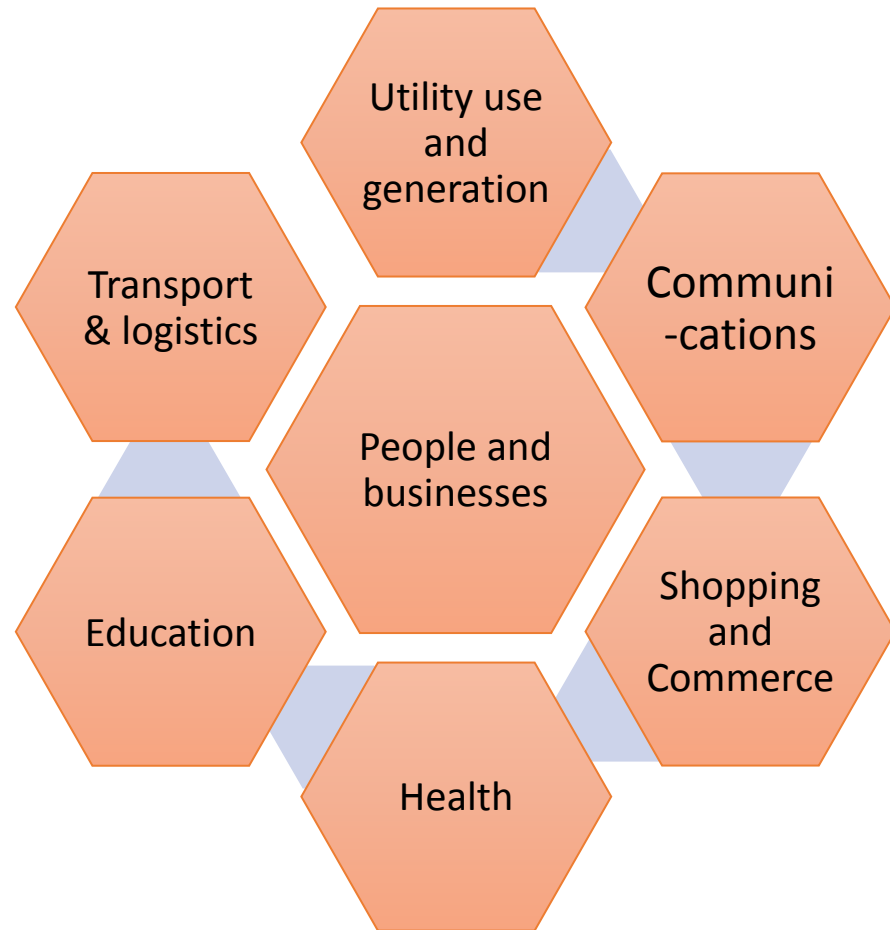2024 OASC Conference
Become Better Connected

The MIMs Overview

Rotterdam, Netherlands, 16th January 2024

There is a lot happening in a local community

Hexagon diagram showing: Utility use and generation, Transport & logistics, Communi-cations, People and businesses, Education, Shopping and Commerce, Health

All these systems generate data and require good data to work well

They all interact with each other at many levels

They therefore need to share data to help manage those interactions

How to help data to flow to deliver value?

Many obstacles to data flowing to where it is needed!

The work of standards organisations

Standards Development Organisations are developing many comprehensive and detailed sets of standards to help cities and communities tackle these issues.

Different standards committees are addressing different of these challenges.

If cities and city service providers would all follow the same sets of detailed standards, then data could flow easily!

However, …

Standards from different Standards Organisations are not always compatible

Standards can also be complex and difficult to implement

City data is gathered and used by many different organisations, with their own ways of handling the data

Some valuable city data is generated using proprietary systems, which may not be standards compliant

What are MIMs?

- Minimal Interoperability Mechanisms (MIMs) take account of the practical challenges of helping data flow between organisations that may use different standards or proprietary solutions in the way they collect and handle data.

- Rather than require all organisations to change their existing practices and use precisely the same set of standards, MIMs propose simple modifications that will enable "good-enough" interoperability.

- Their use simplifies the task of aligning data sets coming from different organisations and enables a useful data sharing ecosystem to be speedily and easily put in place.

- MIMs are based on existing standards and are proposed as an intermediate step to enable organisations quickly gain value from data sharing, while providing a solid base for increasing alignment of standards use by the different organisations involved.

Minimal Interoperability Mechanisms (MIMs)

Sufficient interoperability to allow:
- "Good enough" integration of systems
- Development of a viable market – cutting costs, minimising risk and preventing vendor lock-in

Minimal to ensure:
- No unnecessary complexity or time-to-implement
- Minimal resources required

Clearly defined mechanism so that:
- It is easy to determine if a product or service is compliant
- It is easy to determine the steps to implement

The format for each MIM

```
┌─────────────────┐     Sets the scope for the MIM by describing at a high level what it will
│   Objectives    │     enable a city or community to achieve.
└─────────────────┘
        │
        ▼
┌─────────────────┐     Describes a minimal but sufficient set of business requirements that
│  Capabilities   │     will deliver the Objectives to a good-enough level and in a way that
└─────────────────┘     is within the resources of most cities.
        │
        ▼
┌─────────────────┐     Describes the functional and quality requirements that are needed
│  Requirements   │     to deliver the agreed minimal set of Capabilities.
└─────────────────┘
        │
        ▼
┌─────────────────┐     Identifies technical solutions that address the set of Requirements.
│   Mechanisms    │
└─────────────────┘
        │
        ▼
┌─────────────────┐     Describes options to support interoperability between any different
│ Interoperability│     mechanisms identified.
│    Guidance     │
└─────────────────┘
```

In addition, guidance will be given on conformance and compliance testing

Example

MIM2:
Data Models
- *Objectives*

To support the use of consistent and machine-readable definitions of all the entities about which data is being captured in a local data ecosystem, so that data about any entity can be combined with other data referring to that entity, and every instance of that entity, in the confidence that they refer to the same thing.

Example

MIM2: Data Models

– *Capabilities & Requirements*

Capabilities	Requirements
C1: All entities included in data sets are described using consistent data models to enable interoperability for applications and systems.	R1. Data models used for all entities in any data set should be made explicit.
	R2a. Data models should as far as possible be taken from a commonly recognised set of standardised data models *(as listed in the next slide)* so that, for instance, translation engines can help align data models coming from different sources within a city/community data ecosystem. See also SEMIC Style Guide. https://semiceu.github.io/style-guide/1.0.0/guidelines-and-conventions.html
	R2b. Where it is not possible to precisely align data models, standard concepts and vocabularies should be used so that an ontology service can be used to enable a "good enough" level of consistency between them.
	R2c: Where new data models are needed due to no suitable standardised data model being available, they should be clearly defined using a consistent and explicit process to enable ease of transformation between the different sets of standard data models. A good process for this is provided at smartdatamodels.org,
C2: The data models used in a data ecosystem are machine readable and can be handled by the context management APIs.	R3. All key entities in any data set should be formally defined in a machine-readable way.
	R4. Data models should contain as much information as possible regarding their context.
	R5: Data models should have the facility to link to data that changes over time and location, thus allowing interoperability with IoT solutions
C3: All data sets in a data ecosystem use consistent identifiers for individual instances of each entity	R6. Unique and persistent identifiers should be used to identify particular instances of any entity used in data sets, and the type of identifier used should be made explicit.

Recommended sets of data models

The following list provides the recommended standardised sets of data models for MIM2. This will continue to be added to as new and suitable sets are identified.

1. NGSI-LD compliant data models for aspects of the smart city have been defined by organisations and projects, including OASC, FIWARE, GSMA and the SynchroniCity project and there is an ongoing joint activity of TM Forum and FIWARE to specify more. See https://smartdatamodels.org/

   • NOTE 1: The initiative mentioned above provides a standardised way of developing new data models, where there is no existing model that is suitable, and thus provides an appropriate mechanism for Recommendation 2c above.

   • NOTE 2: Existing data models and ontologies, e.g. the SAREF (Smart Applications REFerence ontology) standard by ETSI/oneM2M, can be mapped for use with NGSI-LD by identifying what are entities, properties and relationships, which can be managed and requested by the NGSI-LD API.

2. oneM2M base ontology (that is compatible with SAREF). Additionally, oneM2M provides the means to instantiate ontologies as a means to provide semantic descriptions of the data exchanged (through the use of metadata).

3. SAREF: Smart Appliances REFerence (SAREF) ontology specified by ETSI OneM2M committee with the extension of SAREF4Cities provides an ontology focused on smart cities.

4. Core vocabularies of ISA like Core Public Service Vocabulary Application Profile used as the basis for the Single Digital Gateway Regulation that touches local governments, Core Person, Core Organization etc.

5. DTDL is the Digital twin Definition Language developed by Microsoft. This language is based on top of json-ld and the existing Fiware data models are converted in this format.

6. For spatial (and spatio-temporal) observation data the provisions of MIM-7 (Places) about data encoding have to be taken into consideration.

Example

MIM2: Data Models

– Interoperability Mechanisms

One issue with interoperability between semantic and non-semantic data models is that semantic models require all instances to have a unique and persistent identifier. Identifiers in a non-semantic setting can use different identification schemes.

One way of dealing with non-semantic identifiers, such as Digital Object Identifiers (DOIs), is by prefixing them with a URI. In this approach, one needs to set up a "resolver" service, which can generate URIs for each entity, and allows resolving them to a page (ideally a semantic document) that provides more information about the entity and allows linking it to others.

The list of MIMs so far
— helping data flow

MIM	Name
MIM1: Context	Context Information Management
MIM2: Data Models	Shared Data Models
MIM3: Contracts	Ecosystem Transactions Management
MIM4: Trust	Personal Data Management
MIM5: Transparency	Fair Artificial Intelligence
MIM6: Security	Security management
MIM7: Places	Geospatial information management
MIM8: Indicators	Ecosystem indicator management
MIM9: Analytics	Data Analytics Management
MIM10: Resources	Resource Impact Assessment

There will be other MIMs later

- The 10 MIMs are designed to help data flow and be useful in a local community, but others may need to be added to make sure all the gaps are filled.

- This is particularly as cities begin to implement data spaces, local digital twins and the CitiVerse, where, for instance, we need to start to consider minimal but sufficient interoperability between models and not just data.

BENEFITS OF THE

Market

For Cities and Communities: Choice, flexibility, efficiency, value-for-money, independence, economic development

For Businesses: Scale, agile development/ deployment

Innovation & Policy

For Innovation Consortia: Pre-proposal alignment, post-proposal synergies, agile deployment

For Policymakers: Scale, broad market uptake, avoiding sub-optimisation, agile policy alignment

For all: Reduced risk, increased investments, innovation

MIMs and MIMs Plus

MIMs are aimed at providing consistent global processes to enable a global market

MIMs Plus set these in the European Policy landscape and are managed through Living-in.EU

Standardising the MIMs format - Y.MIM

Working with the International Telecommunication Union (ITU) - the United Nations specialised agency for information and communication technologies

Y.MIM: Introduction

The MIM structure is being developed as an ITU Recommendation: Y.MIM, within ITU Study Group 20: *IoT and Smart Cities and Communities*.

The proposal was agreed in July 2022 and was further developed in the Study Group 20 Plenary meetings in February and September 2023.

Work on the content has also been carried out in online meetings, and the intention is that it will be ready to be agreed in the next full Study Group 20 meetings in July this year.

Y.MIM: Scope

"This Recommendation defines Minimal Interoperability Mechanisms (MIMs) as a method of specifying sets of requirements that will enable minimal but sufficient interoperability for smart and sustainable cities and communities."

Y.MIM standardises the MIM structure

The MIMs are a good model for any issue where minimal but good-enough interoperability would be useful – not simply for data sharing ecosystems.

OASC/Living-in.eu can continue to develop the set of MIMs we feel are important, and other agencies can develop MIMs to support issues relevant to them.

The status of the MIMs

Status of individual MIMs

Working Groups on MIM1: *Context Information Management*, MIM2 *Data Models* & MIM4: *Personal Data Management* are about to restart

The MIM5 *Fair Artificial Intelligence* WG has been working since last Spring and is making good progress. The Objective, Capabilities and Requirements are at an advanced stage

MIM6: *Security*, WG is about to start, with a scoping out session at this meeting

MIM7: *Geospatial information management*, has reached a good state of maturity, but will be reviewed after MIM1 has been updated, to ensure consistency.

Questions?
Comments?