# Practical Information about Sustainable Mobility for Smart Cities

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Abstract:     One of the objectives of the European Commission is to improve sustainability and accessibility of collective transports, while simultaneously promoting the use of more environmentally friendly means of transportation. In this scope, it is important to make available appropriate and updated information about the mobility options offered by transport operators. With the objective of contributing to improve the quality of information about mobility options, tendentiously more sustainable, it is argued that practical information about transports, associated to domain entities (e.g. points of interest, transport authorities/operators and events), should assume the form of a set of Frequently Asked Questions (FAQ). For this, it is proposed an information model to support the acquisition of FAQ's answers from heterogeneous sources of information. This work was developed in the context of the START European project (www.start-project.eu) as a service for the Integra Social Network (integra.isel.pt) that is a product of the emergent Integra brand.

## 1 INTRODUCTION

One of the objectives of the European Commission is to improve sustainability and accessibility of collective transports, while simultaneously promoting the use of more environmentally friendly means of transportation. In this scope, it is important to make available appropriate and updated information about the mobility options offered by transport operators.

Public collective passenger transport has on most cases poor quality or lack of information, and travelers have difficulties in choosing the best mobility options. This difficulty to access information affects the quality of life and has impact on environmental and economic costs.

In this context, we argue that a contribution to existing mobility options is to provide practical information to travelers in a form of Frequently Asked Questions (FAQ) (Tendeiro and Filipe, 2011). We propose a system where information is gathered from heterogeneous sources and is then presented in a unified view. The proposed system collects data through a Service Oriented Architecture (SOA) and aggregates this data on a separate central server (Crupi and Warner, 2008).

The validation of proposed model architecture is based on an implemented demonstrator in the context of Integra Social Network (ISN) (Antunes and Costa, 2012), which enhances the contribution of the High Institute of Engineering of Lisbon (ISEL) for the European project Seamless Travel across the Atlantic area Regions using Sustainable Transport (START) (http://www.start-project.eu/)

## 2 PROJECT CONTEXT

This research work was made by ISEL in the context of Seamless Travel across the Atlantic Regions using sustainable Transport (START) project. START Project is a European Commission's Transnational Territorial Cooperation Program with 14 partners from Portugal, France, UK and Spain. The main mission is the establishing of a transnational network of regional & local authorities to promote enhanced accessibility, giving tools to make easy to travel to, from, and around the Atlantic regions, using environmentally friendly, collective modes of transport (Carris – Transportes Públicos Lisboa, 2011), greater interconnectivity between transport systems, clearer information within regional gateways, airport hubs ports and rail interchanges.

ISEL's contribution on this project was the proposed information model to support the acquisition of FAQ's answers from heterogeneous sources of information and the data integration for multiple

transportation sources. Implementing this model allows the interrogation of multiple sources of information through a single Integra Social Network interface. The main idea in this work is to give the precise and useful information to travelers while maintaining the access of multiple information sources transparent to users.

The constructed model has some development requirements that allows the deployment on cloud environments (Schubert et al., 2010). The multiple extern information sources with different technologies, implementations and interfaces has many challenges to integrate with our Integra Social Network, and this cloud environments give a flexible way to configure our system according to different needs.

Different public transportation systems and journey planners (BreizhGo, 2013) (Commentjyvais.fr, 2013) can be integrated with Integra Social Network with total transparently to the end user. Also this integration allows the creation of mobile systems oriented for tourisms purposes, other main goal of START project, where "low budget tourism" can be guided, to reach POI (Points of Interest) or events by public transportation (Ferreira et al., 2013).

## 2.1 Domain Entity Definition

The proposed model has several concepts defined to allow information modeling based on a specific main type, Entity. This base type is a set of specific attributes and elements that define every physical and conceptual components of the Integra domain.
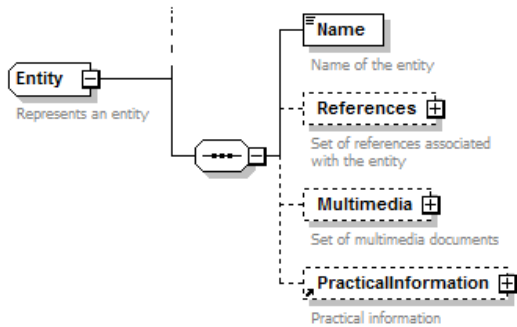


Figure 1: Entity type model.

Every Integra entity implements the model presented in **Fig**, and therefore possesses unique and registered identifiers, short and extended descriptions and a flag to indicate if the entity is enabled. As for the mandatory elements, it must only have a name. Additional elements include sets of Uri references, multimedia documents and finally the associated practical information of the entity.

## 3 MODELING PRACTICAL INFORMATION

The practical information is organized in three distinct parts, the header, the body and the footer as shown in Fig.
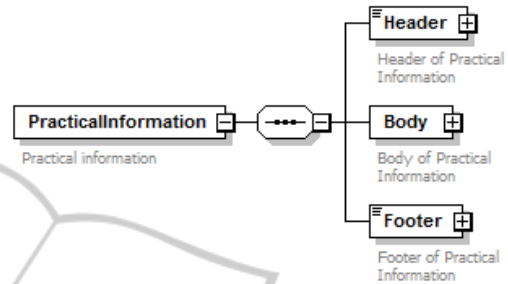


Figure 2: Practical Information Model.

The header and the footer can be anything the administrator deems useful to emphasize the body of the practical information, for example a message to the user, an introductory text, an image with a logo, or even nothing at all.

The body of the practical information is constituted by a set of questions, presented in **Fig**. A question of this set possesses, besides attributes, a set of domain concepts in form of keywords and the verbose elements which constitutes the question, the interrogative.
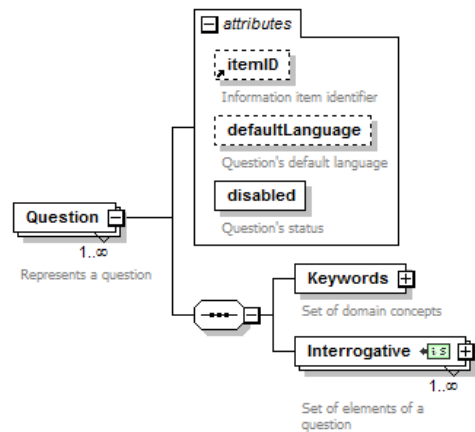


Figure 3: Question Model.

The attributes of a question are mainly the status of the question, and optionally a unique identifier and the default language.

The interrogative, which is presented in **Fig**, is composed by its text message and by its information source, with or without its respective arguments, and

by a set of answers. Each interrogative element of a question has different languages, so each single element contains the date of the last update and the owner or responsible for its creation. By conceiving a language dependent structure, it became possible to find different answers for different languages. The source elements indicate the resources from where the answer is to be retrieved and the arguments enable some degree of dynamism by allowing the user or administrator to choose from them.
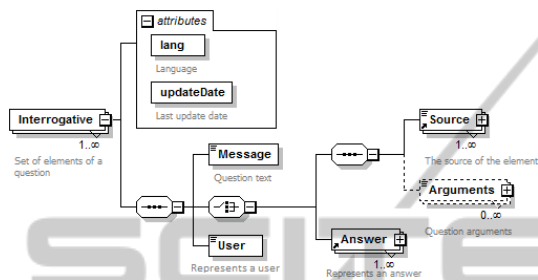


Figure 4: Interrogative Model.

In **Fig** is presented the structure of an answer. The most relevant attributes are its type, the dates of revision, update and expiring, and its status.
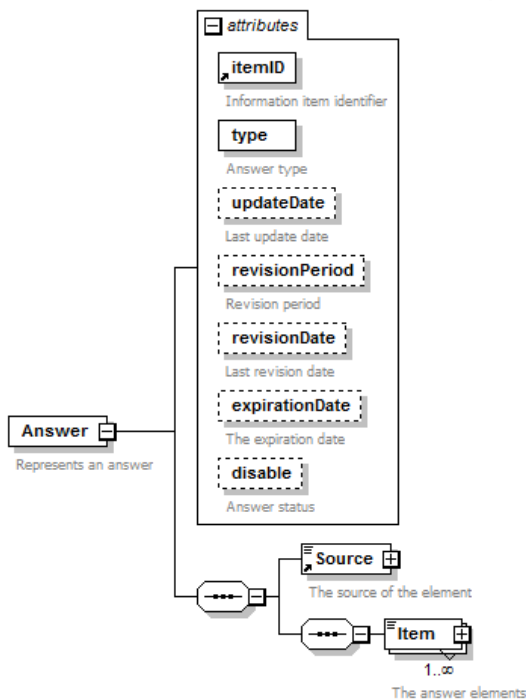


Figure 5: Answer Model.

The element set which composes an answer are the owner of the answer, the used source of information, a set of items which are multimedia ele-

ments such as images or text and optionally a set of a socially typical likes and dislikes, regarding the quality of the answer.

## 3.1 Example FAQ

Who examples of reusable questions are given in the following table, where two contexts are used for the same question.

| Question | Answer | |
| --- | --- | --- |
| | *Train station* | *Bus stop* |
| Where to buy ticket? | Ticket booth | On board |
| When to validate it? | In platform | On board |

# 4 CONCLUSIONS AND FUTURE WORK

This work is a contribution to START project. The constructed model and preliminary tests are promissory. With this model it's possible to integrate different external sources of information dynamically and give travelers the precise and specific information they need.

The Frequently Asked Questions' approach permits question and answer reutilization and which can be an effective solution to the proposed problem. This question answering system allows transparent integration into an existing solution so users don't have to use a different interface or access a different system.

Our contribution is a new approach to question and answering on a specific domain, the sustainable transports, and provides useful information to users on a Frequently Asked Questions basis and allows integration with different public transportation information systems.

As for future work, it is expected to include this system in the Integra Social Network's Reputation System, where the quality of the presented information would be evaluated by users under typical social network approach, through the use of Like/Unlike.

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