



digital : connected : mobile

Work Program of
ITS Austria

October 2018

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Ladies and gentlemen,

this is the Work Program of ITS Austria that was published at the end of October 2018. It blazes several new trails at once.

Firstly, it does so in terms of the target group of the Work Program. Solutions for people have very consciously been made the focal point, and not the underlying technologies. Great emphasis was placed on presenting the content and the described measures in a clear, understandable manner.

Secondly, the Work Program with its guiding principle "digital : connected : mobile" spans essential areas of our mobility system, thereby also picking up on current trends of our times.

The increase in interconnectedness (Internet of Things), big data, artificial intelligence or automation opens the way to systems and services in the mobility sector that were inconceivable a few years ago. Greater cooperation and collaboration is therefore needed among the transport infrastructure operators and the mobility providers in our country to provide joint solutions for users.

Within ITS Austria, a steering board was formed, in which the Ministry of Transport plays a new and central role. Together with the operators and providers of mobility solutions, we will see to the future of mobility on behalf of the public.

Our aim with this Work Program and the measures presented for implementation within it is to make domestic mobility simpler, more efficient and more convenient across all transport modes in collaboration with the operators and providers. My Ministry therefore considers the presented measures to be essential building blocks, which will find full support for their setup and operation.

In this spirit, I hope you enjoy reading this Work Program!

Your Federal Minister Ing. Norbert Hofer

The increasing digitalization of the mobility system means that greater cooperation is needed among the transport infrastructure operators. The goal is to step up the use of synergies and to be steeled for future challenges. Today's research trends, such as greater interconnectedness (Internet of Things), big data and big data analytics, artificial intelligence, automation, cyber security, etc. are increasingly reaching the implementation stage. To be able to offer joint solutions to the people of Austria, the transport infrastructure operators need to cooperate and collaborate. What drives ITS Austria is a common understanding about designing a national mobility system and putting in place sustainable services for its customers. In addition, the mobility system must be designed to be sustainable and financeable.

This will succeed only if the transport infrastructure operators collaborate closely and

the essential national and regional goals are anchored in transport policy.

The public sector is taking on a new and central role here that extends across the operators. ITS Austria is creating the necessary framework, which also takes into account other national strategies.¹ Based on the stated goals of transport policy, the transport infrastructure operators will work with research and industry representatives and jointly define within ITS Austria the priorities in the focal issues of digital infrastructure, connectivity and multi-modality. An important premise is to give members of the public throughout Austria, including in the rural areas, the freedom to choose from among a range of multimodal mobility options.

¹ Besides the Climate Strategy 2030, important framework conditions here include the Action Plan on Automation, the Logistics Action Plan of the BMVIT (with over 120 measures) as well as the C-ITS Strategy of the BMVIT.

Priorities of the work Program of ITS Austria

digital

ITS Austria is committed to continuing and intensifying the efforts to digitalize the Austrian transport system. Data generated in the mobility system by different players is to be made accessible and used efficiently, with due account taken of data security and data protection.² The aim is to ensure that the public has optimum, transparent, barrier-free and nondiscriminatory access to the entire mobility system. This applies to single transport modes and options as well as combinations thereof in keeping with the idea of completeness.

connected

Austria has long emphasized the intermodal interconnectedness of domestic mobility services. This also encompasses interconnectedness among the individual players in the mobility system and connectivity with new players. The environmental alliance³ is central to the deliberations of ITS Austria on the creation of a sustainable mobility system and is to be further strengthened through targeted measures.

mobile

ITS Austria is committed to securing an effective, efficient and safe mobility system in which customer-oriented, environmentally friendly and affordable mobility options are provided. Designing and securing this sustainable mobility system is the core interest of the players at ITS Austria.

Against this backdrop, ITS Austria performs the following tasks:



We observe the international and national framework, the developments, trends and strategies of our members.



We prioritize activities indicated in the discussion of observation findings.



We draw up policy and strategy recommendations to advance the mobility system.



We provide support and make proposals based on our recommendations for the roll-out of pilot applications, including accompanying research activities.



We create an Austrian platform of ITS stakeholders.

² The main goal in data protection is to protect personal data in keeping with the specifications of the General Data Protection Regulation and to apply the highest privacy standards.

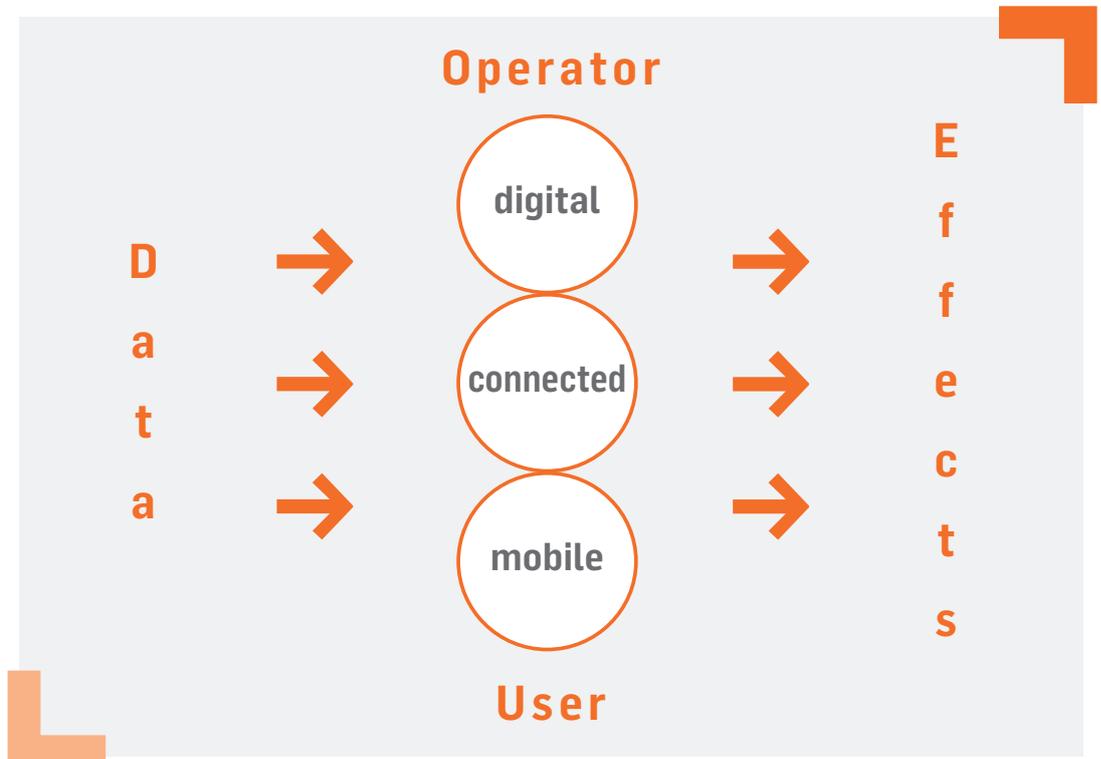
³ Group of environmentally friendly transport modes with regard to pollutant emissions, land use and noise pollution and their active networking with an emphasis on walking, cycling, public transport as well as vehicle-sharing and ride-sharing options.

The Framework

Travelers are in the process of changing their habits. People go from one place to another more flexibly and include more transport options in their travel chain than they once did and, in particular, make use of new options. Modern travelers need and expect a variety of real-time, high-quality information in order to adjust their travel in a flexible manner. This need for information must be comprehended so that mobility providers and transport infrastructure operators can respond efficiently to the new expectations of travelers. Mobility options must meet the customers' expectations. To this end, surveys must be conducted on customer expectations so that personalized services can ultimately be provided to members of the public, with due account taken of the data protection regulations. Only then will the mobility system and its mobility services remain attractive for travelers, thereby allowing the environmental alliance to be strengthened.

An increasing volume of data is generated in the mobility system and the analysis of this data also enables the mobility services to be improved. As a result, the transport infrastructure operators are called upon to manage their transport infrastructures efficiently and safely. Increasingly complex travel chains require the systems to be highly reliable and dependable, especially as regards real-time information. This makes it possible to create more comprehensive services with less latency that are even better attuned to customer needs.

The new technologies also open up major possibilities to the transport infrastructure operators. Measuring the effects of the individual services allows for a better calibration of existing systems and the options offered by operators can be improved. The services offered can be implemented efficiently in a system based on demand and supply. New options, in turn, can be implemented in the scope of the environmental alliance and made accessible to members of the public.



In this integrated mobility system, the aim is to prevent duplications and to create clear-cut responsibilities. In the medium term, the role of the public sector must be brought into sharper focus so that private mobility providers can also be offered a clearly defined scope of action. The scaling of the new mobility systems must be based on pilot projects in different environments (urban ↔ rural, work ↔ recreation, B2B ↔ B2C, etc.). The interactions between these environments must be worked out with account also taken of the increasing flexibility of these environments in which people live their lives (e.g. flexible work time).

The framework for this integrated mobility system extends across three central spheres of action:

- **DIGITAL** – by creating and making available a digital infrastructure
- **CONNECTED** – based on cooperative transport management
- **MOBILE** – with respect to the integration of multimodal services

The handling of and access to data are fundamental aspects in this context. Along with a technical feasibility of solutions, a corresponding organizational and legal framework must be created.

The object is to create a mobility system that is better in the broadest sense of the word, a system characterized by improved accessibility, efficiency, performance and environmental friendliness. A mobility system of this kind will not only directly assist the members of the public but also have a positive impact on the range of mobility options through new collaborations and creating added value between the public sector and private operators.

Provision of a sustainable digital infrastructure

Initial situation

Parallel to the physical transport infrastructure,⁴ the operators of the national transport infrastructure are today already operating a digital transport infrastructure⁵ as well. On the one hand, the infrastructure is monitored by sensors or cameras and transmits the generated data usually over its own communication networks⁶ to traffic control centers, where it is evaluated and the corresponding services are generated for the passengers. In addition, national services assist in assuring highly precise positioning by means of terrestrial correction signals and European services such as Galileo or EGNOS.⁷

For the individual operators to utilize the greatest possible synergies in digital transport infrastructure, intermodal transport operators have

been collaborating since the early 2000s to be able to provide members of the public with the corresponding services. The creation of a jointly sponsored multimodal digital transport map⁸ with a publicly accessible background map⁹ is just one example of a successful collaboration that has been well received by customers. In this case, the description of the physical transport infrastructure is made available in digital form.

The flow of traffic in the individual transport infrastructures is monitored by sensors and cameras. This is also the first collaboration among the federal provinces, ASFINAG and ÖAMTC to obtain real-time interoperator information for the road.¹⁰

⁴ The physical transport infrastructure is equivalent to the built transport infrastructure. The road, a rail track section but also transfer points such as train stations or stops are typical elements of the physical transport infrastructure.

⁵ Unlike the physical transport infrastructure, its digital counterpart consists primarily of hardware and software as well as communication technologies. The digital transport infrastructure is the basis for generating services and applications to support individual travelers before, during and after a trip.

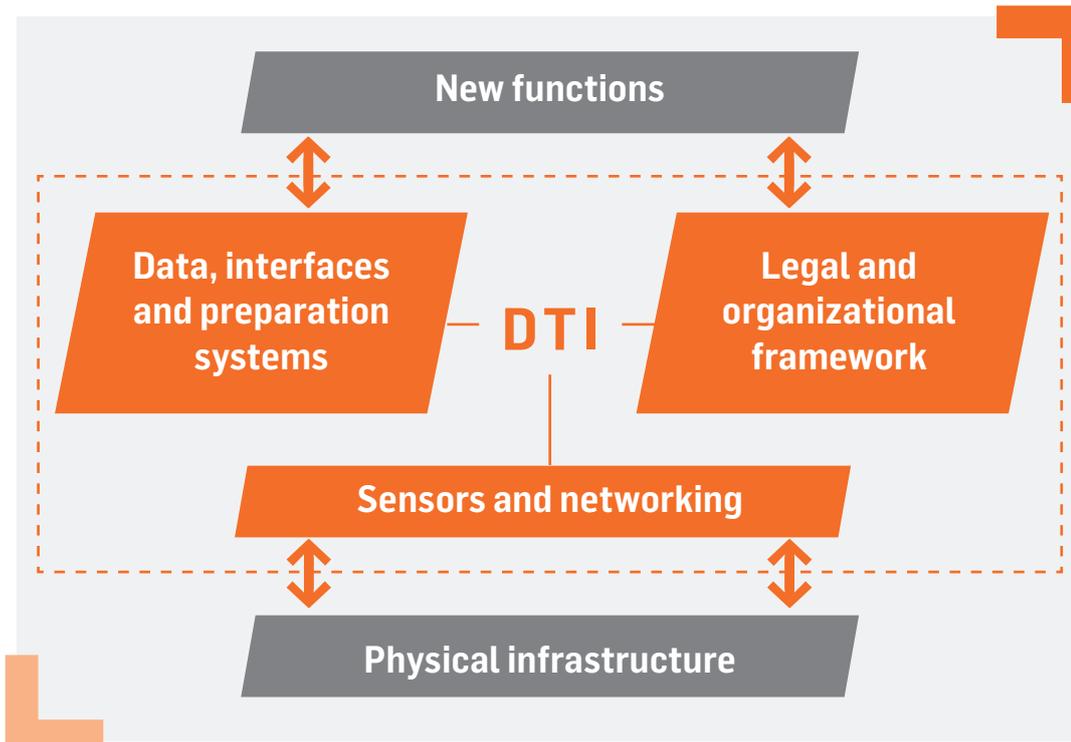
⁶ For example, broad-band networks already exist today along major rail and road infrastructure

⁷ European Geostationary Navigation Overlay Service (EGNOS) is a European Differential Global Positioning System (DGPS) for more precise, satellite-based positioning.

⁸ The multimodal traffic graph GIP (graphic integration platform)

⁹ Base map

¹⁰ EVIS is the acronym of the German term for real-time road traffic information



All these systems generate and interpret data that is also intended to be available over standardized interfaces for future applications, e.g. for connected, automated mobility options. It will be important here that reliable data from known sources is provided with a defined level of service (LoS) being maintained. The newly established national access point to verified mobility data is fundamental to these efforts.¹¹ Numerous national and international projects¹² in the field of networked automated mobility assist the infrastructure operators in enhancing their role and in enabling members of the public to be provided with high-quality services in the future as well.

Goals and next steps

Even if some of the groundwork for sustainable services and applications as well as for the introduction of networked vehicles has already been laid, customers have additional expectations of the mobility system. In general, travelers expect services to be good and sustainable

at all times and in all places, even off the main transport routes. When traveling, members of the public want to be informed via digital services about the valid regulations and recommendations and about their scope of validity. They expect prompt, highly precise information on occurrences (e.g. weather events, road or line closures) to be available and to be made accessible. And they expect the services to be geared to the given needs, or recommendations to be issued only if they are relevant and also useful in the current situation.

To ensure the above, the need for digital transport infrastructure must be clearly defined: What data should be collected, where and how should it be collected, what services should be generated and in what form should the data also be made available to private service providers? How are services transmitted to travelers in order to achieve the necessary effect on traffic in the multimodal mobility system along a multimodal route chain? A certain part of the description of the physical transport infrastructure will have to be made available

¹¹ www.mobilitaetsdaten.gv.at

¹² e.g.: Testfeld Telematik, ECo-AT, DigiTrans, ALP-Lab, C-Roads, Inframix

digitally to be able to support future applications as well, e.g. in the field of connected automated mobility.

To achieve this goal, ITS Austria has defined the following measures for digital transport infrastructure:

Measures for user-oriented mobility

1. I know what events will influence my travel from A to B.

On my trip from A to B, I want to know what events will influence my travel and what delays I can expect. Even if the time of the delay cannot be predicted, it is important for me to know what to expect during the rest of my journey. Besides, I would like to be informed as quickly as possible about any known events critical to safety.



To be able to offer better services to members of the public, the Austrian transport infrastructure operators are emphasizing the following measures as an initial step:

Short-term measures:

- All planned construction sites and their impact are compiled in machine-readable form and incorporated into the operators' own services. This enables travelers to know in advance whether a construction site will influence their trip.
- Other events (e.g. road closures, event information, overview of the situation) are also made available in machine-readable form and through the operators' own services. This information enables travelers to alter their trip from A to B accordingly, if need be, and to check out alternatives.
- Multimodal recommendations can be issued if events occur. If certain transport infrastructures are overloaded or closed, public services will be able to give recommendations on how best to use the environmental alliance. Travelers are thus assured that they are going from A to B on the quickest and safest possible route.
- All events are integrated in the national traffic information system Verkehrs Auskunft Österreich (VAO), which considers all current events when making its routing recommendations. This inclusion of events in the VAO ensures that all public service providers¹³ can pass along the most recent information to travelers.
- Connected vehicles that exchange data and information with the road infrastructure operators will be underway on Austrian roads from 2019 onward. In an initial step, information critical to safety will be transmitted directly and free of charge along the ASFINAG road system. Individual travelers will thereby be informed directly and in real time about any current hazardous situations they might face.

¹³ The applications of public infrastructure operators access the routing recommendations of the VAO. Maximum use is thus made of the existing synergies and all known current and planned events are accessible to everyone in the same way.

Medium to long-term measures:

- Planned construction sites in cities are made available to third parties in a standardized format. The information about the availability of data sets for third parties is made public via the national access point to mobility data. This arrangement enables private service providers, beginning with cities, to offer improved services based on quality-controlled information.
- Networked vehicles will also exchange data and information with the transport infrastructure operators on selected urban transport infrastructures. Travelers thus also receive information about unplanned events in real time, delivered directly to their vehicle.

2. I can rely on my service.

I want to be able to rely on my services. Services should not only be made available in a sustainable way; it is also important to me that the information from a service is correct and up-to-date. Especially in cases where networked automated mobility is involved, I think it is important to be able to identify verified and trustworthy information.

The transport infrastructure operators therefore want to ensure that information they generate and offer is well received by the members of the public.

Only the operator of the transport infrastructure itself can ensure that a piece of information is correct and reliable. Moreover, these transport infrastructure operators that are close to the government show consideration for the privacy of the members of the public. Data that members of the public generate while traveling (or before or after traveling) can be used only in anonymous form. Personified data of members of the public are not misused¹⁴ and it is up to them to decide who may use the personal data.¹⁵ The following measures were therefore defined:

Medium to long-term measures:

- Information and data exchanged with networked vehicles utilize a suitable encryption process. To this end, the European Commission is setting up a corresponding public key infrastructure (PKI)¹⁶ in which the Austrian road operators will also participate. This encryption ensures that only genuine, verified and trustworthy information is received in the vehicle.
- In addition, mobility services that members of the public can safely rely on will receive an Austria mobility trust seal. The newly established ITS contact point¹⁷ is able to monitor and rate existing mobility services. This gives members of the public the assurance that the service or the application they rely on is also based on data and information that has undergone corresponding quality control.



¹⁴ E.g. to monitor transgressions

¹⁵ This also holds true for vehicle-generated data, all in accordance with the motto "my car – my data".

¹⁶ Corresponding to the Certificate Policy for Deployment and Operation of European Cooperative Intelligent Transport Systems (C-ITS)

¹⁷ www.ivs-stelle.at

3. I know where I am.

The requirements for mobility services concerning positioning accuracy are becoming tougher all the time.

As a traveler, I expect to have lane-related information in the future. I want to be informed about when I need to change lanes if there is an obstacle blocking the lane I am in. I want help selecting lanes especially in critical situations, for instance along stretches of road where construction is underway.

At urban intersections, too, I want to find out in time whether I need to change lanes to be able to continue along my way. This information reduces my stress level and increases traffic safety.



To this end, knowledge about the new positioning capabilities of Galileo¹⁸ must be deepened and the possibilities for making services more exact and precise must be evaluated. In parallel, the digital map base GIP must be adapted to the more precise positioning capabilities and more detailed information must be incorporated. Against this backdrop, ITS Austria sets the following priorities:

Short-term measures:

- Analyze and define the requirements of existing and new mobility services regarding positioning and geographic reference systems.

The new technologies open up new possibilities for mobility services in terms of accuracy and currency. For the existing and new services to meet the expectations of Austrians, the new potential capabilities must be assessed.

- In positioning, the newly introduced Galileo services must be analyzed in terms of their usefulness in the mobility system. How can Galileo be used for positioning that is more precise and how can precise positioning be ensured in areas with insufficient coverage (e.g. in tunnels)?

Medium to long-term measures:

- GIP is the Austrian digital map platform. Many traffic signs are already digitally depicted there today. In the future, all traffic signs and regulations relevant to mobility are to be made available digitally. This is the only way that the automation of the mobility system and other new advances can be supported. Following European developments closely, as well as the work of the standardization bodies, provides an important basis for making the GIP even more precise and thus even more attractive.
- In the digital map base, consideration must also be given to whether all information should be made available in the GIP or in parallel reference systems. In networked automated mobility, there is a lot of experimentation with high definition maps (HD maps) and local dynamic maps (LDM). The role of infrastructure operators in this context must be clearly worked out and a mechanism must be developed for making the data available. This holds true especially for short-term measures in traffic control, for instance around construction sites.

¹⁸ Galileo promises positioning accuracies to the nearest 30 cm in non-built-up areas and to the nearest 5 m in built-up areas.

4. Vehicles find their parking space themselves in efficient transfer hubs and I am guided through the transfer.

For a multimodal trip, a main focus must be put on efficient and customer-friendly transfer hubs.¹⁹

I do not want to be hassled with looking for a parking space at this transferhub.

At major transfer hubs I want to have the option in the future of leaving a vehicle²⁰ at the entrance to the Park & Ride facility and transferring directly to public transport hassle-free and without spending a long time looking for a parking space. Vehicles are parked automatically or made available to other customers and then to me again on my return.



Today's technologies enable scenarios like the one above. ITS Austria is clearly committed to multimodality. It therefore focuses on servicing transfer hubs between different modes of transport. They must be rendered more attractive to make transfers as quick and pleasant as possible for members of the public. And automated parking helps to shorten the distances involved. To be able to offer these types of automated services, more must be invested in research and development. ITS Austria has therefore defined the following measures as a starting point:

Medium to long-term measures:

- The technologies for efficient indoor routing should be validated and piloted. Automated vehicles will not be able to be guided safely to their parking space until vehicles can be positioned inside an infrastructure without satellite support. Users would then have the option of leaving their vehicle at the entrance to a Park & Ride facility and having the system operator of the facility park the vehicle.
- Indoor routing and position determination also function in major transfer hubs all the way to the railroad platform, counter, escalators and elevators, etc. with account taken of barrier-free mobility for people and goods (including luggage).
- Further, the corresponding service for automatic parking must be developed as a safe service. The system must be capable of unambiguously identifying and making available a vehicle. To this end, it must ensure that the vehicle is not damaged and can be found again reliably.

¹⁹ Refer also to measure 4 in the "mobile" section

²⁰ Battery operated, vehicle sharing, etc.

Cooperative traffic management as the basis for forward-looking services

Initial situation

Traffic management is among the main tasks of the infrastructure operators, along with the planning, setup and maintenance of the transport infrastructure. These efforts ensure that optimum use is made of the transport infrastructure of the individual modes of transport. If possible, congestion and standstills should be prevented along the infrastructures. This holds true not only for regular service. In case of extreme weather situations, events or other occurrences, travelers should also be assisted as efficiently as possible on their trip from A to B.

Besides efficiency, the transport infrastructure must be designed to be safer. One of the priorities of traffic management is therefore to detect unplanned occurrences (e.g. malfunctions, wrong-way drivers or slippery roads) and to inform travelers of them immediately.

To be able to respond to planned and unplanned occurrences quickly and reliably, the individual infrastructure operators have developed traffic management plans. This tool simplifies decision-making if an event does occur. Based on tested and validated models, it also provides the greatest possible help to travelers, for instance by suggesting alternative routes.

In traffic management in recent years, operators have concentrated primarily on their own infrastructure (e.g. Wiener Linien is responsible for traffic management for public transport in Vienna). Trends show that cooperation with transport infrastructure operators of different modes of transport as well as with private service providers will be increasingly important in the future. To this end, ITS Austria formed its

own internal work group in recent years to analyze this cooperation under the key word "Traffic Management 2.0".

In this context, the federal regions of Austria are also beginning to work together with ASFINAG on inter-operator traffic management plans for the road.²¹ The aim is to be able to make the best possible use of existing transport infrastructure along the major transport routes for all members of the public. And in doing so, account is taken of travelers but also of local residents. New solutions in traffic management rely on new capabilities of a digital infrastructure and provide the basis for efficient and effective multimodal mobility options.

Goals and next steps

As long as the traffic flows and travelers can carry out their journey safely and free of disruption, individual travelers are hardly aware of traffic management, as a rule. It is only when the onset of winter, slow traffic or similar special events occur²² that travelers expect corresponding assistance from the operator of the transport infrastructure. What means of transport should they choose? Are there delays along the travel chain? Should trouble spots be circumvented or an alternative means of transport be selected?

To be able to make optimum use of existing transport infrastructure, this support must be offered increasingly on an intermodal and inter-operator basis. This interconnectedness or

²¹ www.evis.gv.at

²² For example due to closures or construction sites

coordination and cooperation among different traffic management control centers promotes an even quicker response to events in a multi-modal environment. The aim here must also be to render traffic control more transparent. Travelers want to know why certain action is recommended or even stipulated. These recommendations for action must be distributed over all available channels as standard information. The crucial point here is the quality of the information and that it be able to be transmitted to individual travelers and directly as automated functions into the vehicle. ITS Austria has therefore defined the following measures for customers of the mobility system:

Measures for user-oriented mobility

1. I receive harmonized recommendations.

As a traveler, I expect that recommendations I receive for traveling from A to B are not contradictory. It doesn't matter whether I obtain my information from the radio, a smart phone app or variable traffic signs, the items of information should be compatible with each other and assist me on my journey rather than raise additional questions and uncertainties.



Travel recommendations are based on outcomes of traffic management and depicted in traffic management plans. Easy access to the traffic management plans in digital form is considered an important step toward transparent travel recommendations. The infrastructure operators want to ensure the provision of transparent and harmonized recommendations through the following measures:

Short-term measures:

- Existing traffic management plans are to be provided in a digital format.
- In addition, interoperator and intermodal traffic management plans are to be developed and used as a basis for generating coordinated information and sending it to travelers when events occur. The digitalization of traffic management plans lays the groundwork not only for being able to exchange these plans among different transport infrastructure operators but also in the future for being able to make them available to private travel information providers.
- Traffic management plans are activated by events. The Austrian transport infrastructure operators also guarantee the provision of information that is used internally to activate traffic management plans. In addition to a travel recommendation, e.g. in case of a detour, travelers also receive the reason for the travel recommendation.

Medium to long-term measures:

- Traffic management plans are exchanged with third parties via standardized interfaces.²³ This exchange is based on a contractual arrangement with all participating partners to ensure that all relevant information is transmitted to travelers without any contradictions. The goal is to inform travelers through different services about the same events with information having the same content and degree of detail. The important point here is the degree of cooperation among the road operators and third parties.²⁴
- The development of interoperator and intermodal traffic management plans is based, on the one hand, on the expected effects of the individual measures as well as traffic management strategies with combined measures. To this end, provisions must be made for an impact analysis of the measures singly and variously combined with each other. It is important here to consider various impact dimensions such as safety, capacity utilization and efficiency of the entire system, resilience of the entire network, nondiscriminatory access, ecological aspects, integration of new mobility solutions, etc. Whether the interoperator and intermodal plans also enable capacity-oriented traffic management across all types of transport must be duly evaluated. The aim here is to develop

jointly borne traffic management strategies along defined scenarios. In order to be able to constantly monitor strategies and adjust them based on their impact, a direct impact analysis is likewise to be enabled alongside a basic evaluation of measures and strategies.

- Reliability and quality are fundamental factors for having the information from transport infrastructure operators entered by private service providers in their end customer services. A mobility trust seal will therefore be introduced for verified and trustworthy information from transport infrastructure operators.

2. High-quality traffic information is also available for the system of non-major roads.

As soon as a traffic disruption occurs for the infrastructure operator, I want to be informed about it if it affects my travel chain.



²³ E.g. DATEX II in the road sector

²⁴ Corresponding to the findings of international platforms such as www.tm20.org

Besides traffic management plans, the fundamental elements on which traffic management is based must also be made available. They include, for example, pictures of the current traffic situation that can be used to observe traffic events even long before congestion occurs. These tools allow transport infrastructure operators to respond and take action early on. Traffic information of this kind is already available today for the systems of primary roads and urban streets.²⁵ ITS Austria is working to ensure that it is also made available for the network of secondary roads.

Short-term measures:

- Traffic information is made available for the system of primary roads. Informed travelers know how the traffic situation is developing on the road system relevant to them.
- Traffic information will be used efficiently in services by the transport infrastructure operators. As a result, road operators are also put in a position where they can issue multi-modal recommendations. When events take place, rerouting occurs not only in the same transport mode. Instead, the entire transport infrastructure can be used for a travel recommendation.

Medium to long-term measures:

- The infrastructure operators make available the traffic information for non-major roads, too.
- Road infrastructure operators step up cooperation with fleet operators and vehicle manufacturers/service providers as regards access to vehicle-generated data for evaluating road conditions.

3. I receive safety information free of charge delivered directly to my vehicle.

When it comes to traffic information relevant to safety, I, as a member of the public, expect quick, free information as soon as an event occurs. I want to receive these services not only in premium class cars – I want to be alerted in all vehicles as comprehensively as possible. My connected vehicle can understand the messages from the infrastructure operators and alert me quickly and reliably.



²⁵ www.evis.gv.at

Under certain technical conditions,²⁶ today's navigation systems can receive traffic information and incorporate it in their travel information services. A few years from now, the development of connected vehicles will make it possible to transmit information directly into individual vehicles. As an initial step, safety information is sent to the vehicles.²⁷ These services are therefore transmitted more quickly and more efficiently to the individual travelers. In this context, ITS Austria supports the following:

Short-term measures:

- Safety information²⁸ is to be transmitted by road infrastructure operators in real time directly into the connected vehicle. This allows travelers to receive early warnings about critical situations. Initially, these services will be available along the ASFINAG road system. Subsequently these services will be expanded to the system of secondary roads and to cities.

Medium to long-term measures:

- As a special case for the safety services, information should be transmitted to all construction sites (including mobile works sites, e.g. a mower on the motorway) via direct vehicle-to-vehicle communication.

4. Continuous flow of traffic and safe driving through intersections or crossings

As a vehicle driver, I want to know how long I have to stop at an intersection, when I will be free to drive off again and how long it will take until the next traffic light turns green. Ideally, I am assisted if I want to take advantage of phased traffic lights to drive through the city stress-free and with the minimum amount of emissions. If emergency vehicles approach the intersections, I would like to be alerted in a timely fashion. At railroad crossings, I want to be certain that no train is approaching and that I can drive across the train crossing safely.



²⁶ RDS-TMC (Radio Data System – Traffic Message Channel) is a service that has been available in Austria since 2003 and provides TMC terminals with traffic messages.

²⁷ Compare also C-ITS Strategy Austria (BMVIT, 2016)

²⁸ Corresponding to the C-ITS Day-1 services in line with the C-ITS Strategy of the European Commission

The interconnectedness of vehicles enables the urban infrastructure operators to transmit information to the individual vehicle efficiently. This makes individual transport in the cities safer and less stressful. ITS Austria supports the following measures in this regard:

Medium to long-term measures:

- Information on traffic light phases should be transmitted directly into the vehicle. This reduces stress levels since drivers then know how much longer they have to wait at the traffic light. Moreover, drivers have the option of using the traffic light phase information for the subsequent traffic lights to adjust their speed so that they can take advantage of phased traffic lights being all green and thereby reduce emissions in urban areas.
- With this communication between traffic lights and vehicles, special vehicles such as public transit vehicles or emergency vehicles can be prioritized. This assuages critical situations for emergency vehicles in the vicinity of intersections.
- One special case of connected communication in the vicinity of intersections deals with railroad crossings. At technically secured and technically non-secured railroad crossings, the information about an approaching train is sent directly into the vehicle on the road infrastructure.

Integration of multimodal services to support a new understanding of mobility

Initial situation

ITS Austria has always been driven to create and strengthen integrated multimodal mobility offers and services. When it comes to multimodal services, Austria is very well positioned compared to many other countries. For instance, a multimodal digital traffic map²⁹ has been created, which serves as the basis for multimodal travel information. With the national traffic information service Verkehrs-auskunft Österreich³⁰ (VAO), an interoperator organization has been established, which offers intermodal, door-to-door routing for all of Austria. This routing, in turn, is the basis for numerous national public routing planners.

The provision of static and dynamic data from transport infrastructure operators is an important goal of the European Commission.³¹ The European Commission hopes this will lead to more multimodal travel information services in the future. One goal is to embed the routing results from VAO also in private travel information services through the linking of services. Initial cross-border pilot tests³² for the linking of services are promising. This could enable travel information services to take account of local needs.³³

New trends arising from slogans like "Mobility as a Service" (MaaS) show that private service providers are increasingly involved in communicating public transport services. The point here is to make optimum use of the synergies and to gain clarity as to what the goals and responsibilities of the public sector are. Existing offers must be incorporated in the services

and demand for new offers must be identified. In the end, one must create a sustainable multimodal mobility system that is affordable for all participants and that is jointly sustained by all transport infrastructure operators and mobility providers.

Goals and next steps

Individual travelers want to receive optimum assistance before, during and after a trip. Ideally, they use services that have integrated offers from a wide variety of mobility providers. They have no interest in obtaining information or conducting bookings and payments via different services or platforms. They expect their future mobility service to give them easy, high-functionality access³⁴ to interoperator services that work throughout Austria. This capability is based on a flexible, quickly scalable system in which new offers can be integrated with minimal effort and expense.

A flexible system of this kind must be able to adapt to the needs of the public. The system must be able to assist members of the public in the city as well as the country or in tourist regions and to respond to special needs.³⁵ The system and its services must be trustworthy and thus offer barrier-free access to individual mobility.

This system does not have the goal of being able to offer all services itself. Instead, it should support the creation of new services – also by private providers – with public services

²⁹ The multimodal traffic graph GIP (graphics integration platform) – refer also to the DIGITAL section

³⁰ www.verkehrsauskunft.at

³¹ Compare ITS Directive 2010/40/EU

³² See Linking Danube (<http://www.interreg-danube.eu/approved-projects/linking-danube>)

³³ The fastest or shortest connection between two points is not always the most suitable. In particular, in mountainous regions, in residential areas or in zones requiring special caution (e.g. schools, hospitals, retirement homes), local knowledge must be incorporated in the route planning.

³⁴ Integration of information, booking/reservation and payment

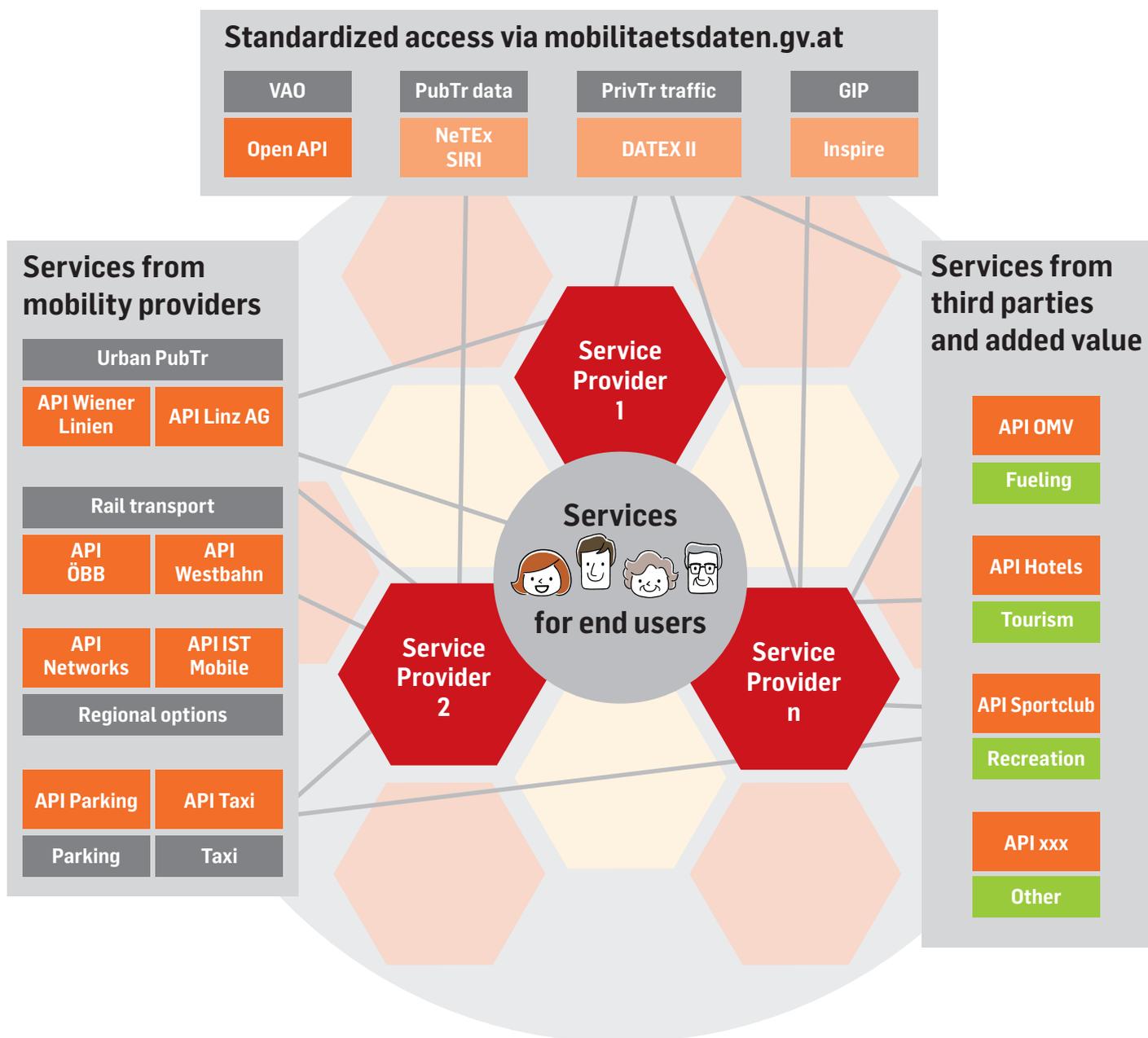
³⁵ Pupils, retirees, individuals with personal limitations

also able to be offered by third parties. The goal is to let services covering all transport modes be created between the individual operators.³⁶ This will give members of the public alternatives to current mobility behavior.

For these new kinds of mobility services, as the backbone of mobility systems, public transport must also be ensured in rural areas and must

be supplemented with needs-oriented mobility options (e.g. micro public transport). To be able to provide alternative mobility behaviors, the existing transport system must be adapted to existing needs and rendered more efficient.

The Austrian mobility system ("MaaS made in Austria") could take shape as follows:



³⁶ e.g. between cities and their environs

Mobility services relevant for all service providers are made accessible here via application programming interfaces (APIs). In addition, static information on the individual transport modes is offered via standardized interfaces. The data sets accessible here are listed at www.mobilitaetsdaten.gv.at. "Integration as Self-definition" is the goal here. Private providers (where applicable, even from adjoining sectors) can also make their data and services accessible to the service providers.

With this specified goal in mind, ITS Austria has defined the following measures:

Measures for user-oriented mobility

1. I have easy access to multimodal mobility services.



The concept of "Mobility as a Service" is a good option for me and a comprehensive approach for being able to access the entire transport system and all existing services in just a few steps.

Developing a common understanding of mobility as a service – MaaS for short – is fundamental to being able to offer integrated multimodal travel services as "MaaS made in Austria" to the public. The important point in this regard is to create a flexible, quickly scalable system with the functionalities described above and able to ensure easy access both for mobility providers³⁷ and for service providers.

"MaaS made in Austria" should be an affordable system and bring about regional added value. On this subject, the annex makes available an initial work plan for designing an Austrian MaaS system. ITS Austria would like to carry out the following measures as part of this plan:

Short-term measures:

- A common understanding of a "MaaS made in Austria" system should be developed. Based on an agreement and description of the mobility services offered via the open API interface³⁸, a multimodal MaaS architecture will be jointly developed and borne by all major domestic mobility providers. Based on the MaaS architecture, any necessary technical interfaces will be defined for accessing data and services in order to deduce from them what will be exchanged, where and by what means. The important point here is a common commitment to a top-quality range of products and services.
- An agreement is to be reached on the exchange of status information from individual operators that is relevant for the travelers. Thus, information about delays, unscheduled events or the temporary unavailability of a product will be able to be passed along to travelers easily and quickly so that alternatives can subsequently be provided.
- The technical interfaces for accessing data and services of mobility providers should be opened up to the extent that service providers can set up their end customer services on these interfaces in line with the joint MaaS agreement.

Medium to long-term measures:

- Based on the common understanding of the Austrian "MaaS made in Austria" system and the system architecture built on it, initial

³⁷ Mobility providers can be both national transport infrastructure operators and private mobility providers.

³⁸ Including needs-oriented services and value-added services

pilot applications are to be developed in different regions. The jointly borne system must meet the expectations as regards user acceptance and scalability. ITS Austria therefore recommends that pilot projects be carried out in urban and rural settings. Furthermore, a tourist MaaS pilot project should show how the integration of services from adjoining sectors is possible and makes sense.

- Freedom from discrimination is an important basic prerequisite for a national MaaS ecosystem. Trustworthy service providers are therefore to be awarded a mobility trust seal. The aim is to ensure that future MaaS service providers can make non-discriminatory use of the provided data and services in line with the common understanding of "MaaS made in Austria".

2. The public mobility service providers and infrastructure operators open up access to mobility information.

I want access to all information relevant to my trip. This includes not just timetables or disruptions along the route but also information about the capacity utilization of e-charging stations, the availability of rental bicycles.

All necessary information is contained in the existing systems of the transport infrastructure operators. The task now is to make this information accessible to third parties in a

non-discriminatory way in keeping with the European regulations.³⁹ To this end, ITS Austria supports the following measure:

Medium to long-term measure:

- Data and services of the kinds defined in the annex to the Delegated Regulation EU/2017/1926 are to be made accessible to third parties by 2023 pursuant to the European standards and specifications.

3. Services from infrastructure operators are networked with each other.

As a traveler, I expect integrated services in keeping with the requirements outlined at the outset. All available modes of transport should be presented, be offered and be bookable in a non-discriminatory way.

Offering integrated services is based on blending and linking the services.⁴⁰ Although there have already been pilot trials in this regard, too, farther-reaching tests must be conducted to obtain better evidence about the potentials and possibilities involved. ITS Austria therefore defines the following measures:

Short-term measures:

- There is a joint commitment to opening up interfaces so multi-modal services can be offered that will subsequently feature an integrated booking and payment function.

³⁹ See Delegated Regulation of the European Union 2017/1926

⁴⁰ The possibility of linking services over an open API is presented in the Delegated Regulation EU/2017/1926

To this end, there should be more extensive international pilot projects conducted with public infrastructure operators from neighboring regions abroad (e.g. South Moravia), also including national public mobility providers. These efforts are meant to ensure that the employed interfaces are harmonized internationally.

- New forms of electronic access to mobility options should be evaluated across the different mobility options and pilot projects should be launched to try out promising approaches.
- Based on international findings, national pilot projects ensure that the requisite know-how can be built up by the public sector to enable the interfaces to be opened up also to further providers in a later step.

Medium to long-term measures:

- Drawing on the findings of the first pilot projects, multimodal services based on the linking of services are to be tested jointly with private providers in selected (tourist) regions. Besides feasibility, acceptance among members of the public is to be evaluated.

4. Transfer points and information on them are also integrated in a MaaS ecosystem.



Along with the provision of information on the trip from starting point to final destination, I also expect clear assistance at the transfer points.

Knowledge about the time of transfer is not the only important factor for travel planning. So, too, are necessary walking distances, availability of parking spaces plus escalators, elevators, ticket counters, etc. What help does the calculated transfer time give travelers if the Park & Ride facility is full and no parking space can be found? What good is the fastest route from A to B if there is no bicycle available at the rental bike stands? Support for travelers is therefore especially important at the transfer points.

Even if much of the information is available in the systems of the infrastructure operators, it is not always included in the provision of information for travel planning. The service level at multimodal nodes is to be raised by providing the necessary information. It is also important in this regard to make available information for individuals with special needs. ITS Austria thus defines the following measure:

Short-term measure:

- In an initial step to provide information at major transfer points, parking space information is to be integrated at Park & Ride facilities. It should be possible to integrate the information on available parking spaces in existing and new mobility services, along with a possible prediction on how the parking situation will develop. The degree of capacity utilization of other infrastructures (e.g. sharing options) needed to transfer between transport modes should be rendered integratable in a further step.

Accompanying Measures

Besides assistance, ITS Austria is committed to undertaking guidance and observation to implement the defined measures. What is important here is that not just the measures in the Work Program are carried out but rather, above all, that efficient impact monitoring is conducted. How does the mobility of Austrians change with the implementation of the measures? Are there new requirements of the public concerning the mobility system?

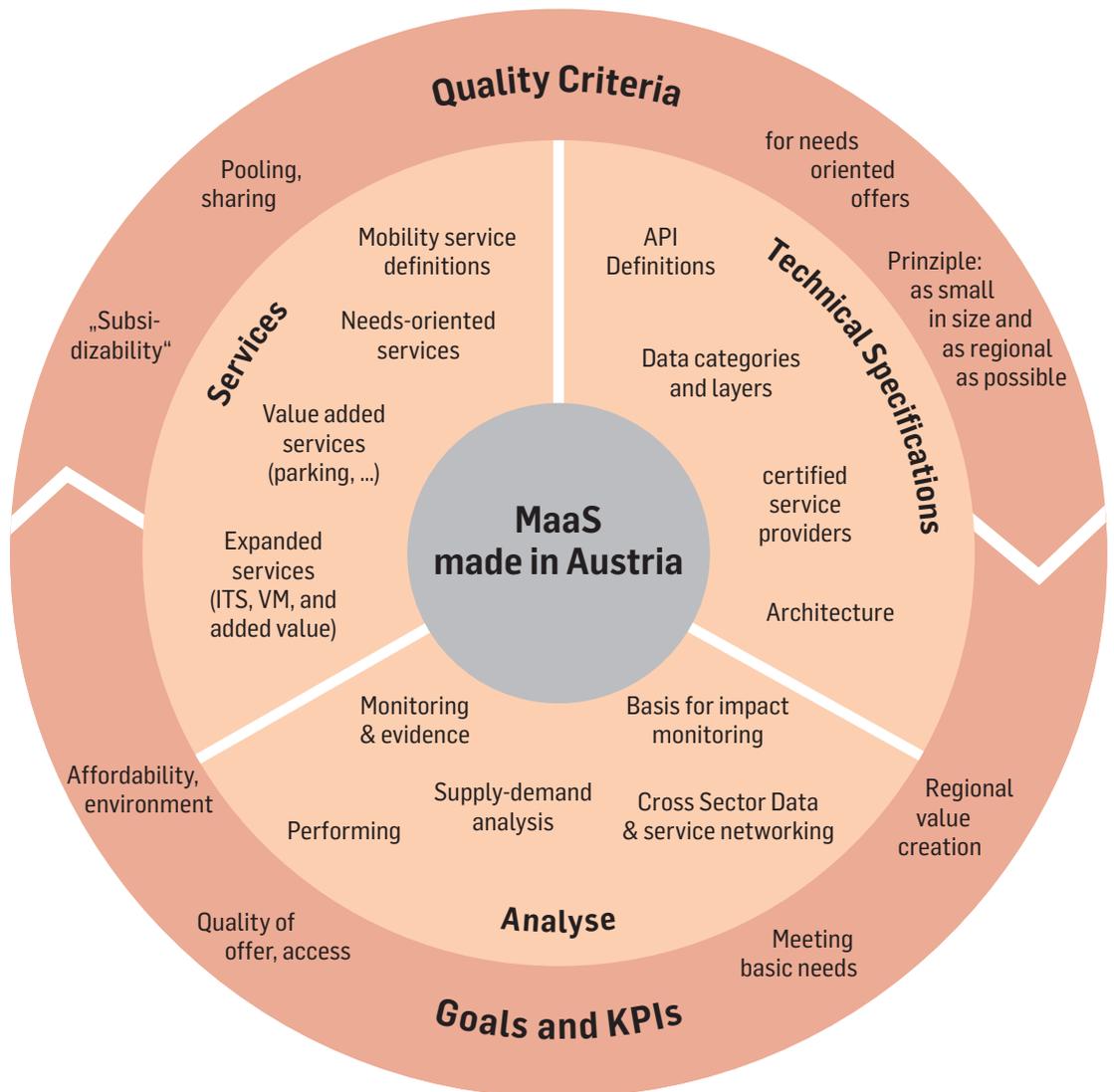
Besides viewing the mobility system from the perspective of customers, one must verify whether the mobility system in and of itself is remaining sustainable and financeable. The transport infrastructure operators expect a balanced and non-discriminatory use of the mobility options they offer. To this end, it is important to design the Austrian mobility system so it can be scaled to supply and demand.

In an annual report, ITS Austria will report on the implementation and continuation of the Work Program from the standpoint of customers and the transport infrastructure operators.

Work Plan for Designing „MaaS made in Austria“

Pursuant to measure 1 in the MOBILE section, here is ITS Austria's initial Work Plan for the purpose of describing and agreeing to a national "MaaS made in Austria".

Roughly speaking, this involves four steps ITS Austria will take in order to make "MaaS made in Austria" a reality.



1. „MaaS made in Austria“:

In the first half of 2019, the public transport infrastructure operators are intended to depict the functionalities in a multimodal MaaS architecture. In this functional architecture, one will define the responsibility of the individual players and the requirements to be met by the

interfaces between the players. An organizational model will emerge for a MaaS operation in which each player knows his or her roles and responsibilities and subsequently also performs them.

2. MaaS Basics

As soon as the functional and organizational framework conditions between the transport infrastructure operators are defined and agreed to, the next step is, on the one hand, to define services (which services are to be offered in an initial step) and on the other, to draw up a technical specification for the data categories and the interfaces.

One should remember to include a separate layer for analysis to enable the transport infrastructure operators to obtain feedback on the services rendered. The analysis layer lays important groundwork for impact monitoring and for the analysis of supply and demand. This is the only way to ensure that the Austrian mobility system can remain scalable in a sustainable way.

3. MaaS Framework

A third Work Package deals with the goals and quality criteria of "MaaS made in Austria". Consideration is given not only to the goals of members of the public (meeting of basic needs,

quality of the range, etc.) but also to the goals for the operation of the mobility system itself (financeability, affordability, environmental impact, regional value creation, etc.).

The quality criteria, for their part, are closely associated with the involvement of further stakeholders, for instance for needs-oriented options or shared services. It is important that the entire MaaS ecosystem remains scalable and can respond strongly to regional requirements.

4. Pilot applications

In a final step, regional pilot projects (in urban and rural regions as well as tourist regions) are to be used to test and validate the "MaaS made in Austria" ecosystem. This phase can be followed by a further gradual roll-out throughout all of Austria.

