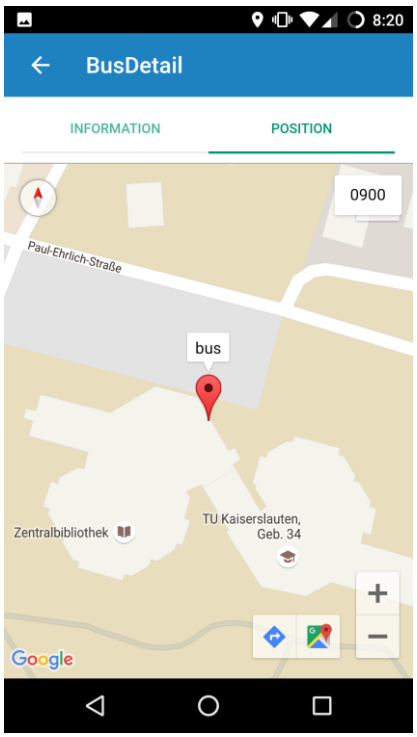
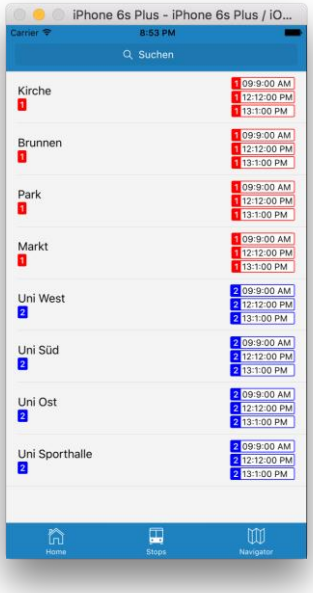
#SC_C0: Start Screen	

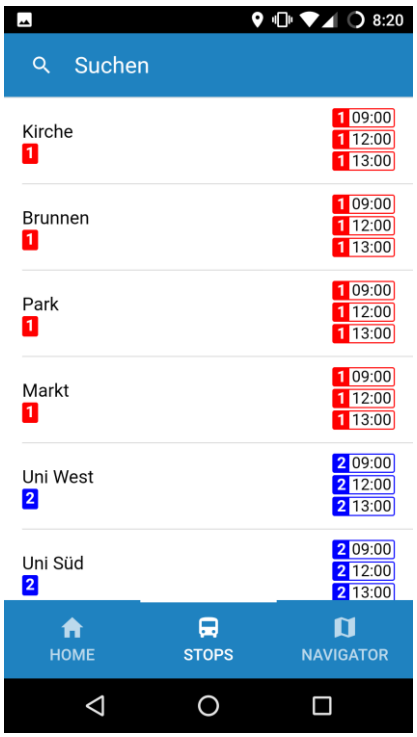

iPhone 6s Plus - iPhone 6s Plus / iO...
Carrier
8:53 PM
Digitale Doerfer
Haltewunsch äußern
Zeige mir meine Bus auf der Karte
Home
Stops
Navigator

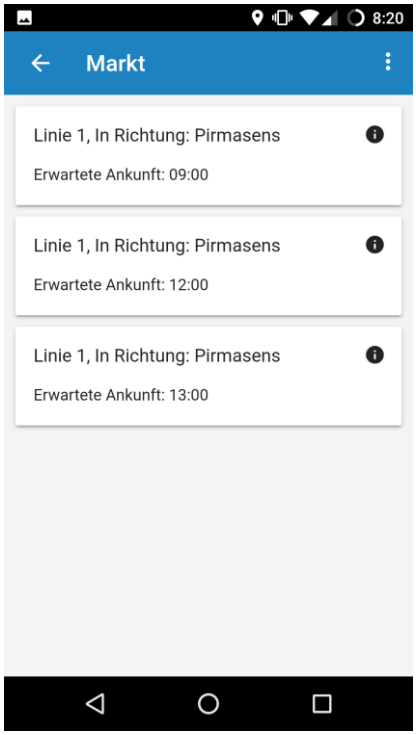
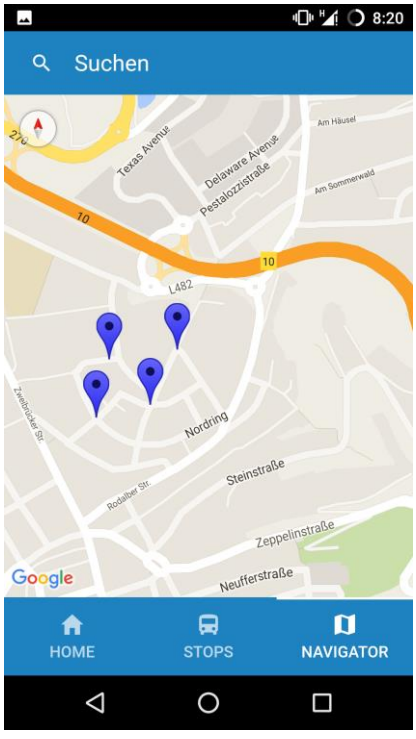

8:24
Digitale Doerfer
HALTEWUNSCH ÄUSSERN
ZEIGE MIR MEINE BUS AUF DER KARTE
HOME
STOPS
NAVIGATOR

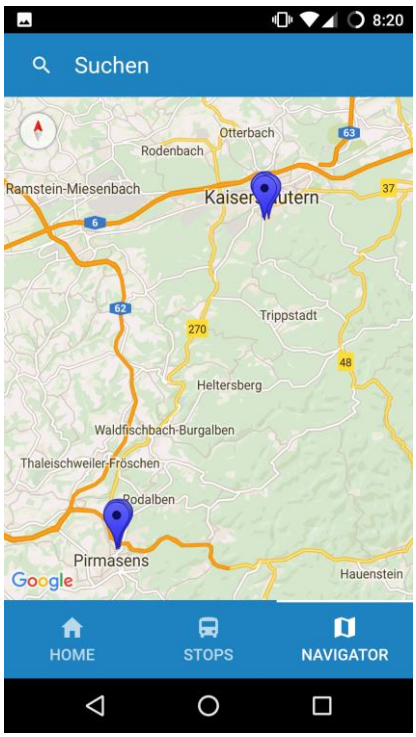
#SC_C1: Request Stop	 

#SC_C2.1: Show Bus Information	 
#SC_C2.2: Show Bus Position	

	
#SC_C3: Show Stops	

	
#SC_C3.1: Show Routes	

	
#SC_C4: Show Map	



Author: Marcel Müller
Status: incomplete
Reviewer:
Review status:

9 Additional implemented elements of BusDriveApp at current state

Table Additional implemented elements

Name	Description
BusDriveApp: Change Language	For later localisation of the BusDriveApp, you can now change the language of the application on the Settings Screen
BusDriveApp: Set Server Address	On the Settings Screen you can choose a server address and also add new server addresses.
BusDriveApp: Route to Custom Stop	If you tap on the marker for an accepted Custom Stop or if you tap on the address of the Custom Stop on the #SC_B3: Drive Screen the route from your position to the Custom Stop is displayed

Author: Sascha Müller, Charel Irrthum
Status: Complete
Reviewer: Patrick Pschorn, Oliver Säger
Review status: Complete

10 Glossary

Table Glossary

Name	Description
Bürgerbus system	Consists of BusDriveApp, BürgerApp, server backend
BusDriveApp	Mobile application to be used by the Bus Driver
BürgerApp	Mobile application to be used by the Citizens
Line Stop	A stop that is constantly part of one or more Lines, with estimated arrival time within the corresponding schedule
Custom Stop	A stop that is not in the schedule of any Line, the position can be off the normal Lines, a Citizen requests it, the server propagates it to an appropriate Bus Driver and the Bus Driver decides if he includes it to his tour and tries to be there on time

Author: Sascha Müller
Status: Complete
Reviewer: Charel Irrthum, Oliver Säger
Review status: Complete