Recommendations on eMOTION service framework conditions

September 2008
Final 1.0

Project funded by the European Community under the Sixth Framework Programme for Research and Technological Development.
THE INFORMATION IN THIS DOCUMENT IS PROVIDED AS IS AND NO GUARANTEE OR WARRANTY IS GIVEN THAT THE INFORMATION IS FIT FOR ANY PURPOSE. THE USER THEREOF USES THE INFORMATION AT ITS SOLE RISK AND LIABILITY. FURTHERMORE, DATA, CONCLUSIONS OR RECOMMENDATIONS IN THIS DOCUMENT ARE PROVIDED ON THE BASIS THAT SUCH INFORMATION IS SUBSEQUENTLY, AND PRIOR TO USE, VERIFIED BY THE PARTY WISHING TO USE THAT INFORMATION.
## List of Abbreviations

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ADSL</td>
<td>Digital Rights Management</td>
</tr>
<tr>
<td>AJAX</td>
<td>Asynchronous JavaScript and XML</td>
</tr>
<tr>
<td>DHTML</td>
<td>Dynamic Hyper Text Markup Language</td>
</tr>
<tr>
<td>DRM</td>
<td>Digital Rights Management</td>
</tr>
<tr>
<td>EC</td>
<td>European Commission</td>
</tr>
<tr>
<td>GML</td>
<td>Geography Markup Language</td>
</tr>
<tr>
<td>GPRS</td>
<td>General Packet Radio Service</td>
</tr>
<tr>
<td>GSM</td>
<td>Global Positioning System</td>
</tr>
<tr>
<td>GPRS</td>
<td>Global System for Mobile communications</td>
</tr>
<tr>
<td>HSDPA</td>
<td>High Speed Downlink Packet Access</td>
</tr>
<tr>
<td>HTML</td>
<td>Hyper Text Markup Language</td>
</tr>
<tr>
<td>HTTP</td>
<td>Hyper Text Transfer Protocol</td>
</tr>
<tr>
<td>ICT</td>
<td>Information and Communications Technologies</td>
</tr>
<tr>
<td>IFOPT</td>
<td>Identification of Fixed Objects in Public Transport</td>
</tr>
<tr>
<td>INSPIRE</td>
<td>Infrastructure for Spatial Information in the European Community</td>
</tr>
<tr>
<td>ISO</td>
<td>International Organisation for Standardisation</td>
</tr>
<tr>
<td>ISP</td>
<td>Internet Service Provider</td>
</tr>
<tr>
<td>LAN</td>
<td>Local Area Network</td>
</tr>
<tr>
<td>MDA</td>
<td>Model Driven Architecture</td>
</tr>
<tr>
<td>OGC</td>
<td>Open Geospatial Consortium</td>
</tr>
<tr>
<td>PDA</td>
<td>Personal digital assistant</td>
</tr>
<tr>
<td>RDS</td>
<td>Radio Data System</td>
</tr>
<tr>
<td>RM-ODP</td>
<td>Reference Model for Open, Distributed Processing</td>
</tr>
<tr>
<td>SIRI</td>
<td>Standard Interface for Real Time Information</td>
</tr>
<tr>
<td>SMS</td>
<td>Short Message Service</td>
</tr>
<tr>
<td>SOA</td>
<td>Service Oriented Architecture</td>
</tr>
<tr>
<td>SOAP</td>
<td>Simple Object Access Protocol</td>
</tr>
<tr>
<td>TIC</td>
<td>Traffic Information Centre</td>
</tr>
<tr>
<td>TMC</td>
<td>Traffic Message Channel</td>
</tr>
<tr>
<td>TPEG</td>
<td>Transport Protocol Experts Group</td>
</tr>
<tr>
<td>Abbreviation</td>
<td>Full Form</td>
</tr>
<tr>
<td>--------------</td>
<td>-----------------------------------------------</td>
</tr>
<tr>
<td>UML</td>
<td>Unified Modeling Language</td>
</tr>
<tr>
<td>UMTS</td>
<td>Universal Mobile Telecommunications System</td>
</tr>
<tr>
<td>WP</td>
<td>Work Package</td>
</tr>
<tr>
<td>WSDL</td>
<td>Web Services Description Language</td>
</tr>
<tr>
<td>WS-I</td>
<td>Web Service Interoperability Organization</td>
</tr>
</tbody>
</table>
# Table of Content

1. **EXECUTIVE SUMMARY** ............................................................................................................. 8  
2. **THE eMOTION VIEW** .................................................................................................................. 10  
3. **HIGH LEVEL eMOTION FRAMEWORK SPECIFICATIONS AND RECOMMENDATIONS** ................................................................................................................. 11  
   3.1 **THE eMOTION VALUE NETWORK** ..................................................................................... 11  
   3.2 **SPECIFICATIONS AND RECOMMENDATIONS CONTEXTS** ........................................... 12  
4. **ACTORS AND USERS CONTEXT** .............................................................................................. 14  
   4.1 **MAIN USERS AND ACTORS REQUIREMENTS** .................................................................. 14  
   4.2 **SUMMARY OF FRAMEWORK CONDITIONS AND RECOMMENDATIONS** ....................... 17  
5. **TECHNOLOGY CONTEXT** ........................................................................................................... 18  
   5.1 **eMOTION ARCHITECTURE AND STANDARD** ................................................................. 18  
   5.2 **INFRASTRUCTURE** ............................................................................................................ 22  
   5.3 **INTEROPERABILITY** .......................................................................................................... 23  
   5.4 **ACCESS AND CONNECTIVITY** .......................................................................................... 23  
   5.5 **END-USER APPLICATIONS AND USER CLIENTS** .............................................................. 24  
   5.6 **VISUALIZATION AND MAPPING** ....................................................................................... 25  
   5.7 **SUMMARY OF FRAMEWORK CONDITIONS AND RECOMMENDATIONS** ....................... 25  
6. **POLICY CONTEXT** ..................................................................................................................... 28  
   6.1 **KEY POLICY ISSUES** ........................................................................................................... 28  
       6.1.1 **Protection of end users** ............................................................................................... 28  
       6.1.2 **Contracts and Rights Management** ............................................................................ 28  
   6.2 **SUMMARY OF FRAMEWORK CONDITIONS AND RECOMMENDATIONS** ....................... 29  
7. **BUSINESS AND FINANCIAL CONTEXT** .................................................................................... 31  
   7.1 **PUBLIC AND PRIVATE OPERATORS** .................................................................................. 31  
   7.2 **COST FOR THE END USER** .............................................................................................. 32  
   7.3 **GEOGRAPHIC EXTENSION** .............................................................................................. 32  
   7.4 **MODAL SHIFT TOWARDS PUBLIC TRANSPORT** .............................................................. 32  
   7.5 **SUMMARY OF FRAMEWORK CONDITIONS AND RECOMMENDATIONS** ....................... 33  
8. **ORGANIZATIONAL AND OPERATIONAL CONTEXT** .................................................................. 34  
   8.1 **SUMMARY OF FRAMEWORK CONDITIONS AND RECOMMENDATIONS** ....................... 34  
9. **CONCLUSIONS** .......................................................................................................................... 36  
10. **REFERENCES** ............................................................................................................................ 37  

© eMOTION Consortium
List of Figures

Figure 1-0-1 - eMOTION Pillars............................................................................................................. 8
Figure 3-1 – The eMOTION value chain.............................................................................................11
Figure 3-2 – high level view of the eMOTION Framework ...............................................................13
Figure 4-1 - User requirements .........................................................................................................15
Figure 4-2 – example of a realization of a service chain.................................................................16
Figure 5-1 – The eMOTION “Single information space” .................................................................19
Figure 5-2 - eMOTION nodes and interactions................................................................................21
Figure 5-3 - Content providers and service providers in the Genoa PoC ........................................22
Figure 5-4 - interactions of end user application and services for the Proof of the concept in Genoa ........................................................................................................................................24
Figure 5-5 - Example of map in the Proof of the concept in Genoa ..............................................25
Figure 6-1 – application of Rights Management components........................................................29
Figure 6-2.- Selection of available digital maps in the Proof of the Concept in Genoa..............30
1. Executive Summary

The Deliverable D12 “Recommendations on eMOTION service framework conditions” is a concluding document for WP6 activities (Dissemination and Exploitation) and for the whole project activities as contains the recommendations for the eMOTION service framework conditions.

These recommendations are based on the assessed results of WP5 (Proof of the concept and assessment) and take into account the main lines of potential exploitation described in Deliverable 11: Plan for Using and Disseminating Knowledge. The following diagram illustrates the dependency of this analysis with the other aspects of the whole project..

The two pillars of eMOTION project comprising Organisational/Institutional, Legal, Economic and Technical aspects led to a global, high-level design of the eMOTION framework that can be used as a reference to provide recommendations for different aspects of eMOTION keeping in mind the exploitation principles identified in Deliverable 11:

A. **Implementation and industrial exploitation of the eMOTION Framework** as a generic Service Oriented Architecture including all of the eMOTION Services, tools and characteristics. This is possible starting from the specifications delivered in the project and has the main implications and requirements from every of the mentioned aspects.

B. **Design, implementation and integration of specific End-User Applications** (services, solutions). This refers again to the eMOTION Framework and the eMOTION specifications and aims at solving integration and interoperability
issues in a given application context (such as specific content/data sources, end-user services, target users, etc.);

C. Consultancy services for the implementation, development, operation of eMOTION-enabled multi-modal, on-trip travel information services.

Many of the recommendations applied to the high-level design of the eMOTION Framework are of course shared within these scenarios. Hence, the document is not organized with a sharp-cutting distinction and dissertation of the separate exploitation scenarios but rather with a different analysis for contexts that have been defined for the high level view of the framework.
2. The eMOTION view

The objective of the eMOTION project is to develop a European approach for a multimodal on-trip traffic information service by specifying a system architecture able to integrate existing traffic information services and contents. The main obstacle eMOTION tries to overcome is the missing coherence in information offerings from different domains in the traffic & mobility field which apparently hampers a feasible and economic creation of new and innovative service offerings across different domains. An example could be the combination of traffic and network data from different providers (available through eMOTION data services) for an Inter-modal Transport Planning service over different countries (but not only).

From a technical point of view, eMOTION defines a Service-Oriented, open Architecture (SOA) which enables the step-by-step integration of all existing information services (if they follow the eMOTION Technical Standard Specification). From another perspective the eMOTION architecture can be seen as a service-oriented middleware infrastructure providing a number of services that enable the development and operation of end user applications accessing distributed data and contents originally available from different (and not necessarily homogeneous) sources.

This so-called eMOTION "single information space" view allow a uniform data supply scenario against an original offer of non-homogeneous contents. The assessed target of the eMOTION technical infrastructure is then to let every application built on top of the eMOTION services to understand and interpret data in the same standard (the eMOTION standard). Thanks to a complex and wide referenced Data Model (part of the eMOTION Technical Specifications) it is possible to implement these data services and to perform this translation of information. The value added service chains within the eMOTION framework can then be realised and several of the use case described in the preliminary analysis (Work Package 1) have been implemented in the Proof of the Concept.

Concerning non strictly-technical aspects, the eMOTION framework has been investigated and defined in a detailed way from both the point of view of legal aspects (Work Package 2) and Marketing/Business (Work Package 4). These aspects are also crucial in the definition of the eMOTION framework specifications and recommendations that follows.
3. High level eMOTION Framework specifications and recommendations

3.1 The eMOTION Value Network

eMOTION addresses complex service and business scenarios in the domain of traffic information services, involving a number of actors having various and mutual interrelationships. The figure below introduces the “classical” value chain scenario that has provided the background context for the eMOTION investigation and specifications.

![Figure 3-1 – The eMOTION value chain](image-url)

Figure 3-1 – The eMOTION value chain

eMOTION has addressed the functions of all of the actors in the value added chain:

1. **Content Owner/Provider**: At the beginning of the chain multimodal data platforms (content and information sources) can be operated by different providers (content owner and content providers) that can – but need not – be the same institution. For example the sources of traffic data are often operated by public authorities and administrations like Traffic Information Centres (TIC).

2. **Service Operator**: are developing and maintaining the respective end-user traffic and transport related services. Typically they are private organisations running technically the service. They are and are mostly not directly visible to the end user.

3. **Service Provider** Typically, are public or private (or public-private) entities providing their information services to the users of road and transport infrastructures on a free or commercial basis. They are usually directly visible to the end user.

4. **Network Provider**: They provide the necessary communication infrastructure through service related communication via Internet (ISP) or voice and mobile data links (e.g. GSM, GPRS, UMTS, Radio Broadcast). They are typically private, profit oriented organisations.

5. **User**: Finally, end users are the consumers of the information services provided by eMOTION enabled applications and represent a main target segment for exploitation of
eMOTION.

The main role of the eMOTION platform is acting as an enabler of the interactions between the content providers, the services providers and service operators, facilitating the the flexible set-up, deployment and operation of multimodal end-user information services (on an international basis). Data and content exchange between content providers and service providers is primarily supported by the eMOTION platform, while the delivery of information and services through to the end-users is done via the entire chain involving the eMOTION service platform, the service operator and network operator(s).

Given the complexity (and flexibility) of the interactions supported by the eMOTION platform among the different actors, a Value Network model (figure 2-2) is better suited that a linear Value Chain model to represent the patterns of exchanges between the various organisations involved in the delivery of eMOTION enabled end-user services.

![Fig. 2-2 – eMOTION Value Network and interactions](image)

3.2 Specifications and Recommendations Contexts

In order to have a reference pattern for the formulation of the recommendations for eMOTION, a high-level view of the framework is outlined in terms of views or ‘contexts’. Although there is a separation of this kind, it’s important to note that typically, even from the point of view of a single stakeholder having a specific role, the organization of an eMOTION-based application (or project) involves aspects from all of these contexts; in many situations, single aspects of specific context can depend or be strictly related to aspects of other contexts. For this reason, the recommendations should be regarded as a whole and a
global knowledge of the eMOTION framework, from a high-level point of view, is recommended.

The reference contexts for the high level specification of the eMOTION recommendations are those which have been investigated during the project activities, namely:

**Actors and users context:** analysis and definition of the framework requirements starting from end user requirements and role of the actors along the so-called eMOTION value chain. (Project Work Package 1)

**Technology context:** eMOTION Architecture and standards, Infrastructure and Interoperability issues, Access and connectivity, End user applications. (Project Work Package 3)

**Organizational and operational context:** overall organizational and operational issues, mostly related to aspects from other contexts

**Policy context:** legal framework, contractual and policy issues (Project Work Package 2)

**Business and Financial context:** (Project Work Package 4)

The Proof of the concept (Project Work Package 5) and the related assessment activity have provided steps of high importance both for the validation of the eMOTION concepts and for the concrete identification of recommendations for the whole framework.

![Figure 3-2 – high level view of the eMOTION Framework](image-url)
4. **Actors and users context**

Actors within the eMOTION framework cooperates in the process of generating/consuming/providing information from content providers to the end users. This relates to the eMOTION Value Network introduced in previous chapter, where the information is provided by a content owner or content provider, then a service operator uses this content to generate information with added value, the service provider acts as an interface to the customer publishing the service (and being responsible for all marketing and contractual issues) to the end user. The end user is able to access the information on his mobile end user device like a PDA/Smart Phone or an in-car-information system. The network provider is the last “ring” of the chain before the end user and act as the supplier of the communication network for the service.

The main requirements, and hence recommendations, for the different kind of actors/users within the eMOTION Value Network are outlined in the following section.

4.1 **Main users and actors requirements**

The formulation of recommendations for the eMOTION framework from the Actors point of view can start considering the end user requirements and how they influences the whole organization of the eMOTION-based infrastructure legal, technical, organisational, financial or general aspects and implies responsibilities from one or more actors in the value chain of information services.

The end user is the customer of the service provider and is interested in receiving information to accomplish his travel-related needs. Generally, to complete a journey at the lower cost, or select a journey with the highest utility. This has many implications in several aspects: technical, economical, legal etc. each of them have been treated in eMOTION.

The figure below illustrates the relations between the different types of requirements discussed in detail in Deliverable 1: Requirements and service analysis which is the reference document for these aspects in eMOTION. Work Package 1 and the related Deliverable 1 and Deliverable 2 analyzed in detail user requirements aspects with an identification of concrete actors from consortium members who represent actors of the whole value chain and two different stakeholder specific workshops.
The definition of use cases or service scenarios starts from both System requirements and Business expectation needs. Trip requirements (related to the type of trip) and user needs are the basis for a functional description. The use cases are derived from Trip requirements and user needs and satisfy Output requirements. (see D1 for further details)

The eMOTION use case and the related service chains have been a key starting point for the development of the eMOTION Framework and are a fundamental reference for the exploitation of eMOTION.

The analysis of the Service Chains, part of the WP3 activities, help to understand in which way the Service Chains for the Use Cases defined in Work Package 1 can be realised in the eMOTION Service Architecture. Let’s consider the following example:

Here the application available for the end user has an interface to the data service connected to the contents both of which are hosted/provided by the same entity.
In the following table there is a resume of the use cases that have been defined and their implementation in the Proof of the Concepts.

The completeness of the use cases was foreseen during the WP1 activities that included:

- a review of current practice in European multi-modal real time traffic information services;
- an analysis of stakeholders and actors needs and requirements;
- a definition of services, service chains and the implementation approach.

<table>
<thead>
<tr>
<th>Use case</th>
<th>Proof of the Concept application</th>
</tr>
</thead>
<tbody>
<tr>
<td>DYNAMIC ROAD TRAFFIC INFORMATION</td>
<td>Yes</td>
</tr>
<tr>
<td>DYNAMIC ROAD TRAFFIC FLOW DATA</td>
<td>Yes</td>
</tr>
<tr>
<td>DYNAMIC ROAD TRAFFIC ROUTING INFORMATION</td>
<td>(partially)</td>
</tr>
<tr>
<td>DYNAMIC PUBLIC TRANSPORT INFORMATION</td>
<td>Yes</td>
</tr>
<tr>
<td>DYNAMIC PUBLIC TRANSPORT JOURNEY PLANNING</td>
<td>No</td>
</tr>
<tr>
<td>DYNAMIC POI INFORMATION</td>
<td>Yes</td>
</tr>
<tr>
<td>DYNAMIC PARKING INFORMATION</td>
<td>Yes</td>
</tr>
<tr>
<td>DYNAMIC WEATHER INFORMATION</td>
<td>No</td>
</tr>
<tr>
<td>DYNAMIC INFORMATION ABOUT EVENT TRAFFIC</td>
<td>Yes</td>
</tr>
<tr>
<td>DYNAMIC MULTI MODAL JOURNEY PLANNING</td>
<td>No</td>
</tr>
</tbody>
</table>

From a more general point of view there are requirements concerning the different eMOTION User Groups in these fields:

- General (Adaptability, Data availability, Expandability, Maintainability, Robustness).
- Legal (legal constraints, Data agreement, Liability, Trusted third party, Warranties, Privacy etc.)
- Technical (Functional requirements, Safety and security of operation, Performance etc.)
• Organisational (Monitoring and Management, administration through operators etc.)
• Financial

General requirements are described in details in Deliverable 1, section 5.2: manageability requirements and should be carefully considered in order to start design/organize an eMOTION infrastructure.

4.2 Summary of framework conditions and recommendations

The most important recommendations aspects specifically tied to this context concerns the identification of the end user needs (use cases and general needs) and the definition or identification of specific services and actors operating along the value chain to implement these services. One of the aspects emerging from the verification of “What might hinder the usage of eMOTION”, (see D9: Proof of the Concept, validation and results) is the readiness to cooperate along the value chain. That’s why it is important to make a preliminary actor and user analysis at the beginning of the organization of an eMOTION-based project.

**Actors and users context: summary of recommendations**

- Conduct a high level service chain analysis on the basis of the eMOTION specifications and the needs/objective of the system/service to be implemented
- Identify the partners along the value chain
- Provide the partners with a comprehensive documentation about their role and their interactions

**Actors and users context: reference documents**

- eMOTION Deliverable D1 “Requirements and service analysis”
- eMOTION Deliverable D2 “Service Definition”
5. **Technology context**

The formulation of recommendations from the point of view of technology take into account the following aspects:

- eMOTION Architecture and standard
- Infrastructure
- Interoperability
- Access and connectivity
- Access and client software
- End user applications
- Visualization and mapping

5.1 **eMOTION Architecture and standard**

As already introduced eMOTION defines a single information space providing the development and operation of user-oriented applications accessing widely distributed data and content sources with a common standard.

In eMOTION, very detailed technical specifications have been produces following the Reference Model for Open, Distributed Processing, RM-ODP. This was the outcome of activities of Project Work Package 3, resulting in two deliverables (Deliverable 5 and deliverable 6) composed of main introductory documents and several appendixes with fine-grained specifications and references.

One of the core tasks of eMOTION services is the provision of data according to the eMOTION Data Model. Data from various sources has to be queried, combined, processed and made available to other services and end users. The eMOTION Data Model, resulting from the process of selection, harmonisation and integration of the existing standard is the central supporting pillar of the eMOTION Technical Specification and the conceptual basis for enabling Services to deliver uniform data in the eMOTION Single Information Space.
The conceptual eMOTION Data Model is specified and documented in the eMOTION UML Schema which has been created using the Enterprise Architect CASE Tool. It has been developed by harmonising several international and European standards along the lines of the ISO 19100 series of Geographic Information Standards such as DATEX 2 (for Individual Traffic and a general situation message model), Transmodel (as the reference model underlying public transport), IFOPT (to describe fixed infrastructure), SIRI (for public transport schedules) and TPEG (for descriptive location referencing, public transport information messages, and parking facilities).

The exchange format for eMOTION data is defined by an Application Schema of Geography Markup Language (GML). The latter has been automatically derived from the conceptual eMOTION Data Model by means of a standardised process. Using GML enables eMOTION to employ the concept of the OGC defined Web Feature Service as an all-purpose generic data interface and brings eMOTION in line with Spatial Data Infrastructures (SDIs), which are being set up on different scales in Europe and world-wide.

Service Interface Definitions constitutes another important supporting pillar of the Technical Specification making sure that the eMOTION system components can communicate on the basis of well-known interfaces.

---

Data Services, mainly based on the OGC Web Feature Service and the accompanying Filter Encodings standard obtain the information they are exposing from other Data Services or from hidden databases. Conceptual service models, where necessary, have been developed and applying an MDA approach service definitions in WSDL have been obtained. The use of SOAP led to attach rights management and security in a standard way.

The Information Metadata Model is an additional schema, with objects used to describe the eMOTION objects proper. Metadata is used to publish, find and evaluate eMOTION information sources in the distributed eMOTION environment.

The Service Metadata Model, on the other hand, specifies the data necessary to describe the service interfaces of eMOTION. This metadata is necessary to let services automatically bind to eMOTION services.

Centralised eMOTION Services belongs to another category of service. Examples of them are: the Registry services and the Digital Rights Management services. The so-called eMOTION “Business Enabler” makes available centralised services implementing a number of common functionalities.

Here’s a resume of the type of services defined in the eMOTION framework architecture:

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data Services</td>
<td>Data Services give access to the data. The data is delivered according to the GML Application Schema.</td>
</tr>
<tr>
<td>Mapping Services</td>
<td>Mapping Services deliver maps of the data. These maps are styled according to the eMOTION Mapping Specifications.</td>
</tr>
<tr>
<td>Event Notification Services</td>
<td>Services and applications can register with Event Notification Services and are called-back when certain events in the subscribed data or service occur.</td>
</tr>
<tr>
<td>Inter-Modal Journey Planner Services</td>
<td>Journey Planners set-up journey plans in various modes and inter-modal. The interface allows hierarchies of Journey Planners to be built.</td>
</tr>
<tr>
<td>Geo-Directory Services</td>
<td>These service translate geographical names into coordinate or feature references. They also allow translation between street addresses and coordinates.</td>
</tr>
<tr>
<td>Reference Translation Services</td>
<td>Reference Translation Services mediate between different Location References.</td>
</tr>
<tr>
<td>Positioning Services</td>
<td>These services make available the position of mobile users.</td>
</tr>
<tr>
<td>Registry Services</td>
<td>Registry Services access metadata for discovery, evaluation and use of eMOTION resources.</td>
</tr>
<tr>
<td>Rights Management Services</td>
<td>This encompasses a variety of services for assigning identity to users and controlling access to resources.</td>
</tr>
<tr>
<td>Accounting, Billing and Payment Services</td>
<td>These services control the processes of keeping track of licensed resource consumption and the necessary billing and payment.</td>
</tr>
<tr>
<td>Natural Language</td>
<td>Natural Language Translation Services are for online mediation between...</td>
</tr>
</tbody>
</table>
The following picture illustrates the organization of an eMOTION based infrastructure where a service provider search and finds the right service to use thanks to the Business Enabler functionalities (availability of data about service offerings, published by the content providers themselves). The appropriate data service belonging to the eMOTION “Single Information Space” can then be used (possibly prior to license and rights management operated again by the Business Enabler centralized services).

Figure 5-2 - eMOTION nodes and interactions

In order to have a comparison of the abstract scenario illustrated above with a real case situation, let’s consider the overall diagram of the available data services implemented in the “Proof of the Concept” experimental application in the Genoa pilot site:
5.2 Infrastructure

The first issue treated by the Engineering Viewpoint part of the eMOTION Technical Specifications (concerned with the infrastructure required to support the distribution of services and information sources) is the Communication Model. It defines the principle workings of the eMOTION distributed environment.

The communication model focuses on protocols and standards suitable to establish an efficient and reliable communication model for the exchange of information between nodes. eMOTION uses SOAP and WSDL along the guidelines proposed by the Web Service Interoperability Organization (WS-I).

The stack of network protocols comprises:
### Class of protocol

<table>
<thead>
<tr>
<th>Class of protocol</th>
<th>Reference for eMOTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Service Transport</td>
<td>HTTP</td>
</tr>
<tr>
<td>XML messaging</td>
<td>SOAP</td>
</tr>
<tr>
<td>Service description</td>
<td>WSDL</td>
</tr>
<tr>
<td>Service directory</td>
<td>central registry service</td>
</tr>
</tbody>
</table>

All these standards and protocols fulfil some major requirements in eMOTION. They are open, simple to understand (mostly text-based) and allow interoperability between different platforms.

Using SOAP over HTTP let hide all the implementation issues of the different Communication standards (LAN, Wireless LAN, GPRS, UMTS, HSDPA, etc…)

It is then recommended to adopt these standards in order to guarantee communication to be good between the components of the system.

Another issue treated in the Engineering Viewpoint chapter is **Interaction of eMOTION Components** with general information about the distribution and interaction of components and nodes in the eMOTION network. Not being a strict definition it is recommended to adopt it as a best practice.

Finally an **Identifier Model** is defined for all features (objects) instances defined in the eMOTION Data Model. Being part of the eMOTION standard, the identifier model must the reference model in a eMOTION-based implementation.

### 5.3 Interoperability

Interoperability issues between components of the eMOTION architecture are mostly related to web services interoperability across platforms, operating systems and programming languages. The easiest way to fulfil this requirement is to follow the guidelines proposed by the Web Service Interoperability Organization (WS-I [http://www.ws-i.org](http://www.ws-i.org)) which helps customers to develop interoperable Web Services by providing guidance, recommended practices and support resources. Although it is impossible to completely guarantee the interoperability of a particular service, all the Profiles proposed by WS-I attempt to increase the interoperability by addressing the most common problems that implementation experience has revealed to date.

It is then recommended to adopt the WS-I guidelines for a successful implementation of an eMOTION system.

### 5.4 Access and connectivity

From the perspective of the communication model, one of the advantages of the use of web services and related standards is the possibility to inter-operate over a common HTTP connection on Port 80 which is the communication channel with typically fewer restrictions
concerning security policies applied by most organisations and companies (actors of the eMOTION value chain).

Intranet is then a clear prerequisite of the working of the eMOTION Infrastructure. Bandwidth requirements regarding the access of the communication infrastructure are dependent on the nature of the special application. Web mapping applications can already work sufficiently well with medium-speed connections, because relatively small and well compressed images have to be exchanged. Applications, which require data access and need to download large quantities of XML-coded data will need high speed connectivity (e.g. ADSL).

5.5 End-User Applications and user clients

There could be a variety of end user applications based on the eMOTION framework. They could be developed using different technologies and targeting several user groups/devices. It might be composed by one or multiple modules. For the Genoa PoC application, in the most simplified view the application is composed by a Web application interacting with a map server and the combination of the two can be seen as a whole accepting and offering connections with the eMOTION services.

![Figure 5-4 - interactions of end user application and services for the Proof of the concept in Genoa](image)

A end user application might also be a client application (e.g. for special devices such as in-car navigation devices) although a common target of application is web application.

In case of a web application recent client hardware and browsers generally fulfil the requirements of typical eMOTION-related end user applications based on text and maps with mouse/pointer interactions for panning/zooming. Browsers capable of running applications designed and implemented using DHTML, CSS and programming techniques such as AJAX are required to successfully use typical eMOTION-based web application.

The above mentioned requirement are also often found in PDA/Smartphone web browsers which are more and more improved in performance and functionalities. In many cases only
layout adjustments are required to run a pre-existing application in a small device capable of running complex web applications.

5.6 Visualization and mapping

Mapping Services deliver maps of the data. Web Mapping is a simple technique for integrating information from multiple resources on the basis of maps. It is based on the use of layers (images) that are easily overlaid. There is a background layer and the layers on top are transparent in all places, which do not provide information.

eMOTION Web Mapping Services are based on the OGC Web Map Server specification and the accompanying standards Styled Layer Descriptor and Symbology Encoding.

Detailed mapping specifications have been developed for all domains of the eMOTION information model and including different types of symbolisation: Symbols/icons, point symbolisation, line symbolisation, area symbolisation, labels (text in the map).

The implementation and the overlay of different layers in a visualisation of a WMS can be regarded in the following screen shot of the Genoa PoC:

![Example of map in the Proof of the concept in Genoa](image-url)

5.7 Summary of framework conditions and recommendations

The technical aspects of the eMOTION Framework are of primary relevance in all of the exploitation scenarios. The recommendations when designing and implementing a system, service or end-user application based on the eMOTION specifications are concerning, from a strict technical point of view:

- Compliance to standards if specific standards are specified
- Compliance to guidelines and best practices if specific standards are not defined

From a more organizational point of view the technical aspects of the eMOTION framework implies:
• Identification of technical prerequisites from the point of view of personnel training, technology etc.

• Pre-analysis of technical aspects of the system

• Pre-identification of technical critical issues

• Planning and setting of test activities (test environment, test user groups, test plans etc.)

---

Technology context: summary of recommendations

• Prerequisites:
  o Identification of the appropriate design/developing tools
  o Technical competence verification (possible needs for technical training or external consultants)
  o Setup of an appropriate developing environment (see also: organization recommendations)
  o Identification of (application) use cases
  o UML analysis of use cases/requirements and subsequent verification of requirements satisfaction

• Design of system Architecture
  o Identification of the nodes of the SOA (content providers, service providers, service operators etc.) following the eMOTION specifications
  o Design of structure of all data services following the eMOTION guidelines
  o Design of WMS/WFS interfaces for each node following the eMOTION standards
  o Identification of additional components and integration in the SOA
    ▪ Identification of necessary centralized services (Business Enabler: Rights Management, Registry ...)
  o Discussion/approval with technical partners
- **End user application design**
  - Identification of the purpose of the application
  - Identification of the technology for the end user application
  - Identification of client requirements (web browsers etc.)
  - Design of the application from the point of view of main navigation principles and application template (structure, layout, colours etc.)

- **Design and implementation of WMS/WFS**
  - Identification of available technologies and products
  - Implementation following the eMOTION standards

- **Test and deployment**
  - Specification of a test & validation plan
  - Setup of a test environment
  - Setup and training of a user group for T&V
  - Deployment and final test

---

**Technical context: reference documents**

- eMOTION Deliverable D5 “Analysis of technical standards”
- eMOTION Deliverable D6 “Technical Specifications”
6. **Policy context**

The following section dealing with policy and contractual issues take up the main conclusions from WP2 activities and especially from Deliverable 3: policies: general conditions and legal framework. The aspects treated by this analysis are dealing with policy, protection and contracts.

### 6.1 Key policy issues

A first main aspect to note is that the policy issue analysis did not find any specific legal issue, which may be particularly relevant to eMOTION, which is completely left to national law. The conclusion of the policy analysis outlines, anyway, how some legal barriers to the future smooth operation of eMOTION exit. The most significant of such barriers appear to be related to the fact that Community law typically does not provide for full, but only for minimum harmonization, as explained and discussed in Deliverable 3 (international dimension of eMOTION). Different national laws may provide for example different level of protection to the right of privacy and this may determine distrust in eMOTION service providers. In the field of privacy protection a change from minimum to full harmonization may then facilitate the provision of eMOTION services with a relevant extent in the processing or retention of personal data of end users.

#### 6.1.1 Protection of end users

Similar conclusions and recommendations can be formulated for the contractual protection of eMOTION: eMOTION service providers would today not be able to rely on one single body of law concerning the protection of consumers because all Directives dealing with consumer protection provides only for minimum harmonization and eMOTION service providers would need to use different contract models or standard forms with respect to end users/consumers of different Member States. A Regulation directly applicable in all Member States would be very helpful in this sense and would result in reduced legal and administrative costs for service providers and then in an overall reduces cost for the provision of the service for the end user.

#### 6.1.2 Contracts and Rights Management

eMOTION contracts regulates the relations between the different actors of the chain and are necessary for the operation of eMOTION services. There will be contracts between eMOTION Content provider, Service operator, Service provider, Network operator, and End users. eMOTION contracts will be generally License Agreement or Interchange Agreement that deals with the use of Resources protected through Intellectual Property Rights (such as Copyright or Sui Generis Right).

As it is fundamental to eMOTION the interfacing and sharing of distributed geographical and traffic related contents data protection and copyrights issues clearly are central to any...
implementation of the eMOTION Infrastructure as these can undermine content exploitability and provision in eMOTION services and products.

Talking about data ownership issues a positive aspect to note for eMOTION is that the particular approach supported for data integration (data is owned by the original content provider and made accessible via eMOTION services) is a positive driver as data remains in the hands of the original content owner. Moreover from the technical point of view, the eMOTION framework provides support for the management of Rights Management connected with the use of an eMOTION service.

The Rights Management Components provide a means for ensuring that eMOTION resources, particularly the information providing services can be used only to the extent agreed on by a licence document. This applies to server-side authorizations whereas end-user client-specific restrictions are outside the specifications of eMOTION.

The specification of the eMOTION Rights Management components are given in Deliverable 6: Technical Specification. The following diagram for example explain the working principle of the eMOTION Rights Management components in the case of a Request from RM-enabled Geo Web Client to RM-enabled Geo Web Service. (see Deliverable 6 for detailed specifications).

![Diagram of Rights Management components](image)

**Figure 6-1 – application of Rights Management components**

### 6.2 Summary of framework conditions and recommendations

A main aspect of the availability and true exploitability of eMOTION related digital contents is related with the requirements and potential difficulties and barriers from the legal context in terms of policies, contracts and protection of the end user. As the information is mainly geographical and related to traffic, the data and digital contents of interest for eMOTION very easily cut across different type of public sector data owners, organisations and service...
providers usually comes from different Member States.

The EC provides only for a minimum level of harmonization and a difficult aspect for an implementation of the eMOTION framework remain in terms of differences between the national laws which regulates legal eMOTION issues.

Today’s increased availability of geographic digital contents (such as map data) free for use (or partially free under specific conditions) accessible in many cases via WMS and WFS constitutes certainly a favourable trend to overcome some legal constraints for the implementation of eMOTION-based applications. An example found in the eMOTION Proof of the concept is the possibility to choose from available digital maps for the background layer. This comprises contents available for free under specific conditions. (See picture below for a screenshot)

![Selection of available digital maps in the Proof of the Concept in Genoa](image)

**Policy context: summary of recommendations**

- Policy analysis should refer to the applicable laws framework (European and local)
- Identify Intellectual Property Rights issues and possible application of eMOTION specification to manage technical aspects related to them.

**Policy context: reference documents**

- eMOTION Deliverable 3 – general conditions and legal framework
- eMOTION Deliverable 4 - Policies – Contracts and agreements
7. **Business and financial context**

The business model analysis carried out in deliverable D7, chapter 6 “eMOTION Platform service business models”, has lead to the identification and investigation of several alternative business models for the eMOTION platform. Particularly, the following elements are considered which outline eight specific alternative models:

- operation by a public operator
- operation by a public private partnership
- operation by an infrastructure operator
- operation by a private operator,
- for each of the above elements, considering
  - regulated market
  - market without regulations

The main conclusions and recommendations resulting from business and financial context analysis are summarised in the following.

7.1 **Public and private operators**

One of the fundamental questions set at the onset of eMOTION is whether the eMOTION traffic and travel information services should be provided by public or private operators.

As previously introduced, different options can be identified and these should not be necessarily seen as exclusive alternatives. Rather, one can consider evolving business scenarios where different options can be appropriate at different maturity stages of service provisioning.

Most likely, the starting scenario for eMOTION-enabled services has a public driver. The market for travel related information has a strong local connotation and due to the regional development of many different data systems, maps or contents, the roll out and start up of operation of a European traffic information system like eMOTION would need an initiation of a public authority.

In D7, a potential evolution of the eMOTION service platform operation is also described. After an initial start with a public operator in a regulated market, the provision of eMOTION services could naturally continue with a public private partnership, which may change to a pure privatised operation in the long run. In a likely scenario one can reasonably expect that the regulation of the market will decrease and the market will progressively play the role of a main driver for the eMOTION services, both as regards the number and quality of the enabled services.
7.2 Cost for the end user

Another starting issue for eMOTION was to investigate the extent and implications of free vs. paid services.

Today many local travel related information systems are basically provided for free. This means that most of the basic traffic information for the end user are accessible free of charge and only the value added services are paid by end users (e.g. personalised individual journey messages via SMS). This situation is a prevailing context condition that significantly influences the willingness to pay for the eMOTION services. On the other hand, the eMOTION platform cannot guarantee end user services for free without a regulation of the market. The eMOTION service platform acts as a B2B platform enabling third party services to be deployed and operated. The customer of the eMOTION services is thus a service operator or service provider who will build the interface to the end user.

Without a regulation for offering basic end user travel related services for free, private service providers are able to sell their services to the end users on a commercial basis.

7.3 Geographic Extension

The eMOTION platform should create the basis for multimodal travel related information services on a European level provided by different private or public service providers to all European travellers.

In order to allow for a most efficient set-up and operation of the eMOTION platform, existing and emerging (local) contents and services should be integrated in the common eMOTION service environment also to guarantee their seamless integration in European offerings.

A main requirement in this respect is the full compliance of the local content sources with the standard eMOTION interfaces as described in previous sections 5.1 and 5.3.

7.4 Modal shift towards public transport

Two possible drivers for using public transport services are the quality of the private and public transport information services and the quality of public transport itself. The quality of public transport is not part of this study so the answer is based on the quality of the private and public services providing transport information pre- and on-trip. The usability of most of the analysed travel-related information services is very good (see chapter 4.1 of deliverable D7). These services are helpful to organise individual journeys in all situations where the decision about which kind of transport mode to use was made already. But if the end user does not know which transport mode to choose because of the different costs or time needed, most of the analysed information systems are not appropriate.

Such situations represent a chance for the eMOTION service platform to provide basic services for setting up and operating multimodal travel-related information services.

As a consequence, eMOTION is expected to contribute significantly to improve the modal shift by influencing the choice of individual travellers and increasing the accessibility and
acceptance of public transport.

7.5 Summary of framework conditions and recommendations

The main framework conditions and recommendations related to business and financial context can be summarised as follows:

### Business and financial context: summary of recommendations

- Should the service be commissioned by a public authority? Basically yes. This is a starting scenario, given the prevailing local nature of traffic and travel related information market. A public authority is needed to provide the initial context for the harmonization and interoperability of many local, different contents, information, maps and systems.

- Should the service be provided by the private sector, the public sector or a combination of the two? The role of the different type of actors is seen as complementary and part of an evolutionary scenario. Services start in a public regulated environment and gradually develop in a public-private and finally private service provision, mainly driven by an established market for eMOTION-enabled services.

- Should the service include basic features free of charge for the end-user? Basic traffic content and features should be provided for free; value added information and services will be sold on a commercial basis. eMOTION is a B2B service platform that should enable service operators/providers to provide commercial end-user services in a free market.

- Should the service be provided a city/Country/European wide level? The eMOTION platform is able to act as a local aggregator of city/country level information. Thanks to the adoption of an open and standard based architecture, the interoperability (content-wise, technical, operational) of the eMOTION platforms in different sites should allow the building up of European-wide services.

- How can the service foster the modal shift towards public transport? eMOTION is able to impact on the quality (and interoperability) of transport related information services, thus contributing to improve the accessibility and acceptance of public transport services.

### Business and financial context: reference documents

- eMOTION Deliverable 7 “Business Cases and Financial Framework”
8. Organizational and Operational context

The organization of activities for the design and development of a system/application operating in an eMOTION based infrastructure is highly related with aspects from technical, economical and legal point of view. For a successful organization of an eMOTION implementation the whole set of recommendations given for each single context should be taken into account.

Some of the organizational and operational recommendations are based on the experience from the realization of the eMOTION proof-of-concept but, as the organizational scenarios can have different characteristics it is important to keep as a reference the whole eMOTION framework requirements.

General Organizational and operational issues can start with the analysis of the goals of the system/service to be implemented which implies the adoption of the recommendations in the user and actors context. Then, the analysis of the geographic context, the domains covered etc. is a pre-requisite for a complete legal, contractual and business analysis and should help to identify potentially critical issues.

A preliminary technical analysis let identify if the project goes in the direction of an eMOTION implementation and should indicate if the technological background of the involved actors is adequate. After these very preliminary steps the identification of data, services and functionalities can start in order to assign responsibilities and organize the work. Subsequent steps are typically the identification of the infrastructure necessary to run the system and the setup of a test environment.

Installation and deployment issues should not present relevant problems as eMOTION is a distributed system and web services can interact via HTTP connections from distinct nodes. During the proof of the concept, for example, a remote installation of the end user application for the Genoa Test site was successfully done without major efforts leaving the web service functionalities intact.

8.1 Summary of framework conditions and recommendations

Organizational and operational context: summary of recommendations

- Overall organization
  - Main purposes
  - User and actors analysis
  - Geographical coverage
  - Domains covered
  - Identification of critical aspects (recommendations from other contexts)
• Preliminary technical analysis
  o Identification of overall eMOTION compliance
  o Estimation of the effort necessary to implement eMOTION services

• Identification of data, services
  o Identification of content providers
  o Verification for actual availability of data
  o Verification for possible complexity in terms of data access
  o Legal constraints
  o Privacy constraints

• Identification of the infrastructure necessary to run the system:
  o Specification of infrastructure requirements in terms of
    ▪ Overall infrastructure specifications
    ▪ Web Application Hosting requirements
    ▪ Web service hosting requirements
    ▪ Connectivity
  o (if applicable) Identification of suitable service providers / network providers

• Setup of a test environment:
  o For test of external technologies
  o For developing applications and services
  o For giving (temporary) public/restricted external access to other subjects

Organizational and operational context: reference documents

• As the organization of activities for the design and development of a system/application operating in an eMOTION based infrastructure is highly related with aspects from technical, economical and legal point of view, the related eMOTION deliverables are the reference documents
9. Conclusions

The assessment activities including a real application of the eMOTION principles in two different sites demonstrates the validity of the framework concepts and design.

The eMOTION-based technology can be applied to a wide range of Infomobility Services and Intelligent Transport Systems ensuring interoperability, extensibility and conformance to standards.

An appropriate planning and a successful implementation of an eMOTION-based system or service should take into account some recommendations for each of the aspects of the eMOTION framework: legal, institutional, financial, technical etc.

This document identifies a set of recommendations for an high-level view of the eMOTION framework with a differentiated analysis concerning: users and actors, technical issues, organizational context, policy context and business/financial aspects.

The users and actors related recommendations are important in the starting phases of the project as the identification and active involvement of the partners along the eMOTION value chain should be conducted together with the identification of the needs/objective of the system/service to be implemented.

Also technical aspects implies strategic choices and determine the necessity of an accurate preliminary study. An overall but appropriate understanding of the eMOTION technical aspects together with the identification/UML analysis of the use cases, design of system Architecture and identification of the actors along the nodes of the SOA is important to make a plan of the technical resources (technical competence verification, availability of technology etc.). Subsequently the specific design / implementation / test and verification activities can be planned and brought to completion.

Policy and business aspects also have a relevant impact on project planning activities in terms of contractual issues, Intellectual Property Rights aspects, geographic extension of the service, type of charge for the service etc.

Above all, anyway (and this relates to the organizational recommendations) it is important to consider every recommendation given for the high-level view of the eMOTION framework as a whole. This should really support an organization, public authority, private company or any other subject involved in a eMOTION-based project.
10. References

[eMOTION 2006a]
eMOTION Deliverable D1 “Requirements and service analysis”

[eMOTION 2006b]
eMOTION Deliverable D2 “Service Definition”

[eMOTION 2007a]
eMOTION Deliverable D3 “Policies – general conditions and legal framework”

[eMOTION 2007b]
eMOTION Deliverable D4 “Policies – Contracts and agreements”

[eMOTION 2008a]
eMOTION Deliverable D5 “Analysis of technical standards”

[eMOTION 2008b]
eMOTION Deliverable D6 “Technical Specifications”

[eMOTION 2008c]
eMOTION Deliverable D7 “Business cases and financial framework”

[eMOTION 2008d]
eMOTION Deliverable D8 “Proof of the concept. Prototype”

[eMOTION 2008e]
eMOTION Deliverable D9 “Proof of the concept. Validation results”

[eMOTION 2008f]
eMOTION Deliverable D11 “Plan for using and disseminating knowledge”