

Data makes MaaS happen

- MaaS Alliance Vision Paper on Data

WHAT IS MaaS?

MaaS is the integration of various forms of transport services into a single mobility service accessible on demand.

For the user, MaaS offers added value through the use of a single application to provide access to mobility, with a single payment channel instead of multiple ticketing and payment operations. To meet a customer's request, a MaaS operator facilitates a diverse menu of transport options, be they public transport, ride-, car- or bike-sharing, taxi, car rental or lease, or a combination thereof. A successful MaaS service also brings new business models and ways to organise and operate the various transport options, with advantages including access to improved user and demand information and new opportunities to serve unmet demand for transport operators. The aim of MaaS is to be the best value proposition for its users, providing an alternative to the private use of the car that may be as convenient, more sustainable, and even cheaper while contributing to the achievement of societal and environmental goals.

THE KEY ROLE OF DATA IN DEVELOPING A COMPETITIVE MaaS ECOSYSTEM

Booming demand for more personalised transport services, together with the widespread enabling technologies like smartphones, and the rapid growth of the IoT, have created a market space and momentum for MaaS. **The development of this new, prominent mobility service market will however rely heavily on access to data and ticketing, open APIs (Application Programming Interface) and interoperability of the systems.** In addition to access to data, an imperative requirement is the high quality of data being exchanged. Interoperable systems, supported by

The Mobility as a Service strongly contributes to the achievement of the general transport policy goals as well supports some wider societal benefits by:

- Making multimodal mobility more accessible, convenient, affordable and sustainable
- Reducing the single occupancy use of vehicles and dependency on car ownership
- Reducing congestion, emissions and air pollution and freeing up public space in the city environment
- Making the most out of past investments in digital and physical infrastructure of both public and private transport service providers
- Offering public authorities and transport service providers richer and more accurate information about travel demand patterns and dynamics
- Offering new sales channels and business opportunities to both existing and new transport service providers with marginal costs

open architecture and standardised sub-element features, such as booking, payment, ticketing, authentication and security, are similarly crucial elements to catalyse the development of the

MaaS market. An additional crucial requirement is the existence of commercial agreements between the operators, and among transport operators and MaaS providers for the sale and resale of transport services. While various MaaS initiatives have been launched across Europe and globally, the MaaS Alliance is now working towards a technical, legal, and commercial interoperability of different types of mobility services.

The [MaaS Alliance White Paper](#)¹, published in September 2017, defines some basic principles on how data should be seen and managed within a MaaS ecosystem. The new document “Data Makes MaaS Happen” gives a more elaborate and precise view on the role of data within the MaaS ecosystem, defines certain use cases for data, explains existing barriers on the full deployment of data and gives action recommendations. **Availability of data and interoperability of systems** are prerequisites for actors in a MaaS ecosystem

DATA PRIVACY

MaaS providers and operators are committed to respect the highest standards of the data privacy. In MaaS services, privacy is not just a GDPR compliance question, but an inherent element of trust between the service provider and the customer. MaaS providers and operators should deliver clear privacy statements as set out in the GDPR. Instead of a *carte blanche* with an all-encompassing take-it-or-leave-it privacy policy, the MaaS user should be informed about what personal data need to be processed and what data is optional, why that is either necessary or beneficial in a given service type and how these personal data sets would be processed when offering a mobility solution via an app or when a user is navigating in their websites.

Personal data should be stored only for the purposes for which they are collected (accordance with the legal basis that allows to do so) or for reasons compatible with the original purpose. While personal data can be processed to fulfil a contract (provision of MaaS services) or based on the service provider’s legitimate interest, customers’ consent should be asked for processing data that is not strictly necessary for the service.

Users need to be informed about the rights hold in relation to their data, having e.g. access to their personal data, right to ask personal data deletion, or restrict the way in which their personal data are used if they believe that there is no (longer a) lawful ground to process it. This right given by the GDPR should be complemented by giving the customer a chance to manage themselves their data through the user interface.

As a specific feature, in some cases, mobility assets used (connected rental/shared cars...) might need further data managing, especially requiring the asset to be ‘wiped’ from personal data before next user will utilise it. This might require collaboration between different players involved which are committed to cooperate, sharing if needed technical tools and requirements (e.g. APIs) to request data deletion in order to be compliant with privacy rules.

prerequisites for actors in a MaaS ecosystem

1. **For user account management:** including validation of personal information and, if necessary, establishing links with national registries to validate the identity and e.g., driving license of account holder.
2. **For optimal routing,** taking into account current traffic and transport conditions, disruptions, accessibility requirements
3. **Provide the user with information on combined mobility solutions matching one’s needs at that given moment**
4. **For reservation and bookings**
5. **To retrieve availability of vehicles, including car/bike/scooter-sharing fleet or rides:** location of the vehicles, but also other characteristics, such as license plates, battery level for EVs, etc.
6. **For vehicle booking**
7. **To unlock the vehicle**
8. **For payment**
9. **For digital ticketing** (common formats/standards needed, including machine and human readable versions where applicable)
10. **To provide the user with solid time-critical information** while planning and travelling

¹ https://maas-alliance.eu/wp-content/uploads/sites/7/2017/09/MaaS-WhitePaper_final_040917-2.pdf

USE CASES TO DEMONSTRATE THE DATA FLOWS

MAAS OPERATOR USE CASE

Anonymised user data gathered by mobility service providers and MaaS operators (on travel patterns, mobility mix, etc.) is valuable for everyone within the MaaS ecosystem. This data improves, for instance, service providers' capabilities to identify gaps and opportunities in matching end-user needs and to better manage fleet distribution. **A win-win for all can be sustained by sharing data with the goal to jointly develop and grow the market. Naturally, the data exchange between different parties could be subject to applicable privacy regulations, commercial agreements and part of the overall business model.** The data gathered while providing various transport services would also be valuable for the public sector responsible for the strategic transport system planning.

From the MaaS operator's perspective, one of the most challenging processes is the user account management, including validation of personal information and building the possible links to national registries to validate user identity or e.g. the driving license of the account holder. Moreover, significant barriers are still in place, hindering access to sufficient ticketing and reservation APIs.

PUBLIC TRANSPORT USE CASE

Public transport authorities and operators manage increasingly detailed traveller data. Sometimes this data is used solely to better manage the public transport service. However, comprehensive strategies for data deployment might be missing. In many cases shared mobility data would help to improve the whole system, yet these benefits are still not widely acknowledged. Data is commonly found in silos, or lacks common structure or format. Standardisation of data, both static and dynamic, is still an issue. Public authorities and public transport operators may also suffer from the lack of resources (financial and human) in data management as this is not their core activity. Finally, one of their main concerns has been whether the data obtained from public-funded systems can be used to improve and develop private mobility services and under what conditions.

Regulation prompting public transport operators to open their traffic-related data to trusted third parties (and vice versa) would support the development of the advanced mobility services. Access to static data alone, such as timetables, would not suffice. Third parties, such as MaaS operators, also need access to business processes, for example reserving seats or issuing verified tickets. Dynamic information regarding timetables, delays, disruptions and deviations are similarly needed. The most urgent step to take would be to ensure the access to data/information in digital, machine-readable, non-proprietary format. A survey of the datasets relevant to transport and to MaaS-related services should be conducted, with commitment to quickly and seamlessly fill existing gaps in service-related data.

FLEET MANAGEMENT FOR CAR-/BIKE-/SCOOTER-SHARING OPERATIONS

Nowadays, the possibility to deliver an efficient vehicle (car-/bike-/scooter etc.) sharing service, as well as to integrate vehicle sharing operations in a single MaaS platform is highly reliant on access to dynamic² vehicle data. Data, resources and functions must be fully accessible to all actors of the MaaS ecosystem at the same technical conditions, and most particularly to the vehicle sharing operators and the MaaS providers (who can, when relevant, ultimately pass some of this information to the final user (e.g. the state of charge of the EV battery). Vehicle rental and sharing operators have a legal requirement to remotely ensure the vehicle being utilized is fully compliant with all roadworthiness rules applicable in the country where the rental takes place.

Access to some vehicle functions, locking/unlocking for instance, allows the sharing operators and MaaS operators to run their vehicle-reservation systems. Simultaneously, accurate and instantly available information about the status/location of the vehicle allows sharing operators to:

- Maximize the fleet uptime
 - By remotely detecting vehicle failures (remote diagnostics based on dynamic data)
 - By pre-emptively identifying possible imminent failures and by intervening to fix them before they occur (predictive maintenance)
- Maximize the fleet utilization rate
 - By ensuring that vehicles are always in the best-possible location (dynamic vehicle relocation)
 - By using dynamic pricing to reduce fares for returning unprofitably parked vehicles to popular locations (incentives)
 - By remotely monitoring the fuel/charge level and preventively refilling/recharging vehicles (optimal charging)

Moreover, the possibility to communicate with the user plays another key role in fleet management: the user feedback, once entered the vehicle is the most valuable information and the first step for vehicle remote diagnostic.

TRAFFIC MANAGEMENT USE CASE

From a traditional point of view, traffic management has been mostly one way - a road authority or a public transport operator informing users on its traffic management measures and plans. Adopting the MaaS concept would institute a new stage in traffic management, where traffic optimization measures can also be provided by mobility service providers and used to enable some advanced services to the end-users. In the traffic management data flow, the following key actors can be identified: content (=data) providers, transport authorities, transport service providers, traffic management operators, service providers, MaaS operators and travellers.

In the future MaaS world, the traffic management operator having access to dynamic traffic data (e.g. travel time, speed, traffic flow etc.) and collecting information about scheduled events by network operators and municipalities, will be able to provide traffic data services related to forecast travel time estimation, forecast level of services as well as to perform interactive traffic management measures to optimize the traffic flow in the

² For definition please see https://eur-lex.europa.eu/eli/reg_del/2017/1926/oj

network. In such a scenario, for instance, the traffic management operators could a capacity drop within the network which they cannot solve merely through traffic management measures, and ask the MaaS operator to channel travel demand into a different travel mode or modes to optimize the flows in the network

Through this enhanced collaboration, on one side, the traffic management operators can acquire dynamic traffic data directly by the connected vehicles and then use capacity of the whole transport system to spread travel demand more efficiently; on the other side, content/service providers and MaaS operators can enrich their mobility service suite with more contents to provide advanced and more precise services. Finally, the traveller acquires enhanced quality of service (e.g. less time wasted, increased comfort, less anxiety, fewer accidents).

In this context, later on, it will also be worth studying how information from other sources, e.g. from transport service providers (similar to Uber Movement data³) and fleet managers, could be used in order to optimise the traffic flows and management in cities, through traffic management measures and advanced data-based urban and traffic planning methods.

EXISTING BARRIERS IN UNLOCKING THE FULL POTENTIAL OF DATA

When it comes to the effort entailed for the different stakeholders to access and share data, a few major barriers still exist today preventing transport providers, MaaS operators, the end users, public authorities and ultimately the entire society from seizing the full potential of integrated mobility services in the MaaS ecosystem.

The first precondition for an emergence and integration of various transports services is the availability of relevant data sets in digital, machine readable, non-proprietary readable format. In order to build real multiplayer, multi-option market platforms **the service providers should provide each other access to essential information in digital format, including routes, timetables, stops, prices and accessibility information. Further on, ticketing and reservation system interfaces should be accessible for other service providers.**

As emphasized, the fundamental precondition for MaaS, is the **availability and access of relevant data**. However, there are some other conditions which might hinder the full deployment of the data power. The most relevant existing barriers for MaaS and underlying mobility services are introduced below.

³ <https://movement.uber.com/?lang=es-ES>

<p>Poor quality and incomplete data</p>	<p>Often the quality of data published is poor or incomplete. For example, data giving information about availability of the services might be inaccurate, published infrequently or not in digital format or is missing for certain services. For example, all public authorities or transport service providers do not publish data elements critical for users to make informed transit choices, such as vehicle location, fare data, or park-and-ride information, or they are inconsistent about stop and route identifiers, impeding MaaS providers to offer a consistent experience to their customers.</p>
<p>Lack of data standardisation</p>	<p>Well-utilized data standards for certain modes do not exist, such as digital ride-hail and car-share, whereas for other modes, such as fixed-route transit, the data standards are incomplete. Non-existent standards, non-standardised data sets with in a standard⁴ and a lack of industry consensus prevent the simple and scaled integration of transport services into a single MaaS application and drastically increase the transaction cost within the ecosystem. Incomplete standards might also prevent certain organizations from publishing internally collected data that would provide value to users and to the creation of combined services. Industry best practices for data publishing feeds are sometimes just ignored, contributing to fragmented and inconsistent data.</p>
<p>Lack of interoperability by design</p>	<p>Certain technological or design barriers are still in place preventing a complete functionality of intelligent systems and integration thereof. Integrated booking and payment processing technology, although it already exists, is not accessible to all nor is it expandable to support multiple validation technologies and revenue generating rules that would cover both the needs of transport authorities and private transport service providers. There is proven demand for more flexible approaches to provide interoperability between these legacy systems. There is also a recognized need to scalable governance and licensing models for data accessibility.</p>
<p>Lack of consumer/professional ability to switch between different service providers (data portability)</p>	<p>The traveller preference data, which is used to personalise a mobility service for the customer, can sometimes not be utilized by another service provider and will therefore have to be re-entered by the user or 'relearned'. The same problem also exists when the entity wanting to switch the service provider is a professional user and not a consumer.</p>
<p>Lack of economic incentives</p>	<p>In many ways this case entails most of the above-mentioned barriers. In some cases, transport operators or their technology vendors face a disincentive to make interoperable data available. For example, some mobility operator disallows dynamic data about their services to be shown alongside that of competitors, limiting a robust marketplace facilitated by innovative apps. Also, publicly supported existing data services, even if of bad quality, may hinder developers from offering better quality services on the market.</p>

In a digital economy, the ownership and access to data determines the market dominance. Therefore, it should be understood that data sharing does not necessarily equal to free data, but data sharing and exchange models should be designed between partners to be fair and to fit for purpose. Generally speaking, the following options can be considered as principles / business models for data sharing:

- Voluntarily
- In collaboration
- In reciprocity

⁴ E.g. in case of Datex

- Based on commercial agreement
- Due to regulatory obligation

ACTIONS AND POLICY RECOMMENDATIONS

Some of the existing barriers (i.e. poor quality and incomplete data) often have a purely local dimension and are simply based on a structural lack of technical knowledge and trust among stakeholders. Setting-up inclusive multi-stakeholder entities, such as MaaS Alliance, to bring the necessary expertise and different perspectives together and to share **recommended practises** helps the stakeholders and the ecosystem as a whole to overcome those barriers without putting the burden of development on one particular party. By promoting critical mass through openly accessible licensing and open source development, MaaS Alliance can also sustain the fact that the market potential of MaaS is benefitting a broader range of society and companies.

Through its three Working Groups, handling the technical and interoperability aspects of MaaS services, supporting market actors in identifying the most suitable governance and business models, and sharing knowledge on the best practises, the MaaS Alliance and its members contribute to the development of the MaaS ecosystem through various self-regulatory measures as indicated in the table on the next page.

Sometimes little can be done at industry level for some barriers, and some targeted policy interventions might be decisive to overcome such barriers. One of the core functions of the MaaS Alliance is to monitor and enable best regulatory practises to support a wide deployment of new mobility services and MaaS, catalysing the creation of a competitive MaaS ecosystem which supports innovation and creates greater value for consumers.

	Self-regulatory measures and best practises	MaaS Alliance recommendations
High-quality and complete data⁵ (covering both static and dynamic data)	<ul style="list-style-type: none"> Establishing neutral platform/servers (e.g. GEOTAB neutral vehicle platform) Aggregation & anonymization of data Transparent & well defined MaaS user consent framework (fully compliant with the privacy rules) Constant monitoring of local and national best practises <p>EXAMPLES:</p> <ul style="list-style-type: none"> Uber Movement GEOTAB platform 	<ul style="list-style-type: none"> Extend the use of National Access Points (NAPs; based on the ITS directive) to be used also for information and data sharing in MaaS ecosystem Adopt and share knowledge on data sharing schemes based on reciprocity Adopt and share knowledge of data sharing schemes pushed by public procurement
Dynamic data⁶	<ul style="list-style-type: none"> Identify precise data sets needed for each use case and multimodal integration Creation of specifications for requirements for each data set (e.g. in terms of latency, accuracy, metadata, ...) 	<ul style="list-style-type: none"> Adopt and share knowledge on data sharing schemes based on reciprocity
Data standardisation	<ul style="list-style-type: none"> Liaising with the relevant standardisation organisations (like SAE International⁷ and corresponding European organisations) affecting MaaS ecosystem and data needs 	
Interoperability by design⁸	<ul style="list-style-type: none"> Specifications addressing critical data needs, roles and responsibilities to assure data quality and trustworthiness Specifications for structured data and use case specific data models Setting standard requirements for data sharing and supporting effective collaboration between stakeholders Good-will commitment to promote interoperability Model contractual agreements Training on procurement processes, to better understand and manage IPR questions in value chain to support scalable business opportunities 	<ul style="list-style-type: none"> Share best practises on the adoption of “interoperability by design” principle (inspired by EU Directive on Payment Services (PSD2)) or similar Wide implementation of the ITS Directive 2010/40/EU providing a framework for interoperability of deployed ITS services

⁵ Please see directive on Public Sector Information, art. 2

⁶ dynamic data = information in electronic form, subject to regular updates

⁷ MaaS Alliance and SAE International has signed a Memorandum of Understanding in order to start collaboration inter alia in the field of standards creation for shared mobility in spring 2018

⁸ Please see the delegated act on multimodal travel information services; definition is coming from PSD2 directive

Ability to switch between different service providers (Personal + non-personal data portability)^{9 10}	<ul style="list-style-type: none"> • Code of conduct • Sharing best practises and industry self-monitoring 	Promotion of “Right to data portability” principle for both the consumer and the professional user who want to switch the between different service providers in wide scope. EXAMPLES: Nordic MyData management model (created to help individuals to manage their own data)
Lack of economic incentives	<ul style="list-style-type: none"> • Use of advanced data sharing schemes base on the different data sharing options / models 	Study and support the use of advanced data-sharing schemes based on the different models

The MaaS Alliance and its member organisations are pleased to provide their insights and expertise to support development of data-driven economy as advisory partners to discussions in local, regional, national and international level when any regulatory initiatives are considered.

The Mobility as a Service Alliance (MaaS Alliance) is a public-private partnership that is creating foundations for a common approach to MaaS, and unlocking economies of scale needed for successful implementation and take-up of MaaS in Europe and beyond. The main goal is to facilitate a single, open market and full deployment of MaaS services. MaaS Alliance members from all sectors collaborate to create the enablers needed for successful deployment of MaaS in Europe and beyond. The Alliance contributes to European policy-making, promotes the added value of MaaS to local government and business, monitors the MaaS market and facilitates the dialogue with the research community. Finally, the Alliance is the voice of the MaaS community for awareness and advocacy.

For more information & inquiries: www.maas-alliance.eu, info@maas-alliance.eu

⁹ Both personal and non-personal data: please see GDPR art. 29 working party

¹⁰ Data portability means the possibility for consumers and professionals to control, get access to and transfer respectively the personal and non-personal data they generate and submit to third party systems. Data portability has been recognised as a key enabler of competition and a structural incentive for innovation.