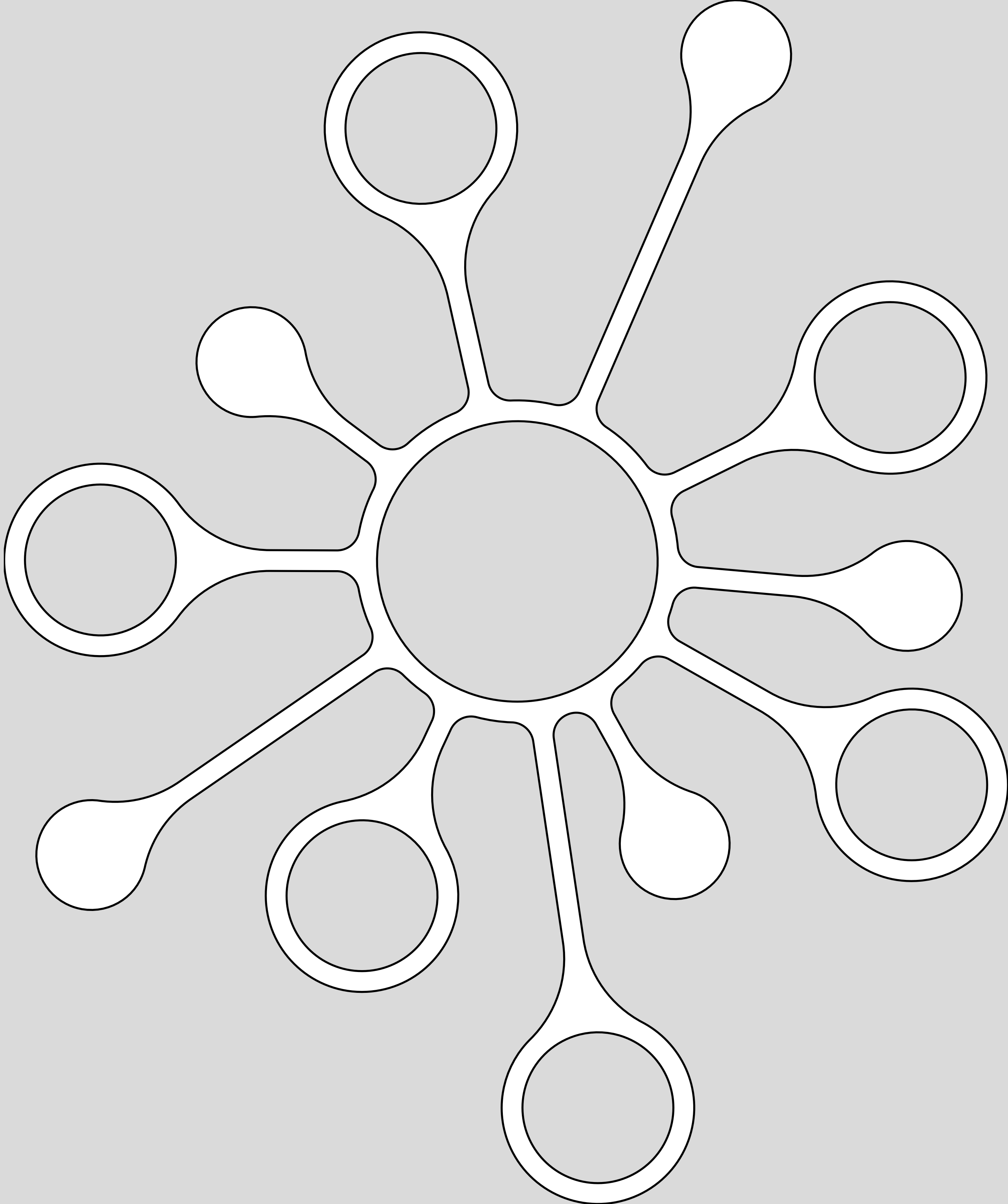
Data sharing protocols

MaaS Discussion Paper

September 2020



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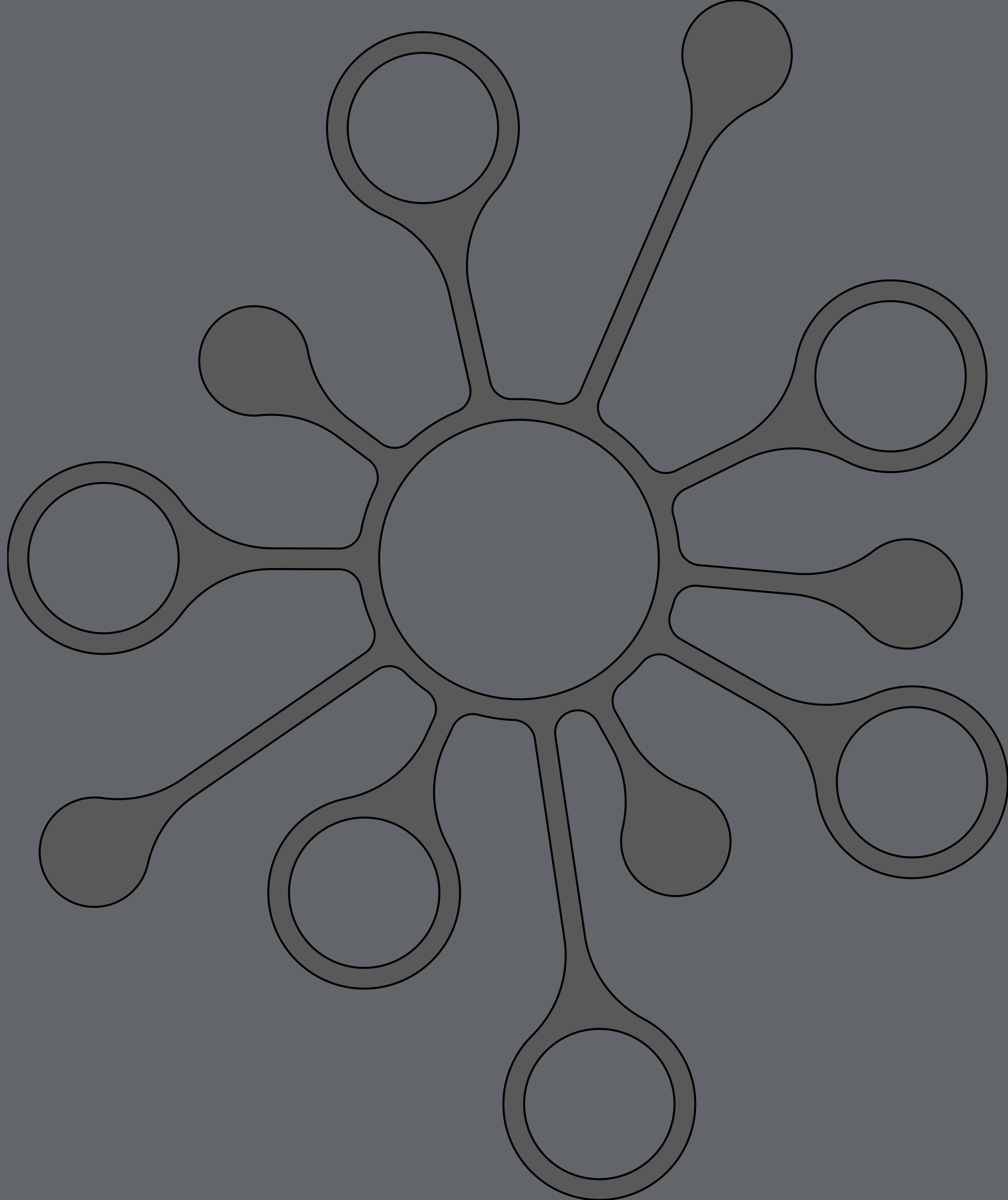


overview

ITS Australia members, through the MaaS National Reference Committee, were tasked with investigating global open standards, protocols, specifications and algorithms relating to MaaS and consider how these could be applied to the Australian context.

The approach involved a global literature review and consulting with national and international stakeholders informing the development of this discussion paper which provides an overview of the various considerations and a taxonomy of 25 different standards, protocols and algorithms.

These protocols are detailed and assessed in this paper with questions posed against a range of issues, the responses to which will be used to inform the final discussion paper

The 2019 Austroads report investigating Opportunities in MaaS through a literature review and observations of international MaaS schemes, concluded that MaaS models are working best in jurisdictions with:

- a wide range of transport services
- high level of customer access to digital infrastructure and personal devices
- open and secure data access
- available online journey planning for trips combining multimodal fixed public transport; flexible public transport; and personal services including private car trips
- operators offering contactless payments and e-ticketing
- jurisdictions that are open to third parties selling their services.

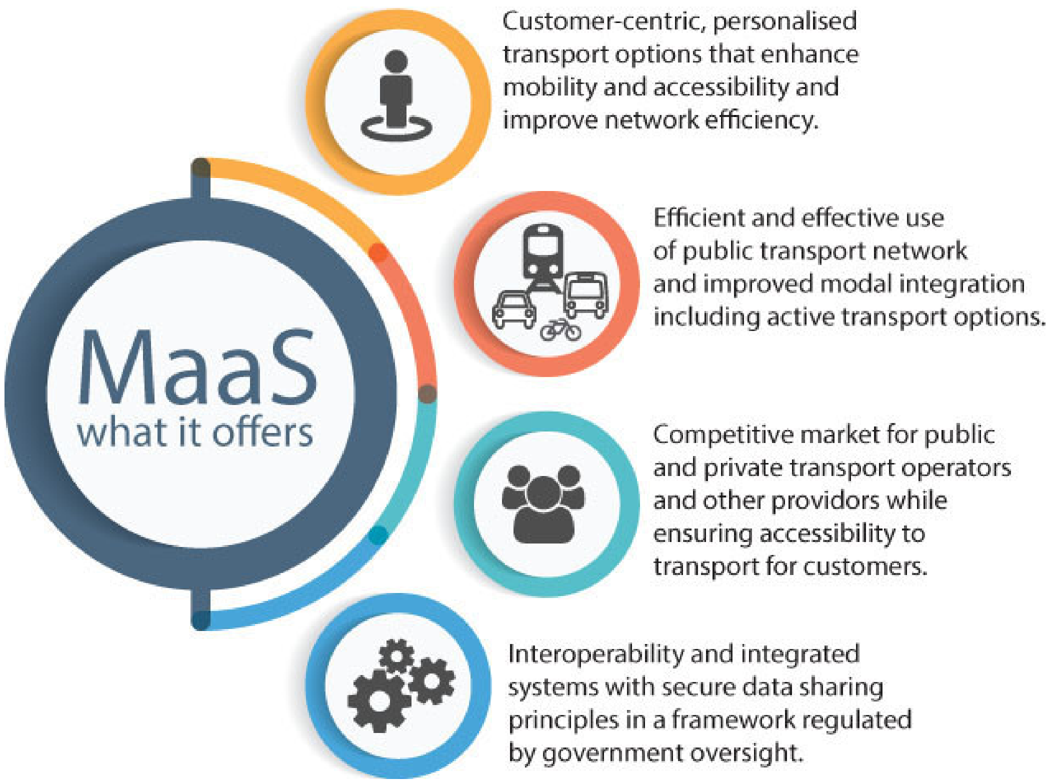
overview

Many of these are currently available in a large part of Australia and are increasingly being expanded to regional centres and outer suburbs and while transport has been massively impacted by Covid 19 and we are seeing striking changes in travel patterns and mode choice we have seen that data has been key in continued delivery of safe public transport and effectively informing customers.

This is only going to become more critical and working to better understand how we can safely, effectively, and efficiently share necessary data to design and deliver improved transport options through MaaS and MoD is key.

One of four components of a MaaS ecosystem identified in the ITS Australia MaaS report (see figure right) “Interoperability and integrated systems with secure data sharing principles in a framework regulated by government oversight” is foundational, the key to enabling MaaS in Australia.

This discussion paper has been developed to assess options, opportunities, and challenges and consider options going forward.



introduction

This paper considers the results of the learnings from a global literature review into MaaS Data Sharing – Open Standards, Protocols, Specifications and Algorithms.

Although MaaS is a relatively new and rapidly evolving area of transportation, many of the technical foundational elements that enable MaaS are already well defined and deployed throughout the world. Also, it makes little sense to search for an allusive "MaaS Protocol" as MaaS can be thought of as an aggregation of other standards, protocols, specifications and algorithms.

MaaS is being actively targeted in in Australia by both transport agencies and operators, as well as other entities appreciating the potential for MaaS in their markets, and it is timely to look at what the world has to offer and consider the opportunity to adopt or adapt the most effective for Australia.

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From a technical point of view, a successful MaaS solution needs many of the following features:

- Details of the transportation network so that multimodal routing can be achieved (including active transport)
- Knowledge of road conditions including disruptions, road works and congestion
- The route and timetables of public transport services
- The availability and location of ride share services (car, bike, scooter)
- The real time running of public transport services
- The ability to plan, book and pay for a journey
- The ability for authorities to data-explore the MaaS ecosystem, to understand the network's ability to manage the demand and to provide incentives that will maximise efficiency.

Listed in descending order of sophistication these features are associated with protocols that are discussed in detail throughout the document. It is these "layers of abstraction" that underpin a MaaS "protocol stack" and this is one of the key metrics used to create this document's protocol taxonomy.

introduction

This discussion paper is specifically aimed at the MaaS stack. Similar diagrams could be included for C-ITS, freight or incident management but these are outside the scope of this discussion.

Some established protocols and specifications have been included even when they are clearly not applicable to the Australian context. This has been highlighted in the commentary. This is both for completeness and to help avoid readers unnecessarily studying specification dark alleyways – of which there are many. Also, lessons can be learnt from these initiatives.

This strategy has created a "MaaS protocol taxonomy" and it will be referenced throughout the document. This diagram will allow the technical aspects of new and existing MaaS solutions to be mapped to contrast and highlight the relative strengths and weaknesses. It will provide a concrete framework against which abstract protocol discussions can be projected and allow those who only have a passing familiarity with the field to be readily included in the discussion.

abstraction

the relative level of sophistication of the protocol in supporting a MaaS ecosystem.

european

Strong focus on standards and generally government backed

governance

the regulatory nature of the protocol

american

Majority business lead, less formal standards enabling agile and responsive approach

Considerations for Australia

An analysis of existing protocols can raise more questions than answered so there is real benefit in clearly assessing approaches taken by other jurisdictions and testing their utility and potential against a number of necessary metrics, namely technical and governance.

The protocols assessed are not all specifically developed for MaaS yet they do often lay the foundation for MaaS or enable functions that are also key requirements for MaaS.

While there are jurisdictional differences, and aside from some European countries, the majority of MaaS products are currently delivered within specific regions, there is always benefit in considering harmonising core elements at a national level in Australia.

Some questions to consider:

1. Taking a principles approach what data would be required to be shared to enable MaaS?
2. Considering the type and nature of data to be shared is there an existing protocol that would be suitable in Australia?
3. While recognising regional differences is there an approach that would enable a core national data sharing protocol?

Data Sharing Principles:

1. Projects: Data is shared for an appropriate purpose that delivers a public benefit.
2. People: The user has the appropriate authority to access the data.
3. Settings: The environment in which the data is shared minimises the risk of unauthorised use or disclosure.
4. Data: Appropriate and proportionate protections are applied to the data.
5. Output: The output from the data sharing arrangement is appropriately safeguarded before any further sharing or release.

Australian Best Practice Principles for Data Sharing

Levels of abstraction

From a technical point of view, a MaaS solution requires an array of technologies; from an understanding of the transport network topology up to the multi-modal route planning, payments and bookings. A successful MaaS solution will require several of the following features;

- Details of transportation network so that multimodal routing can be achieved (including active transport)
- Knowledge of road conditions including disruptions, road works and congestion
- The route and timetables of public transport services
- The availability and location of ride share services (car, bike, scooter)
- The real time running of public transport services
- The ability to plan, book and pay for a journey
- The ability for authorities to data-explore the MaaS ecosystem, to understand the network's ability to manage the demand and to provide incentives that will maximise efficiency.

These points, listed in order of sophistication, are associated with protocols that are discussed in detail throughout the document. These are "layers of abstraction" that support a MaaS "protocol stack". This is one of the key metrics used to create this document's protocol taxonomy.

This concept of abstraction useful for two reasons; the path up the levels of abstraction generally references lower levels of abstraction and there are two distinct stacks as described in the next section. Depending on the architecture and the solution's sophistication, the number of layers in the stack may differ.

Label	Level	Description
Low level	1	Normative references that underpin other level specifications
	2-3	Geospatial models of the transportation network
	4	Network status and asset tracking
	5	Public transport routes and timetables
	6	Realtime location of available services
	7	Demand responsive services
	8-9	Multi-modal journey planning, booking and payment
High level	10	Experience planning

Abstraction refers to the protocol's relative level of sophistication in supporting a MaaS ecosystem. For example, an electronic description of a jurisdiction's multimodal transport network has a lower level of abstraction to that of public transport timetables and routes. This is in turn a lower level of abstraction to that of MaaS journey planning, booking and payment. No level of abstraction is more or less important nor is it any more or less technically challenging. Any MaaS ecosystem needs solutions from across multiple levels of abstraction.

abstraction
the relative level of sophistication of the protocol in supporting a MaaS ecosystem.

Levels of governance

Generally, these protocols, standards and algorithms have emerged from either Europe or the United States. When compared against each other, it is the level of governance that sets them apart.

The maturity of the European MaaS offerings are in a large part due to adherence to well-defined and long-established standard and their approaches are mostly system-to-system, back office, heavy lifting protocols that have been developed through government backed, rigorous review and approval processes and have been in place for well over a decade.

Contrast this with the American protocols that have developed out of a business need and then have been adopted by other jurisdictions to become a de facto standard. (TMDD is a notable exception). In some examples, the MaaS system developers can readily download code from Github and change it with impunity to suit the needs of the problem.

A solution that implements a standard may have a competitive advantage that promotes the system's ability to interoperate, whereas a system based on a more informal standard may allow it to be more agile and responsive to business needs.

This is not to say that the standards cannot be adapted to the pressures of a local context. Even the most prescriptive standards are generally extensible. DATEX II and TMDD for example have very strong support for situational specific data concepts.

The level of governance is subjective. Some emerging protocols started with almost no governance whatsoever (GTFS for example) but as they grew in popularity a level of governance was applied over them. Whereas other protocols were born out a governance-first mindset (DATEX II, NeTEx).

Label	Level	Description
Informal	1-2	Software projects possibly with multiple deployments released under open source licensing with a low level of governance.
	3-4	Software projects with widespread deployments released under open source licensing and actively supported through defined governance structures.
	5-7	Emerging, collaborative effort following solid governance practices for the development of industry standards and in the process of being ratified by industry bodies.
Formal	8-10	Established, multinational, collaborative, long term effort, following world's best governance practices for the development of industry standards and ratified by globally recognised authorities. (ISO, CEN, SAE, IEEE, U.S. DOT ITS Standards Program)

Governance refers to the regulatory nature of the protocol. Some protocols are subjected to a high levels of collaboration by many stakeholders and have been developed over the course of years or even decades using well defined and transparent processes. Examples include protocols that fall under the auspices of ISO, IEEE or CEN and are generally have a European heritage. Other protocols have relatively low levels of governance. Examples include protocols developed out of a business need, placed in the public domain and listed on public source code repositories. As a general rule of thumb, these protocols will have a US heritage.

governance

the regulatory nature of the protocol environment

Levels of maturity

A MaaS solution designer can 'pick and choose' the specifications that are most suited to their needs and build their own protocol stack. A solution does not need to be exclusively 'European' or 'American' in approach.

Some protocols of transportation are rapidly developing whereas others have been defined for a long period of time. INSPIRE was entered into force in 2007 while MDS for example is only a few years old and is rapidly gaining traction across America and the world.

A MaaS solution designer will need to consider the maturity of the protocols. Long established protocols will be slow to further develop and will provide confidence in the stability and interoperability of the solution. Emerging protocols may have a defined roadmap that may give the solution designer confidence that it is progressive and heading in a direction supportive of their MaaS solution.

Label	Maturity	Description
Proposed	1	The protocol is described in documentation but has not been implemented.
Emerging	2	The protocol may be in use but is still undergoing development or has been ratified but not widely used.
Production ready	3	A stable version of the protocol is available and has been widely deployed.

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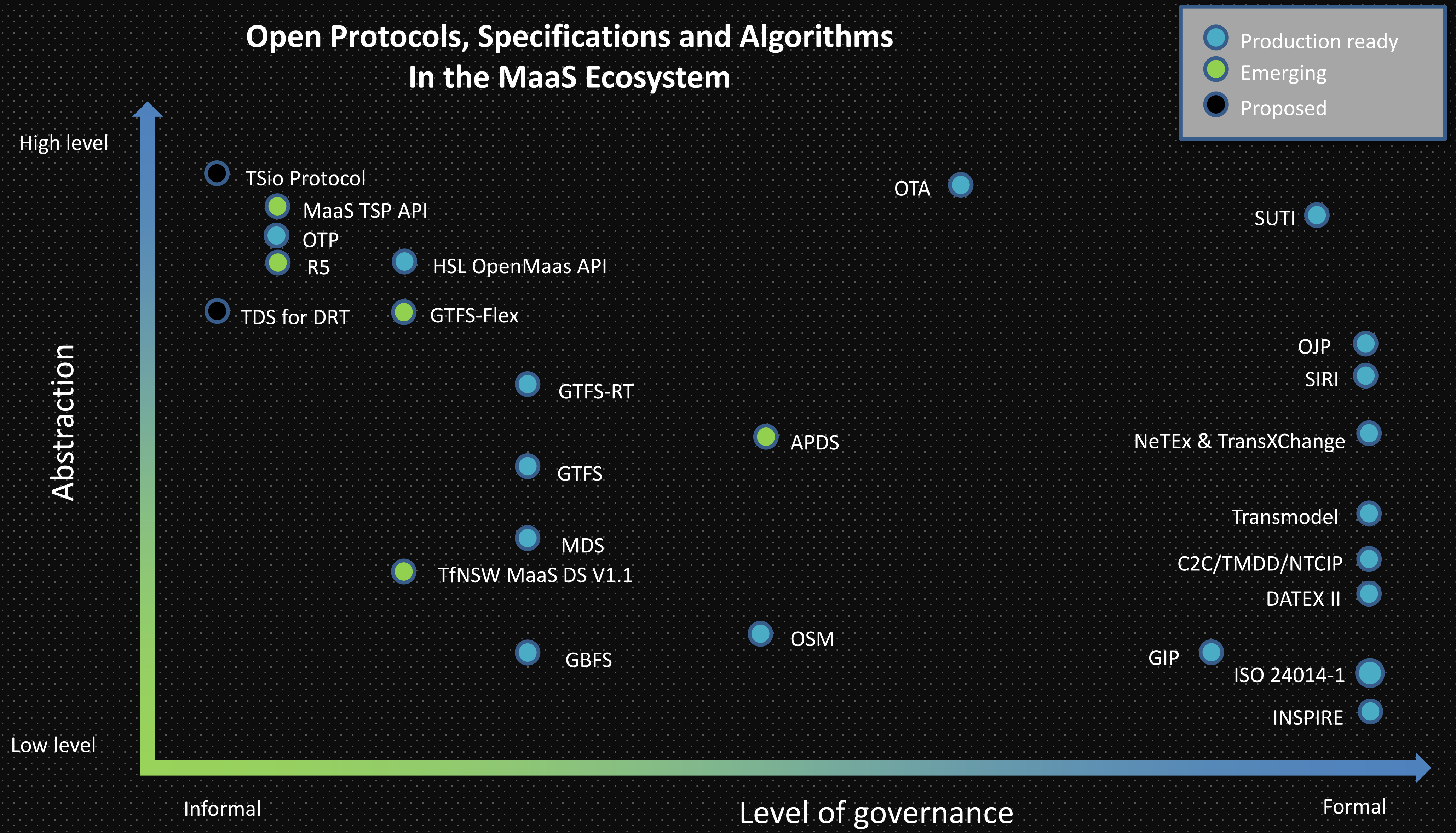
Open Protocols, Specifications and Algorithms In the MaaS Ecosystem



Stack Harmonisation

There are several efforts in Europe where various official groups are defining the MaaS protocol that is to be used within that country; eg Data4PT, NOMAD, ITxPT and MaaS miA. There is an opportunity to consider the potential for Australia and perhaps New Zealand to consider a similar approach. This could avoid duplication of work and ensure that any solutions will provide basic compatibility.

Maturity and Capability Roadmap

Successful MaaS strategies have not been a “lunge for the line”. Rather, they have used a carefully planned maturity and capability roadmaps to acknowledge where the transport authorities’ capabilities are currently, what they see as being the goal and the steps to be taken to achieve that outcome. A jurisdiction armed with a roadmap is well positioned to understand what protocols are needed and when to support their long-term goals.

Obstacles / Risks

The need for risk management cannot be overstated and many organisations have articulated their high-level risks. These risks are not technically specific per se, but it interesting to note how many of them have technical elements.

The MaaS Alliance has identified five headline risks:

- Poor quality and incomplete data
- Lack of data standardisation
- Lack of interoperability by design
- Lack of consumer/professional ability to switch between different service providers (data portability)
- Lack of economic incentives
- The UITP has identified the following obstacles with the data sharing necessary to enable MaaS:
- The decision-making process needs to also take into account benefits falling to others such as time saved by the public.
- Today, very much depends on existing contracts in place. As Open Data is a recent phenomenon, long-lasting contracts are not necessarily adapted yet to this new reality. To remedy this, it may be required to review the existing contracts.
- It is very easy for organisations to decide on the Ownership of Data. In some cases, e.g. when private firms are used for the delivery of certain services, they may, for ‘commercial’ reasons, be reluctant to make the data openly available. Clear explanations and possibly agreements will solve most of these issues.
- License agreements and charging for data are difficult areas. Moreover, the benefits will most likely outweigh the efforts to protect your Open Data. Unduly onerous arrangements can restrict the take-up and thus stifle innovation and competition.
- Engagement with developers and other players takes time – e.g. events such as ‘Hackathons’ to develop products and fill gaps in the market

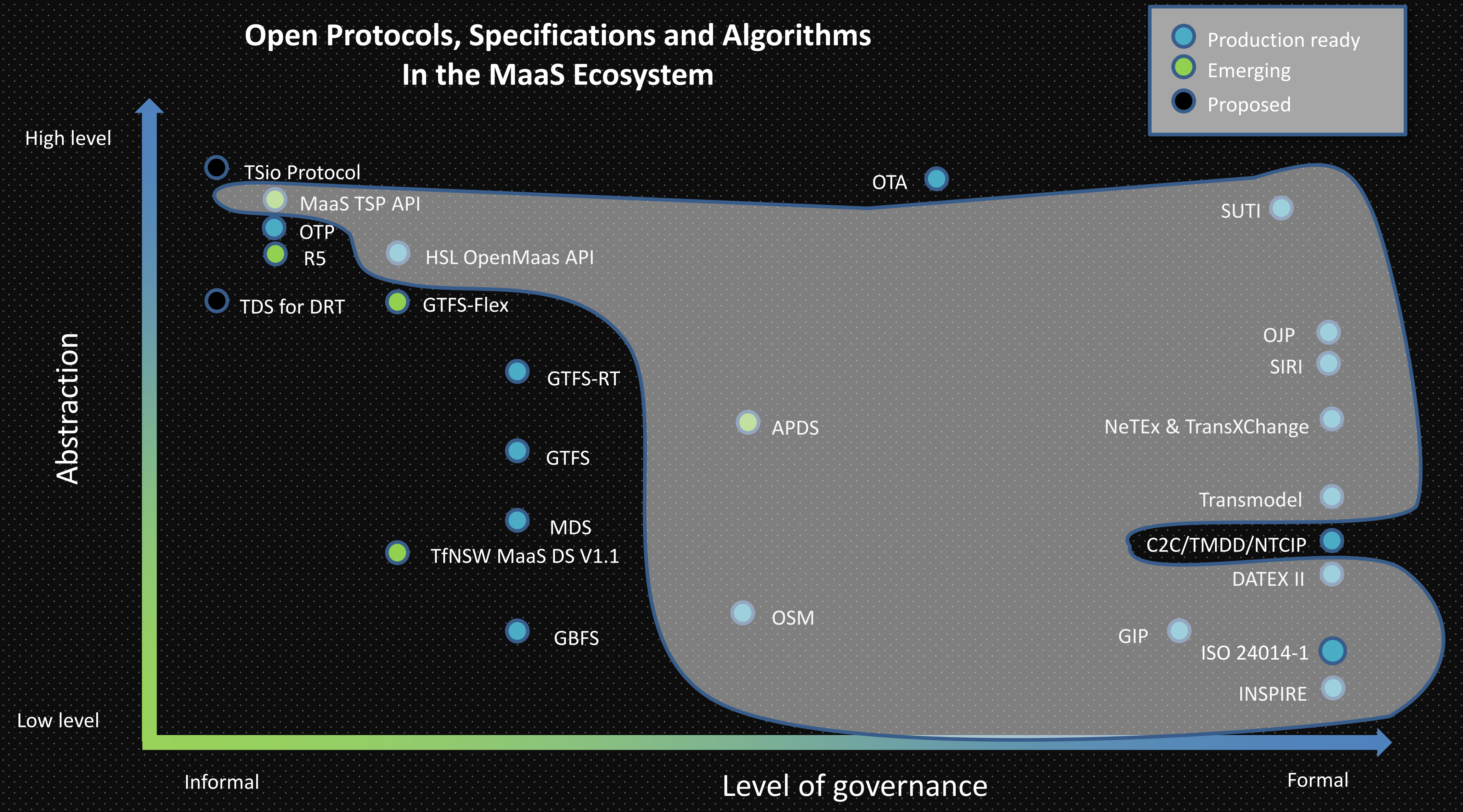
The Rocky Mountains Institute (RMI) has identified the following headline barriers to interoperability:

1. Resources and knowledge
2. Licensing
3. Regulation
4. Payment integration

The Nordic regions (NOMAD) have identified the following barriers and obstacles

- The perceived risk of cannibalisation
- Uncertainties regarding the MaaS business case and associated business models
- The perceived risk to brands
- A lack of key competences within certain organisations
- The perceived risk of losing existing customer relationships
- The lack of an entrepreneurial mindset, or “not invented here” syndrome
- The lack of a shared vision for MaaS
- A lack of understanding related to users’ wants and preferences
- The pervasive role of existing roles and identities
- A lack of understanding related to key customer segments
- Misaligned values among and within different organisations
- A lack of understanding related to willingness-to-pay and overall market demand for MaaS

Protocols with a European Heritage

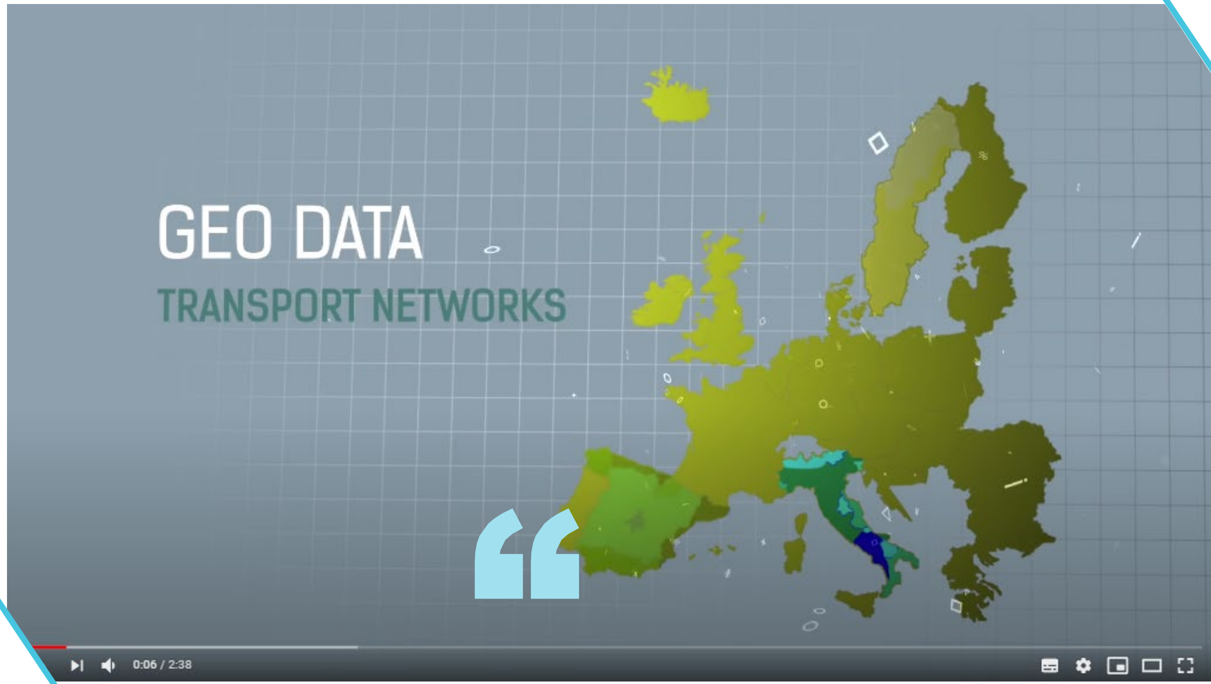

Open Protocols, Specifications and Algorithms
In the MaaS Ecosystem
Production ready
Emerging
Proposed
High level
Low level
Abstraction
Informal
Level of governance
Formal
TSio Protocol
MaaS TSP API
OTP
R5
HSL OpenMaas API
TDS for DRT
GTFS-Flex
GTFS-RT
GTFS
MDS
TfNSW MaaS DS V1.1
GBFS
OTA
SUTI
APDS
OSM
OJP
SIRI
NeTEx & TransXChange
Transmodel
C2C/TMDD/NTCIP
DATEX II
GIP
ISO 24014-1
INSPIRE

Europeans have a strong commitment to standards and the and the maturity of their MaaS offerings are in a large part due to adherence to well-defined and long-established standards.

Many of the protocols and standards are based on either INSPIRE or Transmodel (described in the following sections).

Generally, the European protocols are the system-to-system, back office, heavy lifting protocols that have been developed through government backed, rigorous review and approval processes and have been in place for over a decade.

A report entitled INSPIRE-MMTIS: overlap in standards related to the Delegated Regulation (EU) 2017/1926 identifies overlaps in the standards and should be considered before any implementation.



INSPIRE

INSPIRE is "an EU initiative to establish an infrastructure for spatial information in Europe that is geared to help to make spatial or geographical information more accessible and interoperable for a wide range of purposes supporting sustainable development". It was started in 2007

INSPIRE is based on the infrastructures for spatial information established and operated by the Member States of the European Union. The Directive addresses 34 spatial data themes needed for environmental applications.

The data theme of particular interest is "Transport Networks". The technical specifications for the INSPIRE Transport covers road, rail, air and water transport networks and related infrastructure. It also includes links between different networks.

Taking into account the variety of responsibilities in collecting, managing and using the data and different approaches in the data base management practice, from simple models to complex data arrangements, this data specification is provided as basic framework and with the purpose to maximize the reuse and sharing of the data about a network. It is mainly focused on the "widely reused – widely referenced" segments of spatial objects, supporting the loose linkage between the diverse organizational data with these spatial objects and allowing the extensibility to fit into diverse applications and users' needs.

This approach provides a framework for users to configure and associate their own information (from surface condition surveys, to journey planning, to trans-European transport policy making etc.) using existing transport networks information in each Member State.

The specification is focused on nodes, links and areas but for roads it includes the number of lanes and speed. It is ideal for network routing but is perhaps not detailed enough to do traffic microsimulation or be the basis of a C-ITS Connected Vehicle solution.

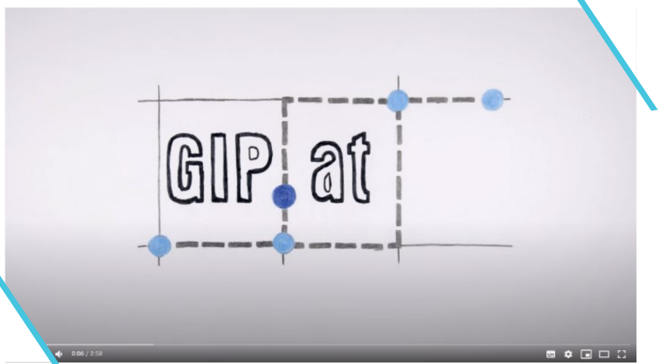
Despite the significance of INSPIRE Transport Networks and the comprehensive specification, when everything is taken into consideration it is remarkably rudimentary but with wide ranging implications. An INSPIRE compatible file can be exported from most GIS tools. And can be found here and here.

GRAPH INTEGRATION PLATFORM - GIP

Three years before INSPIRE was approved, the Austrians were facing an array of transport data issues and created an ambitious project called "Graph Integration Platform" or GIP to harmonise their transport related data problems.

They summarised the problem as:

- Public graphs are held and maintained by a variety of institutions for different purposes. Each one different with its own "philosophy"
- Incompatibility issues - little exchange possible
- No common public reference system in transportation (e.g. for administrative purposes, accident databases)
- Need to rely on market solutions, however no "power" over identification of objects within the graph – IDs can change over time making them of little use for public referencing.



GIP solved these problems with the following features:

- Provides a data model for all means of transport
- Decentralised updating (separated databases)
- Synchronisation of these databases when needed
- Basis for government processes
- Historisation
- Stable sub-networks (for example bike paths)
- independent from commercially available graphs
- simple implementation of INSPIRE
- integration of planning networks.

Advantages

- Door to door routing becomes possible:
  - business location
  - tourists
  - emergency
  - influence on navigation systems without costs
- Bicycle routing
- Internet presence of cities and communities
- Communities can use all ITS data (regional projects).

The Austrian case study (see later) relies heavily on GIP.

> From an Australian context, GIP is interesting in that it was designed to solve several transport-related problems well before the concept of MaaS existed. Australia in 2020 faces similar problems Austria faced 15 years ago. With each state authority managing with geospatial data sets working to solve the problems of network planning, network operations and simulation, of incident management, of asset tracking and maintenance and public transport and freight. The challenges of MaaS and Connected and Automated Vehicles further suggest the potential benefits an Australia-wide solution could offer.

TRANSMODEL

Transmodel is the CEN European Reference Data Model for Public Transport Information.

It provides a conceptual model of common public transport concepts and data structures that can be used to build many different kinds of public transport information systems, including for timetabling, fares, operational management, real time data, journey planning etc.

It has been widely adopted throughout Europe and its schema is readily available online. It is the basis for major protocols used throughout Europe and is described in 8 wide-ranging sections seen below.

Module	Description
1. Common Concepts	Concepts shared by the different functional domains covered by the model
2. Timing Information and Vehicle Scheduling	Runtimes, vehicle journeys and day type-related vehicle schedules
3. Fare Management	Fare structure definition, sales, validation and control of access rights
4. Driver Management	Definition of day-type schedules, order of driver duties and recording of driver performance
5. Public Transport Network	Routes, lines, patterns and scheduled stop points and places
6. Operations Monitoring and Control	Operating day-related data, vehicle follow-up and control actions
7. Passenger information	Relevant information on the planned and real-time service
8. Management Information and Statistics	Additional descriptions in the sub-models, including data dedicated to service performance indicators

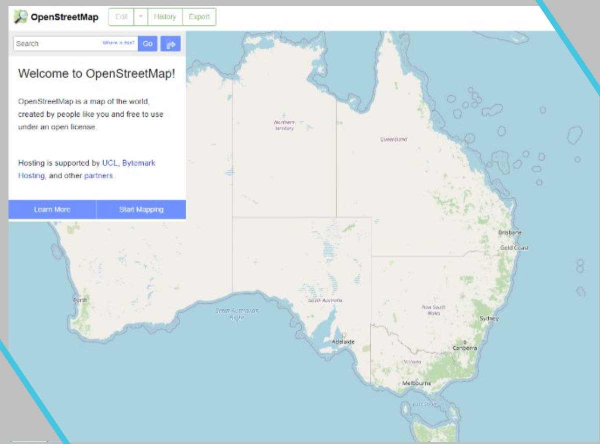
OPENSTREETS MAP

OpenStreetMap (OSM) is a collaborative project to create a free editable map of the world.

The geodata underlying the map is considered the primary output of the project. The creation and growth of OSM has been motivated by restrictions on use or availability of map data across much of the world, and the advent of inexpensive portable satellite navigation devices.

Created by Steve Coast in the UK in 2004, it was inspired by the success of Wikipedia and the predominance of proprietary map data in the UK and elsewhere.

Since then, it has grown to over two million registered users. Users may collect data using manual survey, GPS devices, aerial photography, and other free sources. This crowdsourced data is then made available under the Open Database License. The site is supported by the OpenStreetMap Foundation, a non-profit organisation registered in England and Wales.



Basing a MaaS platform off OSM would provide many advantages similar to that found in GIP including cycling paths but it will largely depend on the quality of the data. The openness of data and its crowdsourced nature may challenge veracity and validity of data but there are examples of governments using it successfully.

It has been considered by Transport for NSW and is an attractive choice for any project that needs to demonstrate "quick wins".

DATEX

DATEX II is the European standard for the exchange of traffic-related data based on Transmodel.

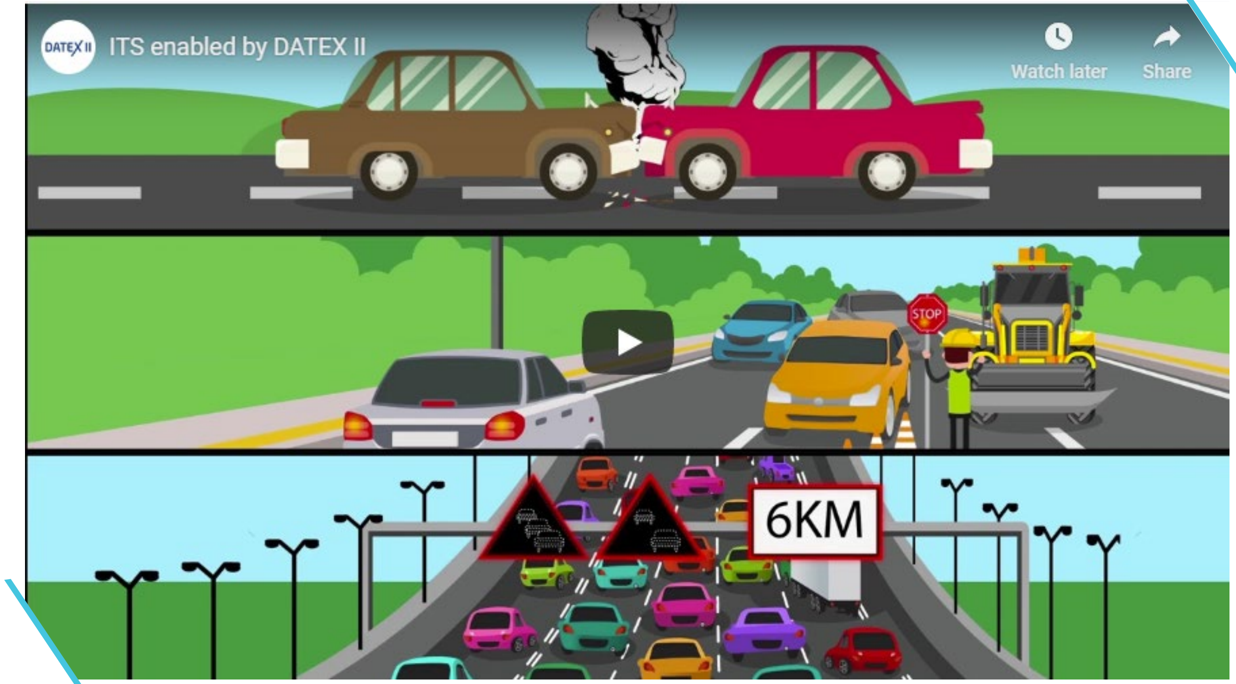
It is a unified XML-based format to allow data exchange between service providers, traffic control centres, and road operators and includes traffic and travel information such as:

- traffic flow
- traffic measures
- roadworks
- accidents
- Parking

The standard is developed by the technical body Intelligent Transport Systems of the European Committee for Standardization. www.itsstandards.eu It is widely adopted across Europe.

DATEX II or similar will be important in a MaaS ecosystem to ensure that the real-time network performance is communicated equally to all parties including the journey taker to inform them of possible disruptions.

Particularly valuable to companies providing telematics at national level to integrate with each state's road accident notification system.



TransXChange

TransXChange is the UK nationwide standard for interchange of bus route and timetable information between bus operators, the Vehicle and Operator Services Agency, local authorities and passenger transport executives, and others involved in the provision of passenger information.

Like NeTEx, it is an implementation of Transmodel and has been in use since about 2001.

TransXChange is used by Transport for NSW for system-to-system communications. It is transformed into GTFS for the public-facing feed.

NeTEx

NeTEx (Network Timetable Exchange) is the CEN Technical standard for exchanging Public Transport Information as XML documents. It can be used to exchange many different kinds of data between passenger information systems, including data describing for stops, facilities, timetabling and fares. Such data can be used by both operational management systems and customer-facing systems for journey planning etc.

It is widely adopted throughout Europe and is based on Transmodel.

Whereas SIRI is similar to GTFS-RT, NeTEx is similar to GTFS. Again, NeTEx is predominantly a back-office communications mechanism and GTFS is consumer facing.

SIRI

SIRI is a Technical Standard that specifies a European interface standard for exchanging information about the planned, current or projected performance of real-time public transport operations between different computer systems. It is an acronym for “Service Interface for Real Time Information” and is maintained by CEN (European Committee for Standardization).

SIRI is based on Transmodel and is used extensively in Europe, with a handful of implementations in the USA and it is also used by Transport for NSW.

SIRI aims to:

- provide real time-departure from stop information for display on stops, internet and mobile delivery systems
- provide real-time progress information about individual vehicles
- manage the movement of buses roaming between areas covered by different servers
- manage the synchronisation of guaranteed connections between fetcher and feeder services
- exchange planned and real-time timetable updates
- distribute status messages about the operation of the services
- provide performance information to operational history and other management systems.

In some respects, SIRI could be compared with GTFS-RealTime but SIRI is primarily intended to be a server-to-server communications protocol.

HSL OpenMaaS API

Helsinki Region Transport (HSL) public transport has an API that allows another system to purchase public transport tickets at the standard rates. Any system integrating into this feature is allowed to mark up (or discount) the fare to the end consumer.

The API documented online and having access to such an API is a critical element of the MaaS platform provider’s system. This is a very simple API. Rather than ordering a mode of transport for a particular time from a particular stop, the API simply requires the list of “zones” that will be traversed. An image or web page of a ticket (presumably including a barcode or similar) is returned and available on the user’s mobile device for presentation at the gate or door.

This protocol is noteworthy as it is a rare example of an open API into a public transport’s ticketing system and it raises some confronting questions about the relationship between MaaS, PT and their systems.

OPEN JOURNEY PLANNING

Open Journey Planning is an Open API for distributed journey planning following the principles set out in Transmodel. Not to be confused with “Open Trip Planner” – OTP. OJP is simply an API, not a routing algorithm.

Open Journey Planning is a system-to-system interface that facilitates long-distance journey planning that may span multiple independent countries or jurisdictions.

Open Journey Planning was developed after studies into three long-established Distributed Journey Planning systems used in Europe. Although the architecture of each of these systems was different, the nature of the communications between the systems, and the content of the responses sent in return, were essentially the same. This suggested that it would be possible to define a single Open Journey Planning API to support all distributed journey planning systems.

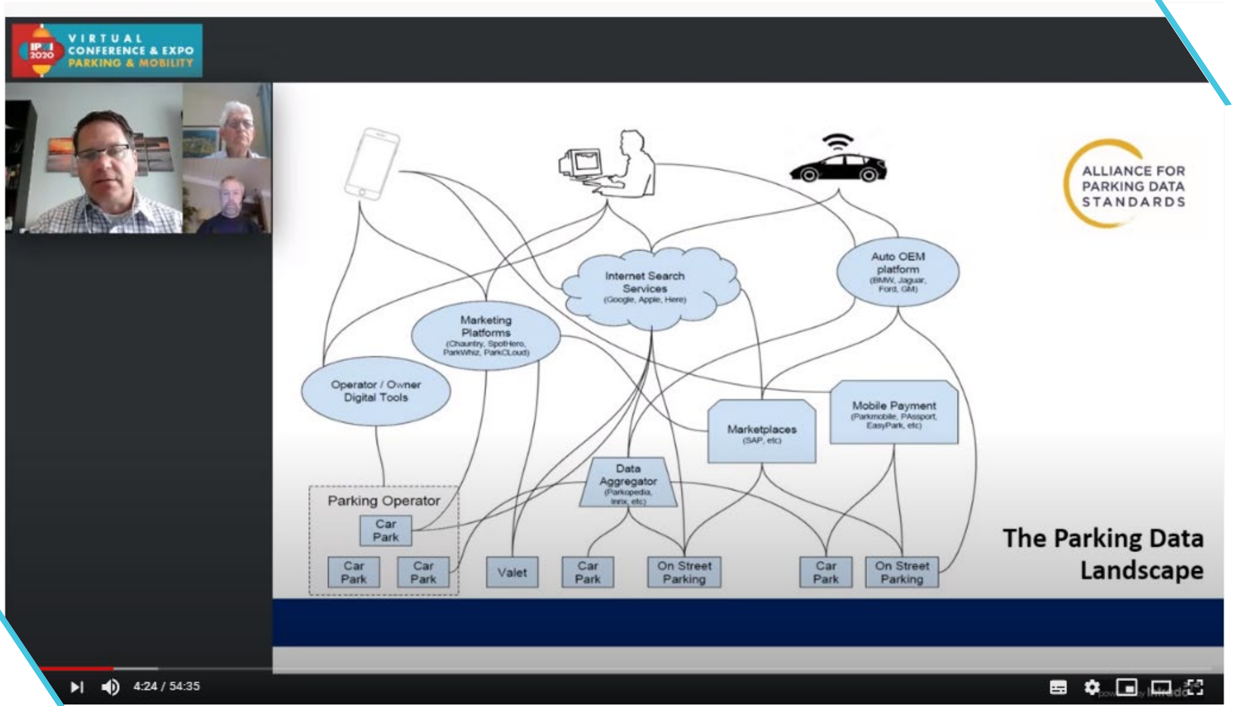
The need for Open Journey Planning may not be as great in Australia as it is in Europe. The need to orchestrate trans-city integrated journey planning may not ever be needed because of the distances between our population centres. Also, established specifications like GTFS have already largely solved the problem.

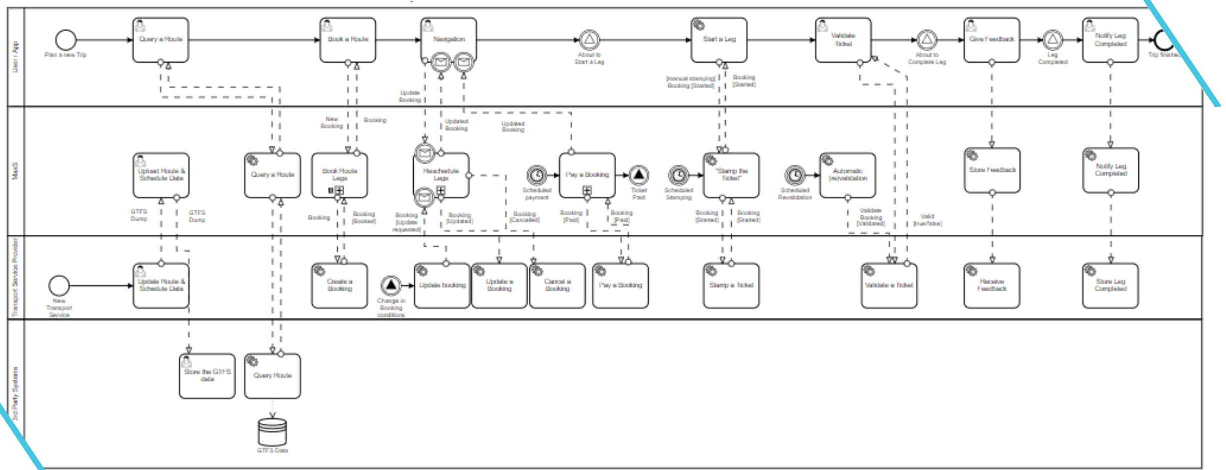
Parking Data Standards - APDS

The British Parking Association (BPA), European Parking Association (EPA), and the International Parking Institute (IPI) formed the Alliance for Parking Data Standards (APDS). Through the Alliance, the three organisations are managing the creation of consensus-built, international parking data standards to establish a common language for data elements and definitions in the parking, transport, and mobility sectors; this will facilitate seamless integration, compatibility, and communication between parking entities, the automotive industry, IT developers, ITS operators, services, and map and app providers, as well as other stakeholders.

APDS is an ambitious, actively developed and well organised attempt to apply standards to the parking industry. It features a well-defined roadmap and is founded on 10 guiding principles; although does not appear to be widely deployed yet. Version 2.0 of the standard was released as a draft in June 2019.

Car parking may seem out of place to the goals of MaaS, but a private car has been a convenient first/last mile solution for many years (park and ride for example). A MaaS operator whose integrated journey planning considers private car ownership and how to park the car may provide benefits to an offering that does not.





MaaS TSP API

The Mobility as a Service (MaaS) Alliance is a public-private partnership creating the foundations for a common approach to MaaS, unlocking the 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.

This led to the creation of MaaS Global and the application Whim with the protocols need to integrate with Whim being in the public domain at and feature the MIT licence.

One of the most intriguing aspects is the flow diagram representing the various actions a journey taker may take in their interaction with the MaaS platform.

This protocol should be studied carefully when a MaaS operator is being established and the architecture to communicate with either the Transport Service Provider or the MaaS operator's app is being considered.

SUTI

There are a number of case studies into SUTI

- http://nap.edu/25619
- https://candacebrakewood.files.wordpress.com/2018/01/2-suti-revised-paper.pdf
- https://www.metro-magazine.com/10002903/denmark-transits-form-demand-response-cooperative-to-cut-costs
- https://rmi.org/wp-content/uploads/2017/03/consortium_approach_to_ITD_report2016.pdf

SUTI is the standard Demand Responsive Transport protocol used throughout Sweden, Norway, Finland, and Denmark. It was formalised in 2002 and stands for “Standardiserat Utbyte av Trafik Information” (Standardized Exchange of Traffic Information). During 2015, more than 30 million orders were organised and executed using SUTI-compliant data communications.

In Scandinavia, the Swedish national government initiated the development of DRT data specifications in the 1990s to enable local governments who sponsored DRT services to be able to change software providers or transportation service providers. The SUTI standard is now a mandatory standard for all transportation service providers.

The SUTI standard has evolved and expanded significantly. The scope of the standard initially focused on the simple task of ordering a taxi for demand responsive transportation from point A to point B. Over time, it has expanded to include the entire route of vehicle trips with multiple pickups and drop-offs, as well as financial transactions and real-time status messages, such as arrivals or no-shows. It does not however appear to integrate with fixed time public transport.

FlexDanmark is likely the largest publicly-supported DRT system in the world. The system is based on the SUTI standards.

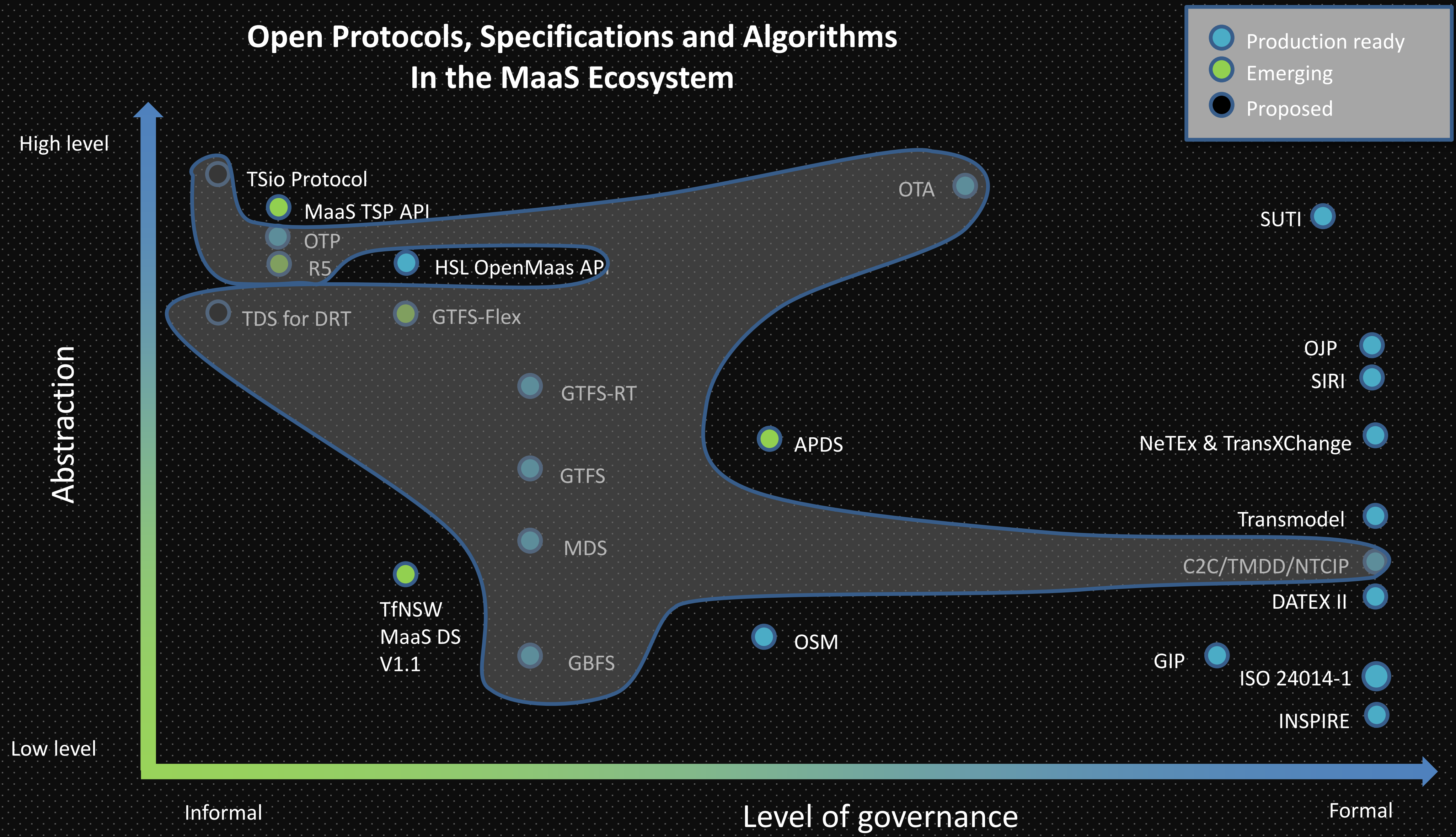
While the Scandinavians refer to “DRT”, SUTI is sufficiently advanced to be in many ways encompassing the goals of “MaaS” – or at least a large component of it. The following is taken from “Development of Transactional Data Specification for Demand-Responsive Transportation”.

> *In a country of 5.5 million people, it (FlexDanmark) operated in each of Denmark’s 6 public transit regions, transporting up to 24,000 passengers per day—the general public, senior citizens, individuals with mobility limitations, people needing transportation for health care purposes, school children with special needs, and others. It uses over 500 different transportation service providers—taxi companies, medi-van operators, school bus companies, public transport contractors—who collectively operate more than 5000 vehicles. Passenger trips are sponsored by over 500 publicly funded agencies— including municipalities paying for trips for the general public, many health care organizations (including large hospitals/medical centers), and school districts—some of whom enter orders for their clients directly into the FlexDanmark trip booking system. All data communication between the ordering systems, the FlexDanmark scheduling system, and the transportation providers’ computer systems—including the devices used by their drivers in the vehicles—is accomplished with data messages that are based on the SUTI standards.*

SUTI underpins an initiative that has several aspects that appeals to the Australian context:

- It is focused on accessibility and equity (includes school, medical, disability, and general public trips.)
- It has a regional focus.
- There are many different operators including private cars to taxi and minibus companies.
- It is a successful collaboration between many government stakeholders.
- It has provided a cost reduction of between 20% and 40%.

Protocols with an American Heritage



Open Protocols, Specifications and Algorithms
In the MaaS Ecosystem
Production ready
Emerging
Proposed
High level
Low level
Abstraction
Informal
Formal
Level of governance
TSio Protocol
MaaS TSP API
OTP
R5
HSL OpenMaas API
TDS for DRT
GTFS-Flex
OTA
SUTI
OJP
SIRI
GTFS-RT
APDS
NeTEx & TransXChange
GTFS
Transmodel
MDS
C2C/TMDD/NTCIP
TfNSW
MaaS DS
V1.1
DATEX II
GBFS
OSM
GIP
ISO 24014-1
INSPIRE

GBFS

The General Bikeshare Feed Specification, known as GBFS, is the open data standard for micromobility; bikeshare or scootershare and makes real-time data feeds in a uniform format publicly available online, with an emphasis on findability.

It is a well organised, open source, actively developed standard. It was originally introduced in 2015 by the North American Bikeshare Association (NABSA). GBFS is intended as a specification for real-time, read-only data about the availability of vehicles. It does not track the vehicles in transit and is guided by the following principles:

- GBFS is a specification for real-time or semi-real-time, read-only data. The spec is not intended for historical or archival data such as trip records. The spec is about public information intended for bikeshare users.
- GBFS is targeted at providing transit information to the bikeshare end user. Its primary purpose is to power tools for riders that will make bike-sharing more accessible to users. GBFS is about public information. Producers and owners of GBFS data should take licensing and discoverability into account when publishing GBFS feeds.
- Changes to the spec should be backwards-compatible. Caution should be taken to avoid making changes to the spec that would render existing feeds invalid.
- Speculative features are discouraged. Each new addition to the spec adds complexity. We want to avoid additions to the spec that do not provide additional value to the bikeshare end user.

GTFS

The General Transit Feed Specification (GTFS) is a data specification that allows public transit agencies to publish their transit data in a format that can be consumed by a wide variety of software applications and is used by thousands of public transport providers globally. GTFS is used throughout Australia.

The protocol is remarkably simple; a series of comma separated files zipped up and the GTFS is one of the most successful transportation protocols since the Passenger Name Record (PNR) for airline booking in use since the 1960s.

An investigation into what made it successful is found in the report by the National Academies of Sciences, Engineering and Medicine.

GTFS-Realtime feed lets transit agencies provide consumers with real-time information about disruptions to their service (stations closed, lines not operating, important delays, etc.) location of their vehicles, and expected arrival times.

GTFS Realtime is public transport focused and it does not support rideshare. Despite its ubiquity, GTFS-Realtime is not necessarily appropriate for consumption by mobile devices. It needs to be polled and has potentially a large payload as it is provided jurisdiction-wide.

GTFS-Flex is an extension of the General Transit Feed Specification designed to enable trip planning for various types of demand-responsive or paratransit service. While GTFS-powered feeds offer convenient information on fixed route, scheduled service, they are not designed to show demand-responsive service, leaving users in certain areas with an incomplete picture of their options. GTFS-flex remedies this, enabling trip planning software such as OpenTripPlanner to generate trips combining demand-responsive and fixed route service.

Whereas GTFS and GTFS Realtime share the same home, GTFS Flex does not benefit from the same backing and has taken longer to develop.

GTFS-Flex appears to be well considered solution to a difficult problem.

MDS

MDS is an OpenAPI specification based on JSON. It is actively being developed by a dedicated community sponsored by several major contributors. It is well organised by people with strong technical skills and could be considered the "model" for how to develop a modern protocol.

The API is currently relatively simple and consists of three distinct components that can be optionally implemented depending on the needs of the agency.

The 'agency' can host an API that the mobility service provide implements; this includes vehicle registration in the system and the posting of real-time updates about the status and the location of the vehicles in the fleet including if they have been taken out of service.

The 'provider' can host an API that allows an agency to query the historical logs of the fleet, the status of vehicles and the trips taken. This API also includes the fare information.

The third is a 'policy' API that is hosted by the agency that describes in machine-readable format where types of vehicles can travel, when they can travel and their maximum speed.

This last aspect, the "policy" API is interesting in of itself. A jurisdiction with bike or scooter share would benefit from its implementation and even have compliance built into regulation.

The authors allude to the longer-term roadmap including parking verification and the application of the API for carsharing. The future roadmap is not openly published.

In Los Angeles (LADOT), shared use mobility providers (like scooters and bikes) must provide real-time information about how many of their vehicles are in use at any given time, where vehicles are at all times, and the physical condition that vehicles are in.

The Mobility Data Specification was based on the GBFS foundations. It is defined as:

"Mobility Data Specification (MDS) enables cities to manage dockless scooters, bikes, taxis, and buses. Tomorrow, that could be autonomous cars, drones, and whatever else the future may hold"

The APIs allow cities to access data that can inform real-time traffic management and public policy decisions to enhance safety, equity, and quality of life.

Additional information provided by MDS includes:

- Percent Battery Charge
- Start Trip Data
- End Trip Data
- Vehicle Utilization
- Parking Verification (on roadmap)
- Operating Cost
- Customer Cost

The MDS also defines a number of other APIs that mobility service companies will support so that, in the very near future, LADOT can actively manage mobility services that are in the public right-of-way. For instance, if a vehicle is parked outside of a proper parking area, LADOT's Agency APIs will be able to communicate in real-time with the mobility service provider and their customer about the proper parking area and may prevent a user from ending their trip until the vehicle is parked in an appropriate designated area. This active management of shared vehicles, for instance, helps ensure safe passage for all who are using the public right-of-way.

MDS is not a specification to facilitate the booking and payment of mobility; it is focused on the monitoring and reporting of journeys.

MDS is now operated by the Open Mobility Foundation; global non-profit organisation who supports the development of open-sourced software that provides scalable mobility solutions for cities.

In October 2019, LADOT suspended Uber's permit to operate its Jump e-scooters and bikes, citing their refusal to comply with the MDS. This has led to a complex and ongoing legal tussle that will have ramifications throughout America and the world. The ACLU and Electronic Frontier Foundation, have filed separate cases against the LA DoT regarding the constitutionality of the MDS requirements that devices and therefore customers are tracked.

TMDD (NTCIP/C2C)

The American equivalent of the “heavy” European standards is TMDD. As taken from standards.its.dot.gov:

Center-to-center (C2C) communications spans the entire ITS domain, covering the exchange of data between computers physically located in different transportation management center facilities. Such facilities include: traffic management centers, transit management centers, public safety, incident management centers, parking management centers, and so forth. C2C standards enable this data exchange, specifying what information is exchanged, how and when it is exchanged, and the underlying transport mechanisms. C2C standards can be divided into two categories: (1) the message and data content, and (2) the rules for exchanging the messages and data. The two categories of standards work together to successfully exchange meaningful ITS-related information.

The TMDD for Traffic Management C2C Communication standards were developed by a joint ITE and AASHTO working group, which resulted in two types of Information Level encodings (XML and ASN.1). The type of encoding used affects the selection of possible protocol level standards. TMDD v3.03b is the latest version of the standard and it defines both types of encodings. The TMDD standard defines the information (messages) and sequence of messages (Dialogs) that are shared between centers, while using the NTCIP Application, Transport, and Subnetwork Levels to define how the information is to be carried.

This a complex set of standards covering the OSI model. It is the top level that is of most interest to this discussion; namely TMDD v3.1 Traffic Management Data Dictionary Standard For Traffic Management C2C Communications. TMDD is in many ways the American equivalent of DATEX II.

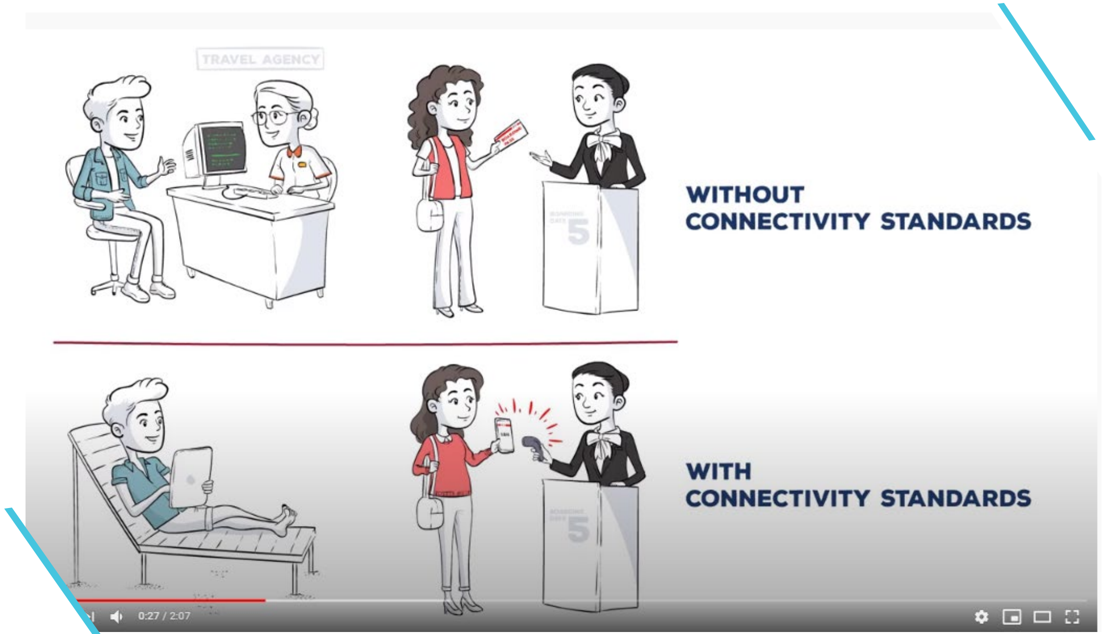
It is split into many sections, with each section dealing with a different area of ITS. A handful of these are related to MaaS. All of the areas are listed below and the MaaS-related ones are highlighted.

Function	MaaS-related
CCTV Camera Status and Control	
Current Event Information	X
DMS Status and Control	
Dynamic Message Signs	X
Environment Sensor Data	
Environment Sensors	
Forecast Event Information	X
Generic Devices	
Highway Advisory Radio	X
Highway Advisory Radio (HAR) Status and Control	X
Lane Closure Gate Control	X
Lane Closure Gates	X
Lane Control and Status	X
Lane Control Signals	
Link Data	
Link Information	X
Node Information	X
Node, Link and Route Status	X
Planned Event Information	X
Ramp Meter	
Ramp Meter Status and Control	X
Roadway Network Inventory	
Route Data	
Route Information	X
The Log of a Current Event	
Traffic Detector Data	
Traffic Detectors	
Traffic Monitoring Data	X
Traffic Network Information	X
Traffic Signal Control and Status	
Traffic Signal Controllers	
Video Switch Status and Control	
Video Switches	

Transactional Data Specification for DDRT

The TRB “Transit Cooperative Research Program's TCRP Research Report 210: Development of Transactional Data Specification for Demand-Responsive Transportation” (TCRP G-16) documents the development of the new data specifications for DRT. This work has been inspired in part by the aviation industry, SUTI and GTFS. Although they have researched the field and have even included some interface specifications the work is in its infancy and is not deployed.

The document “Transactional Data Specification for Demand-Responsive Transportation” is recommended reading. It provides historical background information about successful transport standards and the reasons for their success and have been extensively referenced in this document.



Open Travel Alliance

The Open Travel Alliance provides a community where companies in the electronic distribution supply chain work together to create an accepted structure for electronic messages, enabling suppliers and distributors to speak the same interoperability language, trading partner to trading partner.

Open Travel Alliance is built on the foundation of the protocols that underpin the airline and travel industry and extended it so that the entire end-to-end journey is silo-free. A delayed flight will automatically negotiate with the car rental company and the hotel accommodation and maybe even entertainment or restaurant bookings.

Open Trip Planner (OTP) is an open source multi-modal trip planner.

It is a family of open source software projects that provide passenger information and transportation network analysis services. The core server-side Java component finds itineraries combining public transport, pedestrian, bicycle, and car segments through networks built from widely available, open standard OpenStreetMap and GTFS data as well as a number of propriety bike rental programs.

Launched in 2009, the project has attracted a thriving community of users and developers, receiving support from public agencies, start-ups, and transportation consultancies alike. OTP powers regional and national journey planning services around the world, as well as several popular multi-city mobile applications. Version 1.0 was launched in Sept 2016. The scope of OTP does not include fare information or bookings.

OTP was started in Portland, Oregon and this was also the genesis of GTFS.

R5 is a multi-modal routing engine that spun out of OTP. It is an acronym of “Rapid Realistic Routing on Real-world and Reimagined networks”.

It is considered to be “realistic routing” because it works by planning many trips at different departure times in a time window, which better reflects how people use transportation system than planning a single trip at an exact departure time.

R5 is interesting as it asserts that the journey planning in a MaaS ecosystem may need to be different to that of journey planning against pure PT. In a mature MaaS market-place, the quality of the journey planning may be a competitive advantage that one provider holds over another.

Transport for NSW

The TfNSW Transport Digital Accelerator was developed to fast track the delivery of the 15 ‘no regrets’ initiatives identified as part of the Future Transport Technology Roadmap. The initiatives were designed to enhance the customer experience and how transport delivers services.

A MaaS Innovation Challenge was created to solve the problem: How would you give customers optimal door-to-door mobility service options and seamless combinations for their situation, including the first and last mile?

To support this challenge, the Data Sharing Specification for the Transport for NSW Mobility as a Service was created but is working towards an industry agreed specification. Like MDS, this specification is not about the facilitation of the mobility booking or payment, rather it is about the monitoring (real-time and historical) of journeys that have been taken or are in progress.

The data specification has two components:

1. It sets out the specifications to provide TfNSW with historical data for analysis and future planning purposes. The data will give TfNSW an overview and understanding of the broader transport network and customers’ preference for selecting the best options for their trips.

   The transport service provider sends a suite of CSV formatted files to TfNSW files on a daily basis.

2. It sets out the specifications for participants to share their:

   a. General Transit Feed Specification (GTFS),

   b. General Transit Feed Specification Realtime (GTFS Realtime),

   c. General Bikeshare Feed Specification (GBFS), and

   d. Realtime vehicle information.

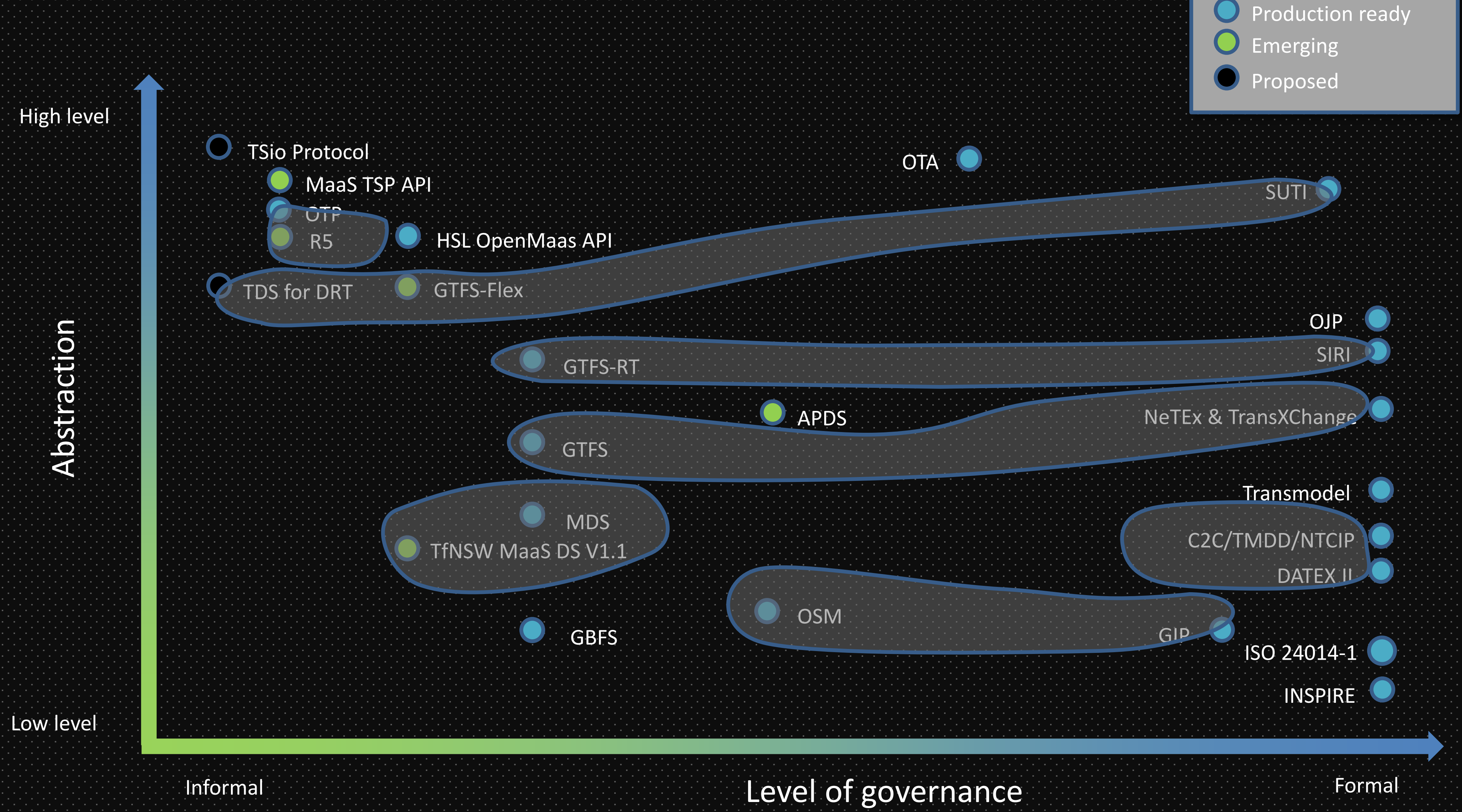
   This information is uploaded to the TfNSW servers at least every 15 sec in a JSON format.

The TfNSW protocol features a significant schema that helps articulate the relationships between actors and objects in the MaaS ecosystem. The relationships alone are valuable and defining them is a difficult exercise.

Comparison of protocols

Similar protocols

The Europeans and the Americans have in many instances solved the same problem using different techniques. The protocols, specifications and algorithms that are similar have been identified below.



comparison

Missing features

This analysis of protocols has revealed some apparent shortcomings that may need to be addressed in future MaaS solutions.

Journey experience

As per the discussion in the Open Travel Alliance, there are lessons from the travel industry. A more holistic "experience" could be considered rather than being limited to multi-modal journey taking. Integration with entertainment, dining, movies, hotels, car hire or accommodation should not be excluded from the long-term vision of MaaS.

Private car ownership

Some goals of MaaS include the reduction or minimisation of private car ownership; or at least the reduction of the need for a second car. Since private car ownership will be part of our culture for the foreseeable future, MaaS should not see private car ownership as being the enemy. Rather MaaS needs to embrace the positive benefits of private car ownership and integrate the concept into the MaaS offering. This will help lower the barrier to entry for MaaS participants and will provide a transition pathway to the time when private car ownership becomes impractical. Private cars can also be a great way to solve the first/last mile (or ten mile) problem given adequate infrastructure is in place like secure car parking.

Provisions for private car ownership is not reflected in these protocols with the exception of the work being done in parking standards through APDS.

Car pooling

Carpooling is rarely if ever discussed in the context of MaaS. An effective carpooling infrastructure may provide solutions to many of an agency's network objectives not dissimilar to the goals of MaaS. Carpooling is traditionally free of monetary exchange, but an agency-backed MaaS solution may encourage the exchange of "transport credits" (kudos points, tokens, etc) or similar.

There appears to be no defined carpooling protocols but some propriety options are available like Liftango.

Demand side

MaaS is very focused on the supply side of the equation; the availability of mobility and taking the journey through the network.

There is very little conversation about the demand side - representing the interests of the consumer or journey taker and this is reflected in the protocols.

A core aspect of MaaS should include the journey takers requirements; disability, traveling with family, level of quality, urgency, oversized baggage, travelling with pets, etc.

This "token" that represents the journey takers requirements should be passed throughout the MaaS stack but the protocols do not reflect this. Being "user centric" is a recurring theme of MaaS solutions but this does not appear to reflect in the underlying protocols.

comparison

Payment Integration

There are no open protocols for payment integration. As identified by the RMI:

Lack of payment integration, particularly backend (behind the scenes) integration, is a recurring hindrance to all-in-one multimodal transit solutions. Lack of standardized fare generation presents a barrier to integrated payment. However, when private tech-enabled transit providers are presented with opportunities to share transit data or participate in payment integration they fear commoditization and brand dilution. Payment integration must work not only on public and private transit, but also on a combination of both.

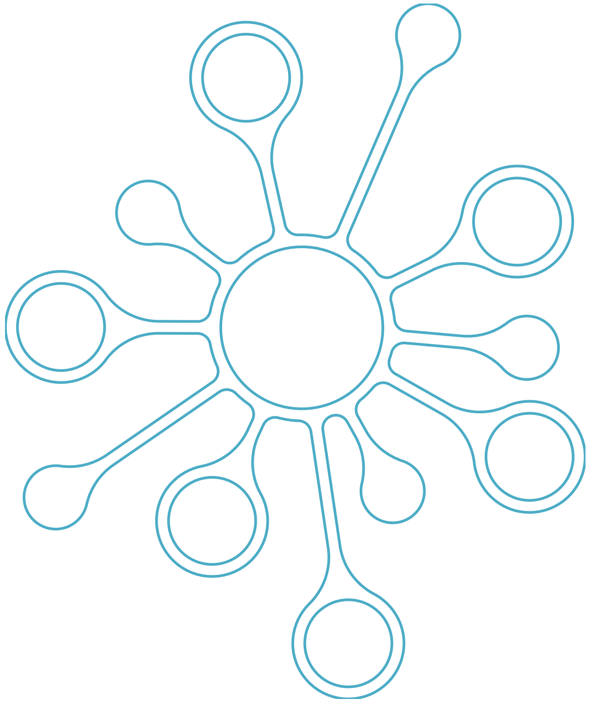
Stack Harmonisation

There are efforts to promote a harmonised MaaS Stacks.

Data4PT

The UITP has recently launched an EU-funded four-year project called Data4PT.

By supporting Member States in deploying a set of harmonised European public data standards (called Transmodel, NeTEx and SIRI), the project wants to enable union-wide multimodal travel information services. In the end, Data4PT aims to contribute to a seamless door-to-door travel ecosystem across Europe that covers all mobility services. This will make it easier for providers to deploy services and meet the ever-changing mobility demand and behaviour of citizens."



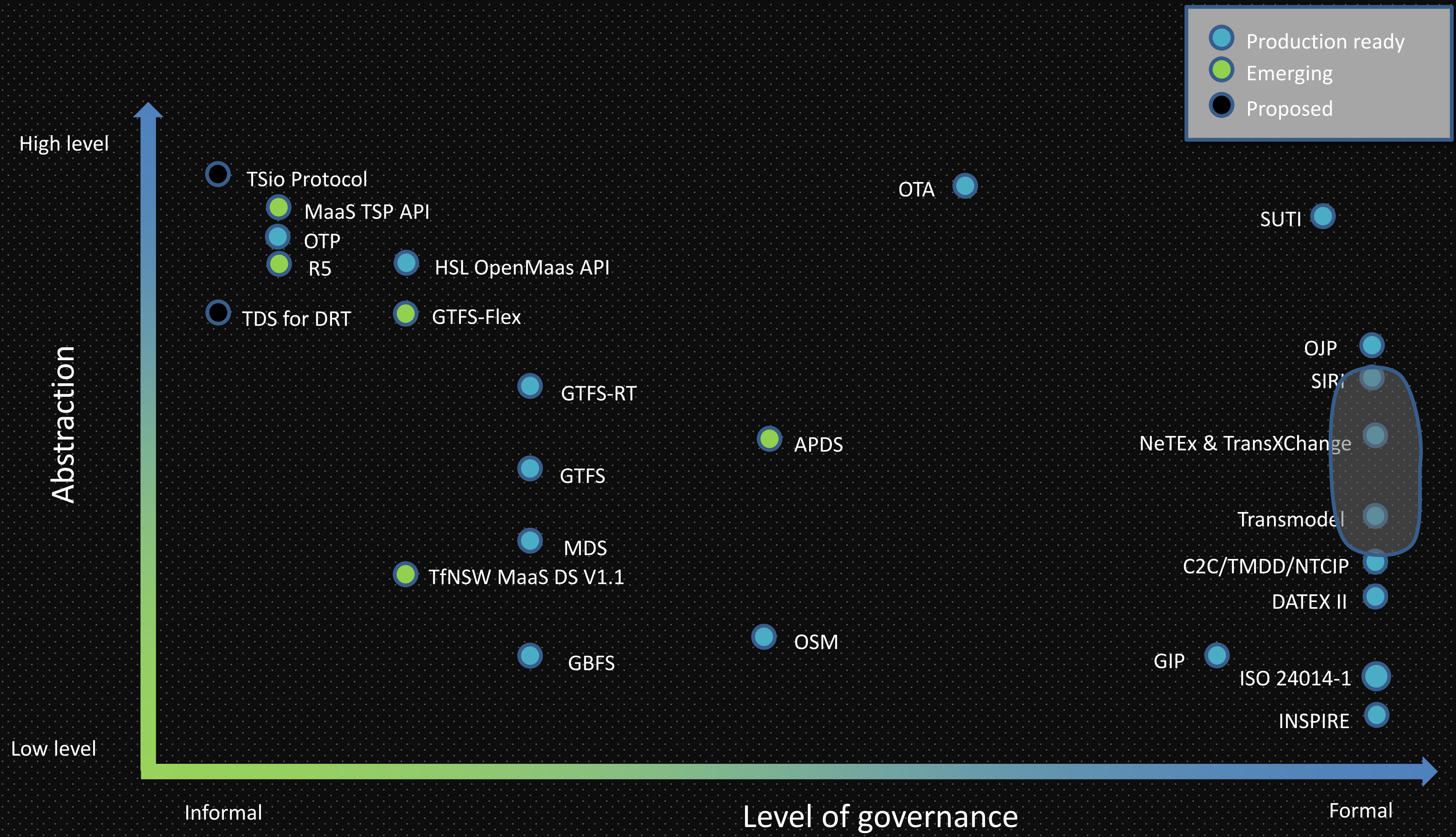
Austrian Stack – MaaS Made in Austria (MaaS miA)

The Austrians have developed a "National framework conditions for the realisation of MaaS in Austria." or "Maas miA".

MaaS miA portfolio defines that the following data interfaces to be used:

- GIP (RVS 05.01.14) for spatial/geo-referenced transport network data
- INSPIRE for spatial/geo-referenced data (European data standards)
- DATEX II for the road network (traffic flow, traffic measures, roadworks, accidents, parking)
- NeTEx for static data of all non-road transport related traffic
- SIRI for dynamic data of all non-road transport related traffic
- OJP for the linking of services via open API interface

Data 4PT



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Proposed
High level
Low level
Abstraction
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MaaS TSP API
OTP
R5
HSL OpenMaas API
TDS for DRT
GTFS-Flex
OTA
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NeTEx & TransXChange
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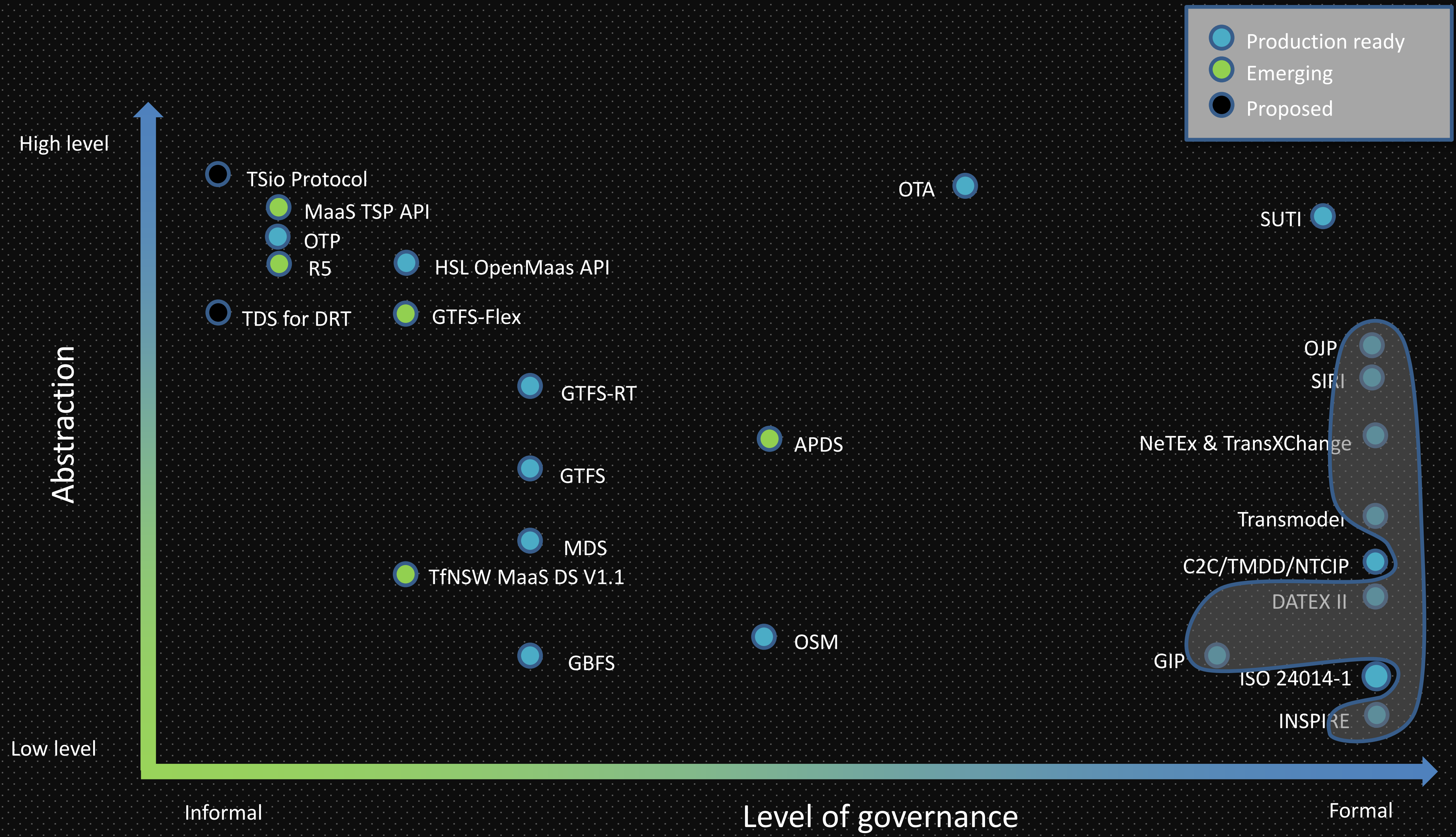
MaaS MiA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ITxPT

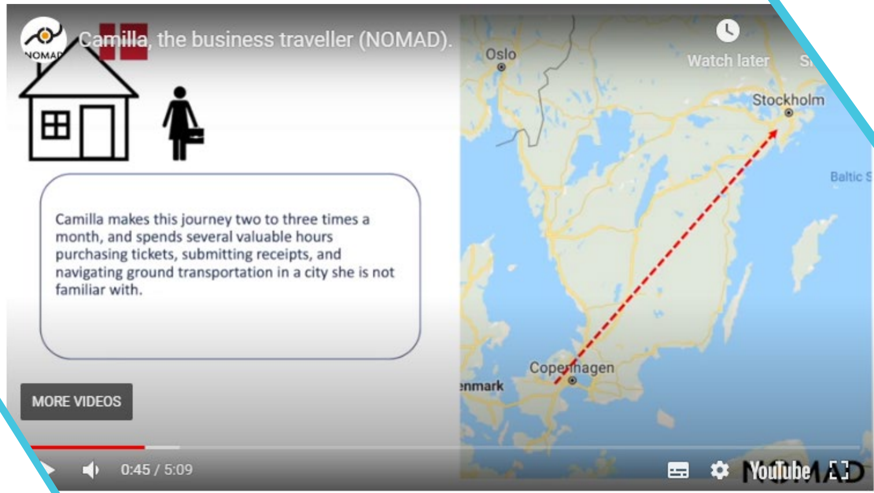
The ITxPT specifications are a set of specifications for public transport authorities and operators with recommendations and requirements to support the purchase and integration of interoperable IT architecture.

The specifications include the following with the ones applicable to MaaS discussions highlighted.

- TS13149
- DNS-SD
- mDNS
- **Transmodel**
- **NeTEx (Network Timetable exchange)**
- **SIRI (Service Interface for Real-time Information)**
- **OJP (Open Journey Planning)**
- TiGR (Telediagnostic for Intelligent Garage in Real-time)
- MQTT bridge OTA

From the list above, ITxPT is very broad covering hardware, communications protocols and the service level. At the service level, it is very similar to the Austrian MaaS miA stack featuring NeTEx, SIRE and OJP.

ITxPT has not been implemented in Australia but has been widely adopted in Europe. Any region with conformance to specifications like ITxPT would be well placed to consider a MaaS rollout.



Norway and the Nordic States – NOMAD

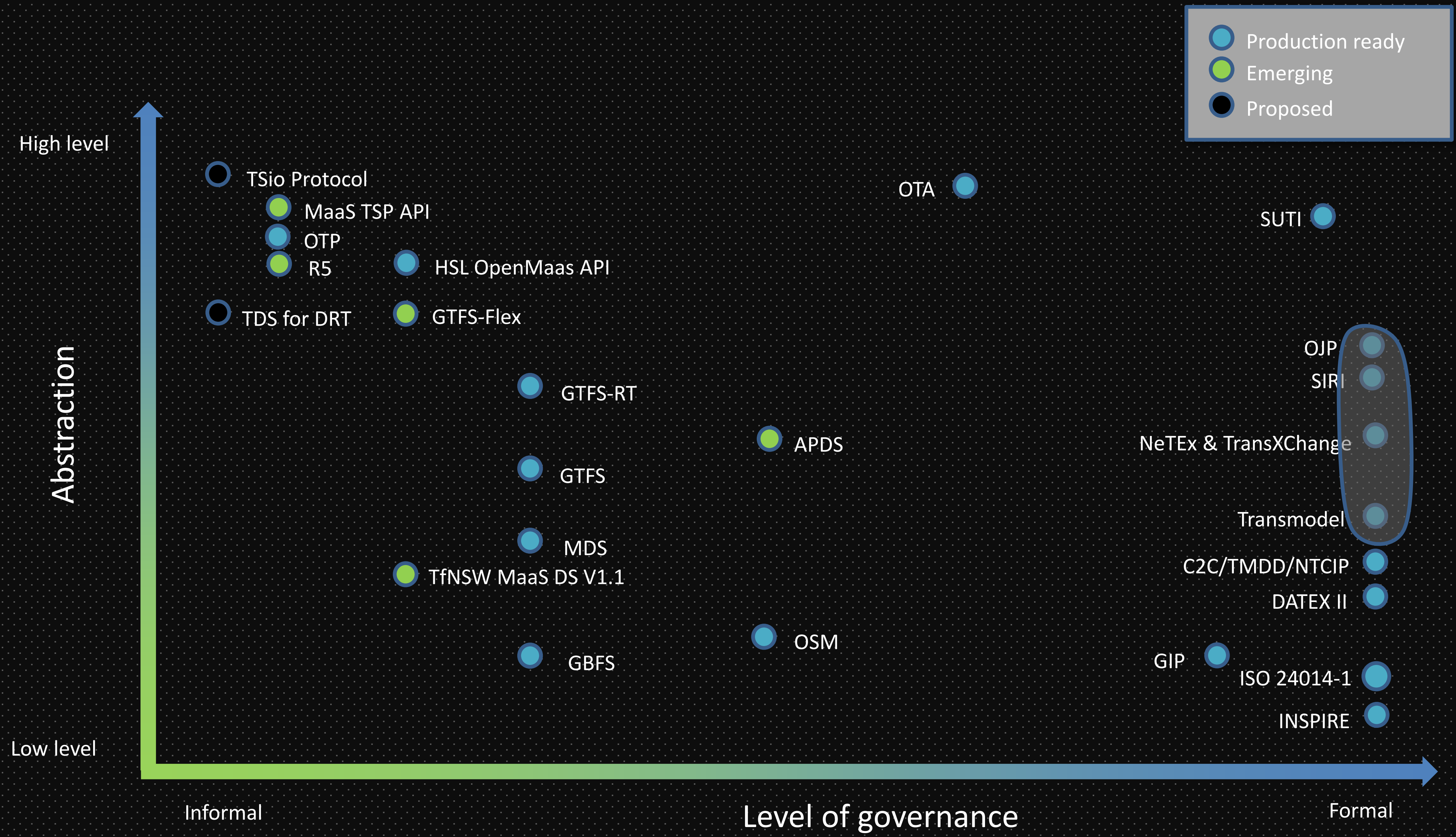
Coordinated and funded through ITS Norway, NOMAD (Nordic Open Mobility and Digitalization) is a research and innovation project that aims to develop an open, pan Nordic mobility system for MaaS solutions. The project explores the concept of roaming as a means to inspire to service agreements between MaaS operators that will benefit individual travellers and organizations, and that will support parallel developments in open data standards within the Nordic region.

NOMAD was formally called "Nordic Mobility Innovation Platform" or NMIP.

The project is in its infancy and the standards have yet to be selected but it features a 7-step plan of action that has a strong emphasis on standardisation, datasets and APIs.

NOMAD has made effective use of user stories and released videos demonstrating the aims of the project similar to the principles of AWS working backwards.

ITXPT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Protocol	Gov.	Abst.	Mat.	Heritage	Ratifying authority	Description	Government benefits	Industry benefits	Consumer benefits
INSPIRE	10	1	3	EU	EU	The infrastructure for spatial information	Interoperability	Enabler	Enabler
GIP	9	2	3	EU	AITDI	Transport graph of public authorities	Interoperability	Enabler	Multi-modal journey planning
DATEX II	10	4	3	EU	CEN	Exchange of traffic information and traffic data	Interoperability	European journey planning	Traveller information
C2C/TMDD/ NTCIP	10	4	3	US	NEMA, AASHTO, ITE	Transportation centre to centre real-time exchange of information	Interoperability		
Transmodel	10	5	3	EU	CEN	Normative reference for higher level PT protocols	Enabler		
NeTEx	10	5	3	EU	CEN	Exchange of public transport Information	Interoperability	Interoperability	Journey planning
TransXChange	10	5	3	EU	UK DoT	Interchange of bus route and timetable information	Interoperability	Interoperability	Journey planning
SIRI	10	6	3	EU	CEN	Exchange real time information about public transport services and vehicles	Interoperability	Interoperability	Real time PT updates
OJP	10	8	3	EU	CEN	Long distance multi-modal journey planning	Interoperability		Enables long distance multi-modal journey planning
SUTI	9	9	3	EU	Sweden Ministry of Transport	Exchange of DRT information	Societal outcomes	Opens opportunities	Societal connections especially for the elderly and infirmed
OSM	5	3	3	EU	OpenStreetMap Foundation	A free editable map of the world	Access to free geospatial data	Access to free geospatial data	Enables routable journeys
APDS	5	5	2	EU	IPMI, BPA, EPA	Share parking data across platforms	Network efficiencies	Better use of resources	Informed parking choices
OTA	7	10	3	US	OTA	Exchange of traveller and supplier information in travel, tourism and hospitality		Enables supply chains	End to end travel experience
GBFS	4	2	3	US	NABA	Bike share findability	Network planning	Business efficiencies	Locate available bikes
TfNSW MaaS DS	3	4	2	AU	TfNSW	Reporting on MaaS operations	Evaluation efficacy of MaaS trial	Business intelligence	
MDS	4	4	3	US	OMF	Ingest, compare and analyse data from mobility service providers	Network monitoring and compliance	Compliance	Improved mode share outcomes
GTFS	4	5	3	US	Transit agencies and stakeholders	Public transportation schedules	Electronic distribution of PT information	Make PT more accessible	Informs journey planning
GTFS-RT	4	6	3	US	Transit agencies and stakeholders	Realtime public transportation updates	Electronic distribution of real time PT information	Make PT more accessible	Informs real time journey planning
HSL OpenMaaS API	3	8	3	EU	HSL	An open-for-all ticket sales interface for PT	Enables e-purchasing of PT	Enables a MaaS market	Seamless journey booking and payment.
GTFS-Flex	3	7	2	US	MobilityData	Models various demand-responsive transportation	Enables DRT	Lowers barrier to entry for DRT	Seamless DRT planning and booking experience
TDS for DRT	1	7	1	US	TRB	Proposal for a national DRT specification	Enables DRT	Lowers barrier to entry for DRT	Seamless DRT planning and booking experience
R5	2	8	2	US	N/A	Routing engine for multi-modal networks	Improve journey taker's experience	Improved journey planning	Journey planning that mirror human decision-making process
OTP	2	8	3	US	Transit agencies and stakeholders	Multi-modal trip planner	Lower barrier to entry	Provide third party journey planning apps	Increase journey planning app choice
MaaS TSP API	2	8	2	EU	Whim	Transport service provider API	Incorporate new TSPs into MaaS solution	Integrate into a MaaS solution	Improved mode options and seamless user interface
TSio Protocol	1	9	1	US	Travelspirit Foundation	Blockchain based multi-modal journey planning		Integrate into a distributed MaaS platform	Government free journey planning, booking and payment

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MaaS National Reference Committee

To further the effective and equitable development of MaaS in Australia, a National Reference Committee was established to continue the collaboration that was fostered during the development of the ITS Australia report Mobility as a Service in Australia: Customer insights and opportunities and to strive for the best outcomes for MaaS and on-demand transport for all Australians.

The Reference Committee is made up of project participants and representatives from ~50 key organisations to ensure a broad range of expertise can contribute to and collaborate on the development of Mobility as a Service in Australia. Through sharing updates on activities in respective jurisdictions and organisations; including research, trials, and international engagement.

ITS Australia facilitated the first workshop with the Committee in advance of the MaaS Conference in Melbourne, May 2019 with the Committee continuing to meet twice a year for in-depth workshops.

Find out more about the research and report that began this Committee: Mobility as a Service in Australia: Customer Insights and Opportunities.

Related research that might be of interest is Unlocking Shared Mobility, another iMOVE project with ITS Australia in partnership with RMIT, Cubic, IAG and RAA to investigate car-sharing and parking.

The Committee collaborates to identify issues that can be collectively addressed to improve outcomes for all stakeholders, in early 2020 a working group of subject matter experts was convened to develop this Discussion Paper on MaaS Data Sharing, for more information or to get updates on MaaS in Australia please contact Stacey Ryan, Policy Manager ITS Australia.

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MaaS Discussion Paper

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