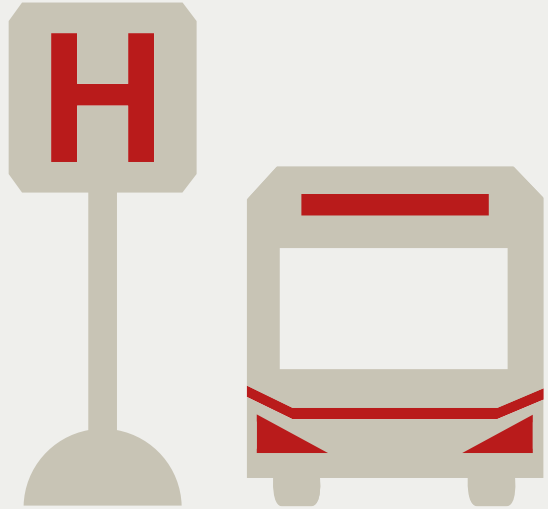# Making Public Transit Data Universally Accessible using GTFS Data

Session – Smart Mobility

TCC Week

Berlin │ 14. September 2023

What is GTFS (General Transit Feed Specification)?

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In cooperation with cities in the US Google developed the "General Transit Feed Specification" as a standardized format machine readable timetable-data

2005

Recently released **Google Maps** offers **route planning only for cars**

2005/2006

First cities provided Google transit timetable data in order to **enable public transport routing**

2007

GTFS (Google Transit Feed Specification) was released by google in order to provide a **standardized format** for other cities

2009

Google proposed to **un-google the name**, since then GTFS stands for General Transit Feed Specification
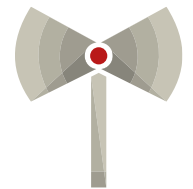
2011

Introduced GTFS-RT standard features **real-time data**

Google and Public Transportation service working together on a standardized format

GTFS became one standard for machine readable timetable-data and is broadly used by various services

Bildquelle GMAPS alt: https://www.eteknix.com/google-maps-10-years-old/

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The Static GTFS Feed already provides a high informative quality and can be extended with various additional data or by third party extensions

Data

GTFS Static

Simple static feed with already a **high information quality.**

Network Data (**spatial data**)

Optional

stops.txt   shapes.txt

timetable Data (**temporal data**)

Optional   Optional   Optional

routes.txt   trips.txt   stop.times.txt   calendar.txt   calendar_dates.txt   frequencies.txt

Additional Data

agency.txt   feed_info.txt   transfers.txt

GTFS Real Time

Simple static feed with additional real time data to provide delays or other restrictions or notices

Real time protocol

GTFS Static with fares

Simple static feed with additional fare data to calculate ticket prices for a route
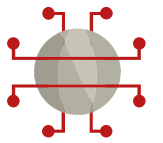
fare_attributes.txt   fare_rules.txt

GTFS Flex

Simple static feed with additional fare data

External Extension

Schema Extension

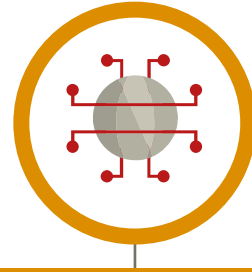Quelle:https://developers.google.com/transit/gtfs?hl=en

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In addition to the originally intended application field of routing in other apps, GTFS offers further potential for cities and public transportation companies

User experience

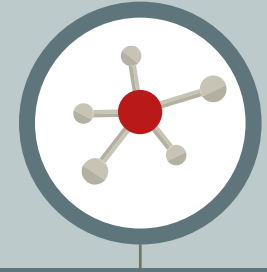> GTFS Data provides information that allows users to do routing planning

Open Data Ecosystem

> Routing on different platforms and in comparison, to different transportation modes

> Open data to public lowers the barrier to innovation

Focus:

Analysis

> GTFS Data allow analysis of public transportation quality in various depths and benchmarks to other regions

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Open GTFS data to third parties, can provide necessary information to all users and help transit agencies to focus on specific customer needs in their apps

BERLIN

> Research of public transportation company BVG finds that most costumer use google maps for travel planning

> Therefore, BVG decided to provide real-time GTFS-data to google

> All costumers can choose the plattform individually

✓ BVG has a divers App strategy and provides specific apps for every use case (App Fahrinfo, App Ticket, Jelbi, etc.).
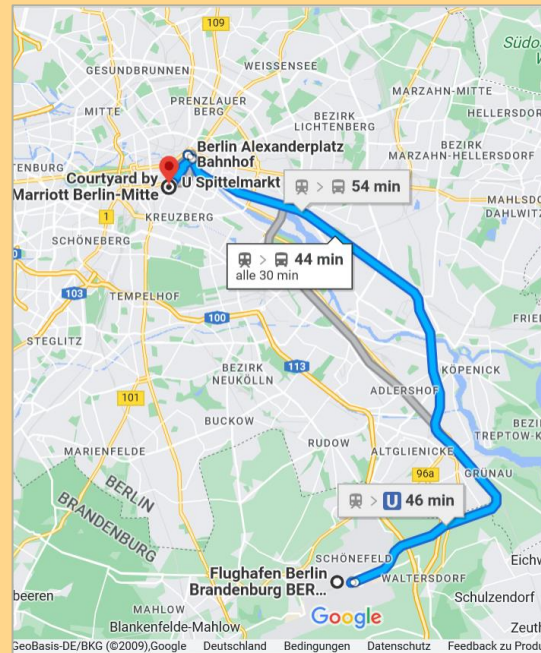
KASSEL (German city, 200 thousand inhabitants)

> No data provision for google or other third parties

> Information for possible connections and timetables only available in KVG App

✗ The result is that for people with little public transportation usage or tourists exist high entry barriers, they need to download specific local public transportation app for any routing information

✗ Locations seem less accessible than they are. Therefore, perhaps even less people are using public transportation

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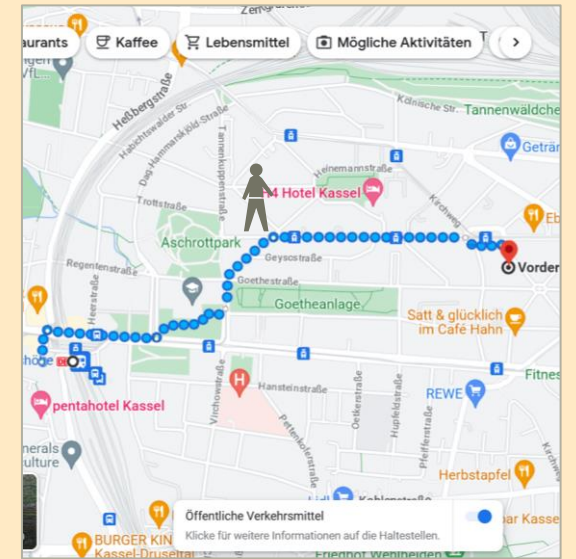
How are we using
GTFS data?

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civity is using GTFS-datasets for their analysis because of versatile advantages as spatial independence….

DataTeam

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Network analysis based on GTFS- Data

Georeferenced data enable detailed analyses of accessibility

timetable data enable detailed analyses of the distribution of supply

Data enables the consideration of characteristics of different means of transport

Network quality and timetable quality can be calculated individually or be combined as overall quality

More objective, differentiated and comprehensive analyses possible (compared to conventional metrics)

Identification of best practices from other regions

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Our analyses aim to provide analytical answers to key questions of our public sector clients

How well is the quality of the service during off-peak hours and at weekends?

What is the overall public transport mix in my city?

How well does my public transport service connect the inhabitants?

Which areas in my city are already well connected and accessible, and which have the most potential for improvement?

How is the travel time via public transport compard to private traffic?

GTFS data allows to calculated different KPIs in order to characterize public transport in your city and compare it to other cities

Frequency (timetable density) and operating hours
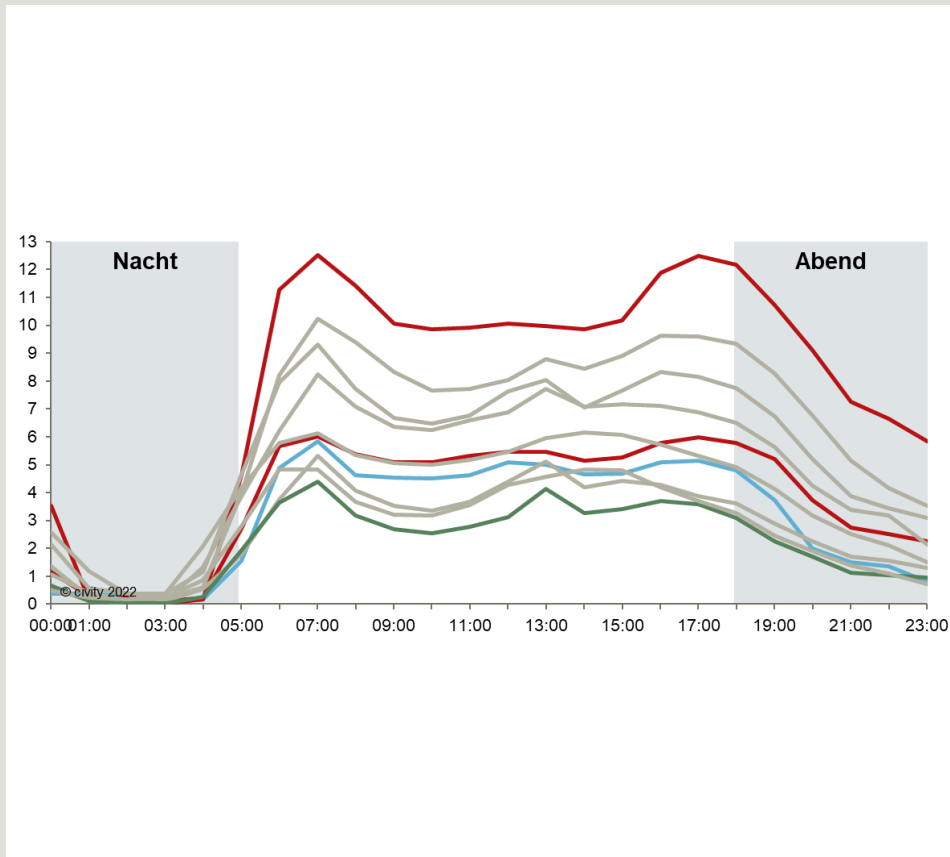
Network density and accessibility
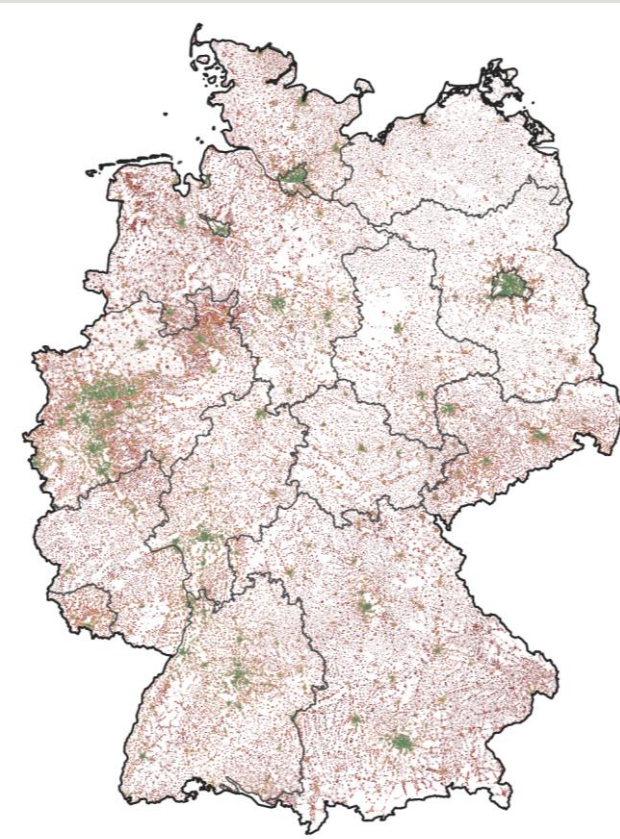
→ **Quality of public transport services**

› Comprehensive analysis of the quality of the public transport service is possible with various KPIs:

– Service density and transport mix

– Network density and accessibility

– Timetable density and service times

– …

› Evaluation at different spatial levels in cross-comparison is possible:

– countries,

– federal states,

– urban and rural districts

– …

Within cities, the quality of service can be compared to prioritize service improvements by calculating quality classes.

Example

Means of transport: Tram

Departures (total): 240

Frequency (direction): 7 min.

Station category: III

Example

Means of transport: Bus

Departures (total): 112

Frequency (direction): 15 min.

Station category: IV

Public transport quality classes

a   b   c   d   e   f
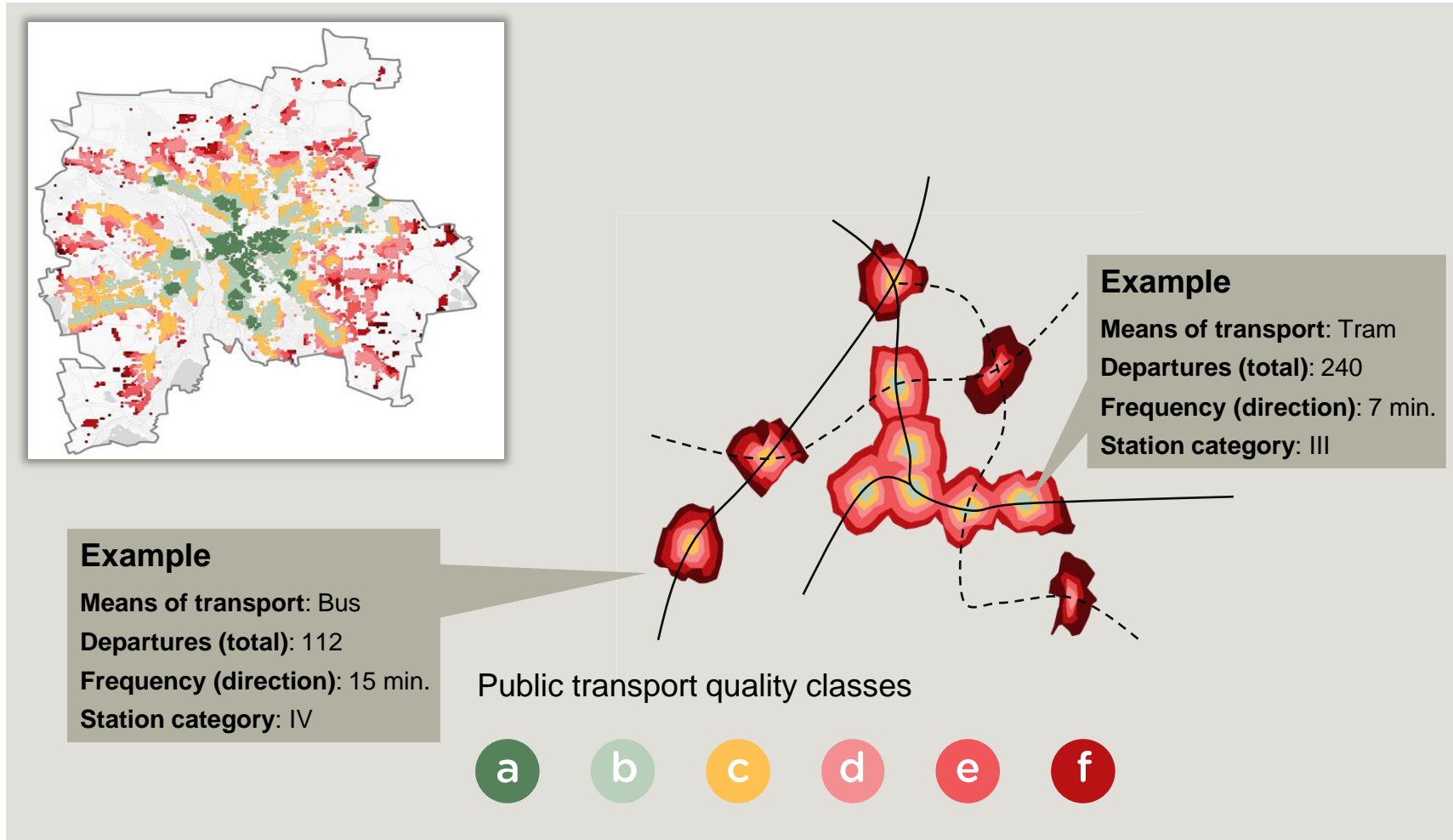
→ **Quality of public transport**

› In-depth analysis and evaluation of the accessibility quality of public transport

› Calculation of so-called public transport quality classes based on the methodologies of Switzerland and Austria

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GTFS data can be used in models to perform travel time analysis on a large scale and to analyze the competitiveness of public transport compared to private transport
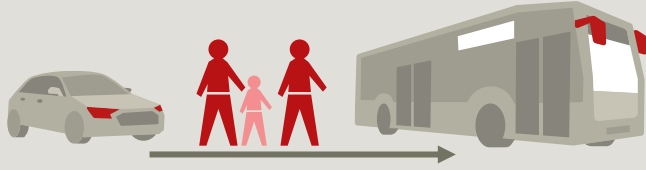
> **An important factor for the choice of transport mode is time**: Competitive travel times with public transport compared to the car are therefore a decisive factor for the desired traffic turnaround

→ **Public transport competitiveness**

> Determination of the competitiveness of public transport in relation to private motorized transport by various KPIs:
> – Travel speed
> – Travel time
> – Number and duration of transfers
> – …

> Determination of the travel time ratio for specific relations between public transport and private car traffic

Average travel speed PT

[in km/h]   Ø 19

Value
24
22
21
21
21
20
19
19
17
17
16
16
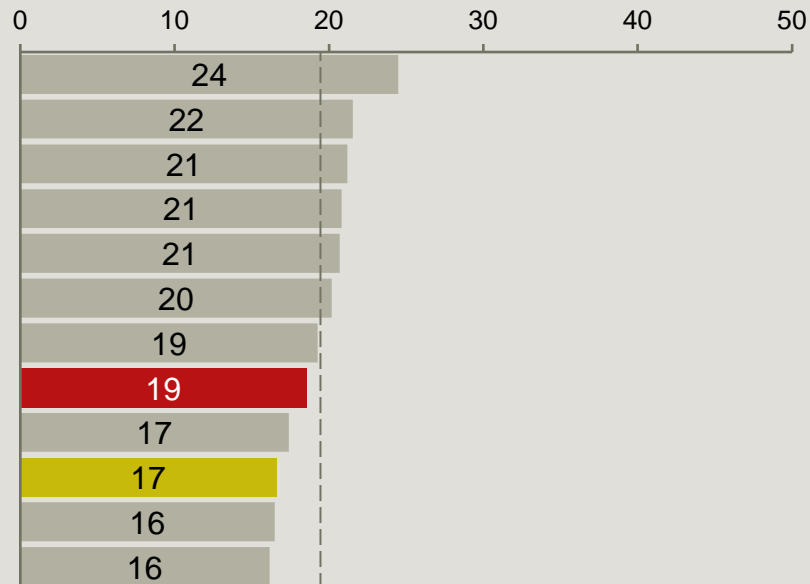
Average travel speed car

[in km/h]   Ø 35,6

Value
32
46
37
34
36
37
36
37
34
25
34
38

What should I pay attention to, if I want to provide GTFS-data?

Despite some shortcomings, the GTFS standard is the state of the art solution for structuring and publishing timetable data.

Interoperability

› GTFS is a widely used standardized data format. Data can be exchanged between cities, regions and applications.

Ease of use

› GTFS is structured in a simple table format that can be easily read and processed by humans and machines

Actuality

› Data can be easy updated when operating changes

Open-Data allows innovation with low initial costs

› Developing of mobile apps, web apps trip planners and more

Planning and analysis

› GTFS data can be used by transit agencies and planners to optimize public transit, increase efficiency, and better understand passenger needs.

Transparency and promoting public transport use

› By providing easily accessible information about public transit, GTFS data can help increase public transit use, which in turn can reduce traffic congestion and reduce environmental impact.

Static information

› originally designed for fixed routes and stops

Limited spatial coverage

Limited flexibility with On Demand or informal public transport

› Workarounds to face these limitations lead to inconsistencies e.g. informal public transportation services, On-Demand

Data quality

› High data quality is crucial for high user experience and robust analysis

› The quality of GTFS data depends on the accuracy and timeliness of information provided by transportation agencies. Inaccuracies or delays can affect the reliability of applications.

Data cleansing and validation is often needed

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There are a few characteristics to consider when choosing the appropriate data format for your public transport system

What are the characteristics of the public transport system?

> Lines based   yes/no

> timetable based   yes/no

> Delay during operation   yes/no

GTFS-data can only be provided for timetable-based systems

Which kind of GTFS-Data is useful?

> Static data

– useful for systems without certain delay during operation or with high frequencies

– For example for railway transport, BRT-systems und regional busses

> Realtime data

– Useful for system with high liability for delay during operations

– For example for bus systems in high-density areas

Static GTFS-data provides sufficient quality for most of the timetable-based systems

Which prerequisites must be met?

> Static data

– Standardized timetable-data can usually easy be converted into GTFS using available tools

– Data needs to be kept up-to-date

– No technical requirements in busses or trains are necessary

> Realtime data

– Depending on the technical implementation positioning systems need to be installed in busses, trains and stops

– Internet access

Static GTFS-data can easiely be implemented, while RT-data requires expensive technical improvements

Make tomorrow today

Contact

Stefan Weigele

Große Reichenstraße 27
20457 Hamburg

T +49.40.181 22 36-62
M +49.175.526 57 99

stefan.weigele@civity.de
www.civity.de

René Kämpfer

Wallstraße 27
10179 Berlin

T +49.30.688 135 22-17
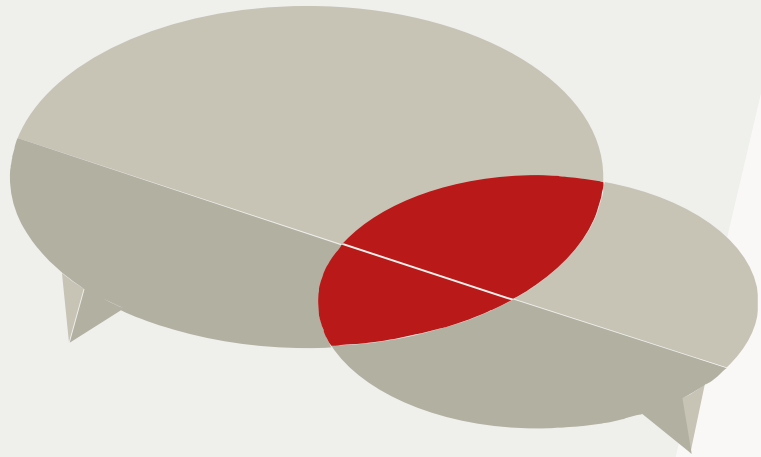M +49.160.98538740

rene.kaempfer@civity.de
www.civity.de

Andreas Wolf

Wallstraße 27
10179 Berlin

T +49.30.688 135 22-13

andreas.wolf@civity.de
www.civity.de

Questions to discuss