ITEC - WP 9

D9.2 - RELEASE OF THE DIRECTORY

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| DATE        | 7/11/2012 |
| ABSTRACT    | This document describes the release of the directory for persons and events. This deliverable is a software package that is released under an open source license, on the software repository SourceForge. It is an update of the previously submitted deliverable D9.2 version 1. |
| AUTHOR, COMPANY | Frans Van Assche – KU Leuven |
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| RELATED ITEMS | None |

1 PU = Public
PP = Restricted to other programme participants (including the EC services);
RE = Restricted to a group specified by the Consortium (including the EC services);
CO = Confidential, only for members of the Consortium (including the EC services).
INN - Internal only, only the members of the consortium (excluding the EC services)
## DOCUMENT HISTORY

<table>
<thead>
<tr>
<th>Version</th>
<th>Date</th>
<th>Reason of change</th>
<th>Status</th>
<th>Distribution</th>
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<td>V0.1</td>
<td>30.04.2012</td>
<td>Initial document</td>
<td>Draft</td>
<td>Selected partners</td>
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<td>V0.2</td>
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<td>Update reflecting recent changes in the software</td>
<td>Draft</td>
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<td>V1.0</td>
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<td>Addressing comments of internal reviewers and other partners</td>
<td>Official</td>
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<td>Update of example JSON binding</td>
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<tr>
<td>V2.0</td>
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<td>Implementation of decisions taken by the technical board pertaining to identifiers, data necessary for harvesting, removing groups. Changes to the information model after feedback on release 1 of the P &amp; E directory as well as the synchronisation with the evolved conceptual model of WP10. Including faceted search and authorization rules documentation.</td>
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**Executive summary**

iTEC is a large-scale validation project about what (existing and new) ICT is useful or can be made to work in schools. In order to support this large scale investigation and validation exercise, iTEC identified a number of areas for which information should be gathered. These areas are: (a) learning activity with object types such as scenario’s, learning stories, (b) resources such as persons, and events, and (c) technology including applications, devices, and the technical settings of schools.

The iTEC directory described in this report deals with information gathered about the object types of persons and events. This information is recorded in and can be retrieved from the iTEC directory.

The iTEC directory relates to different subsystems of the iTEC environment. More in particular, the iTEC Composer may use the directory in order to find persons and events. The information gathered in the directory is also used by different components of the iTEC software comprising the SDE, the authorization module, and specific business logic modules of the iTEC Composer itself. Hence, the iTEC directory must provide an API to be used by these systems.

This report discusses the functionality of the iTEC directory for Persons and Events, the architecture, the information model, the technology, and the user interfaces, which constitutes an important milestone in the delivery the iTEC directory.
# Table of Contents

1 INTRODUCTION  ................................................................. 8

2 THE ITEC DIRECTORY FUNCTIONAL REQUIREMENTS AND ARCHITECTURE OVERVIEW  ...................................................... 11
   2.1 FUNCTIONAL REQUIREMENTS OVERVIEW  .................................. 11
   2.2 TECHNICAL ARCHITECTURE OVERVIEW  .................................... 11

3 THE ITEC DIRECTORY INFORMATION MODEL  ............................... 13
   3.1 INFORMATION MODEL FORMAT  .................................................. 13
       3.1.1 ITECOBJECT  ................................................................. 14
       3.1.2 Person  .................................................................... 15
       3.1.3 Event  ..................................................................... 18

4 VOCABULARIES  ................................................................. 20
   4.1 EUN AGE RANGE VALUES  ...................................................... 20
   4.2 EUN EDUCATIONAL CONTEXT VALUES  .................................... 20
   4.3 EUN EVENT PLACE VALUES  .................................................... 20
   4.4 EUN EVENT TYPE VALUES  ..................................................... 21
   4.5 EUN GENDER VALUES  ......................................................... 21
   4.6 EUN GENERAL YES-NO VALUES  ............................................. 21
   4.7 EUN ICT CHANNEL VALUES  .................................................... 21
   4.8 EUN PERSON CATEGORY VALUES  ........................................... 21
   4.9 EUN PERSON ROLE IN ORGANISATION VALUES  ...................... 22
   4.10 EUN PHONE TYPE VALUES  .................................................. 22
   4.11 EUN SUBJECT VALUES  ....................................................... 23
   4.12 ISO COUNTRY CODE LIST VALUES  ....................................... 23

5 THE SERVICE-ORIENTED ARCHITECTURE (SOA)  ....................... 24
   5.1 THE JSON BINDING  ............................................................. 24
   5.2 THE REST INTERFACE  ........................................................ 26

6 AUTHENTICATION AND AUTHORIZATION  ................................. 29
   6.1 OVERALL DESCRIPTION  ....................................................... 29
   6.2 AUTHORIZATION SUMMARY TABLE  ........................................ 31
7 USER INTERFACES ........................................................................................................33
  7.1 THE USER INTERFACE FOR PERSON ....................................................................33
  7.2 THE USER INTERFACE FOR EVENTS ....................................................................37

8 CONCLUSION AND FUTURE WORK .................................................................40

APPENDIX 1 : LIST OF ABBREVIATIONS .........................................................41

APPENDIX 2 : DATA TYPES ..................................................................................42
  8.1.1 CharacterString .................................................................................................42
  8.1.2 Number ...............................................................................................................42
  8.1.3 Boolean ...............................................................................................................42
  8.1.4 DateTime .............................................................................................................42
  8.1.5 Duration .............................................................................................................42
  8.1.6 Language ..........................................................................................................43
  8.1.7 UriId ....................................................................................................................43
  8.1.8 LangString .........................................................................................................44
  8.1.9 VocabularyTerm .................................................................................................44
1 INTRODUCTION

iTEC is a large-scale validation project about what (existing and new) ICT is useful or can be made to work in schools. In this context, example key questions are (see competency questions in deliverable D10.1):

- Are there good stories of - or good ideas for use of ICT in the classroom that are applicable to my own situation?
- Which technologies are (becoming) available?
- Which persons could contribute to the lesson a teacher is preparing?
- Which persons could contribute to the lesson or educational activity itself?
- What events are interesting for me as a teacher to attend?
- What events could be interesting as an educational activity for learners?
- How can I get hold of persons that are willing to contribute to learning activities?
- How can I participate in events?
- Which digital and other resources are available?
- How can I obtain them?
- How can I integrate them in my technical environment, my workflow, my class room activity?
- etc

In order to support this information need, iTEC developed a number of concepts including Scenario, Learning Story, Activity, Tool, Person, Event, Technical Setting, etc that when properly described will help answering these questions (see D9.1: Analysis and Design Documents for the Directory). This document reports on the system for sharing information about persons and events. Existing solutions such as LinkedIn, Facebook, events sites do not allow an integrated approach as access through an API is limited. In addition, they miss important elements such as the expertise of persons (including teachers) in certain subjects. Furthermore, many teachers and learners have rejected to bring compulsory education into their private social networks. Therefore, a comprehensive directory is required allowing to tailor the available information to the iTEC needs.

PURPOSE AND SCOPE OF THE TASK LEADING TO D9.2

This task is concerned with the development of a web application supporting the sharing of information about persons and events following the information modelling task 9.1. This comprises the following subtasks:

- Review the conceptual descriptions (information models) and controlled vocabularies provided in D9.1
- Elaborate the bindings for these models to relevant technologies
- Develop a functional architecture and functional specifications for the persons and events directory
- Develop a technical architecture (a Service-Oriented Architecture) for the persons and events directory
- Prepare for integration with the iTEC User Management and Access Control (UMAC) system
- Develop the interfaces for this Service-Oriented Architecture
- Construction and testing of the web application
RELATIONSHIP WITH OTHER TASKS

WP9 has as main task to provide the iTEC directory for persons and events. As such it relates to a number of other WPs in the project.

- WP3, WP6, WP7, WP8 and WP10 provided further contributions for the modelling of persons and events as well as the functional requirements
- An intense collaboration happened with WP7 about the iTEC UMAC system as there is a strong relationship between users and the persons stored in the iTEC directory. Moreover, the iTEC directory was the first application to use the UMAC system, which was instrumental in getting UMAC operational.

Users of the iTEC directory are:
- WP3 when they run the pre-pilots and elaborate the pre-pilots
- WP4 and WP6 when running the pilots
- WP5 will rely on the directory for getting usage data.
- WP7 and WP8 are interfacing with the iTEC directory for providing the iTEC Composer functionality.
- WP10 is taking the information stored in the iTEC directory as a basis for the SDE data storage. Data in the iTEC Directory will be periodically transferred to the SDE, to be transformed and enriched using a semantic representation. Therefore, a complete binding will be provided between information models used in both systems.

STRUCTURE OF THE DOCUMENT

Section 2 gives an overview of the iTEC functional requirements and an overview of the iTEC architecture. Sections 3 and 4 give the revised information model and the revised vocabularies respectively. Section 5 describes the Service-Oriented Architecture (SOA) including the JSON binding and REST interface. Section 6 describes the authentication and authorization for the iTEC Persons and Events Directory, and section 7 shows the user interfaces of the iTEC Directory. Finally section 8 provides a conclusion and highlights future work.

IMPACTS OF THE DELIVERABLE

iTEC PROJECT

This deliverable relates to milestone MS29 (due month 21)

There are no new risks detected during the period under report.

ETHICAL ISSUES
None

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\(^2\) Revision of the information model in D9.1
IPR ISSUES
One issue is the IPR of the data that users submit and edit, in particular the data about themselves. The EUN, who is hosting the directory, is a registered organization in Belgium following the European privacy directives. Nevertheless it will be important to also clarify the intended use of the ALL the data including those about Events and even data gathered outside the context of the iTEC Directory. Therefore, a general project approach will be elaborated.
2 THE ITEC DIRECTORY FUNCTIONAL REQUIREMENTS AND ARCHITECTURE OVERVIEW

This section gives an overview of the functional requirements as well as an overview of the technical architecture.

2.1 FUNCTIONAL REQUIREMENTS OVERVIEW

The functional requirements arise from elaborating use cases during the first year of the project (see section 11.2 of Deliverable D7.1) as well as further elaborations in the second year of the project. Key points of the functional requirements of the ITEC directory are as follows:

User interface
- An intuitive interface that allows users to make use of the functionality defined here, with little or no training.
- A user interface accessible by the user connected to the Internet via a web browser

Persons
- Users will be able to register/edit personal information securely, to enable other individuals (e.g., other teachers and learners) to identify them as individuals
- Users will have control over which information they keep secure or share with others
- Users will be able to selectively share/restrict personal information with other users
- Users can search or browse for persons relevant to their learning story, and view details of a selected person

Events
- Users will be able to create/delete/edit events
- Users can search or browse for events relevant to their learning story, and view details of a selected event.
- Users will be able to request participation to selected events
- Users will be able to make events accessible to other users

2.2 TECHNICAL ARCHITECTURE OVERVIEW

The iTEC directory three-tier technical architecture is depicted in Figure 2.1. While the iTEC directory back-end has its own front-end and business logic, it is serving other systems as well such as the iTEC Composer developed by WP7 and the Scenario Development Engine (SDE), as developed by WP10. The back-end also integrates the authentication/authorization functionality developed by WP7.
The directory back-end (in blue colour) consists of Authentication/Authorization modules (see section 6), a Directory Back-end Manager and a Directory Back-end Data store. The latter holds data of the following object types (see section 3 for more information).

- ITECOBJECT: This is an abstract type. Any of the other object types mentioned here are a subtype of ITECOBJECT. An ITECOBJECT has for example an id, a last modification date, and the last operation (create, update, or delete) performed that each subtype will inherit.
- Person: A human being playing a role in the context of iTEC.
- Event: Something that happens or takes place at a determinable place and time

The functionality of the iTEC Directory back-end is as follows:

- Update: Persons and Events can be created, updated, and deleted.
- Validate: The information provided is validated according to validation schemes
- Enrich: Information provided can be enriched by external sources. For example relationships between persons can derived from existing social networks.
- Index. Information provided needs to be indexed for search.
- Search. Persons and Events can be searched using a query language
- Expose. Details about Persons and Events are exposed in the iTEC Directory back-end interface.

---

Figure 2.1 The three-tier architecture of the iTEC directory

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3 An abstract type can not be populated directly, but only when one of its subtypes is created.
4 To be provided later in the project (planned for phase 3)
3 THE ITEC DIRECTORY INFORMATION MODEL

The iTEC directory information model describes all the information that can be recorded in and retrieved from the iTEC directory. This section provides the revised\(^5\) information model itself, using the data types given in APPENDIX 2:

### 3.1 INFORMATION MODEL FORMAT

For each object type as well as compound data type a full specification is given. Such a specification consists of a structured set of data elements (see for example section 3.1.2). Each data element has:

- A reference number. Reference numbers may be structured indicating that it is an element within a container element. For example: 'ictChannel' may consist of a tuple `<name, connection>`. Elements of the tuple would have a reference number 16.1 and 16.2, while the container element would have the reference number 16. Elements indicating a relationship to instances of another object type start from reference number 100.
- A name. A name which is unique within the object type or the container element.
- A description. A textual description of the data element.
- Multiplicity. Multiplicity indicates how many times a data element may occur. It can be a single integer \(n\), which indicates that the data element should appear exactly \(n\) times. The most common use of \(n\) is 1, indicating that the data element should occur exactly once. Multiplicity may also be given as a range of two integers \(n..m\), indicating that the data element should occur minimum \(n\) times and maximum \(m\) times. Finally, multiplicity can be given as \(n..*\), indicating that the data element should occur minimum \(n\) times and that the maximum is undefined. In this case a number known as the **smallest permitted maximum** is given in parenthesis. This is the minimum number of items that the directory or another data handling tool is expected to be able to handle for a given data element. That is, implementers cannot set a maximum number of items that can be recorded for an element that is any smaller than the number specified by the smallest permitted maximum.
- Order. This attribute takes the value **unspecified** for multiplicity 1 or \(0..1\), and **ordered** or **unordered** otherwise. When the value **ordered** is given, then more explanation can be found in the Note column.
- Value Space. The space from which values can be drawn. For example it may be a set of vocabulary terms.
- Data type: See Appendix 2
- Note. An additional note where appropriate. This may for example refer to Semantic Web equivalences (e.g., foaf\(^6\):givenName) for later use.

---

\(^5\) The information model of D9.1 has been revised and is presented here.

\(^6\) foaf stands for friend of a friend, one of the semantic web ontologies.
### 3.1.1 ITECOBJECT

<table>
<thead>
<tr>
<th>Nr</th>
<th>Name</th>
<th>Description</th>
<th>Multiplicity</th>
<th>Order</th>
<th>Value space</th>
<th>Data type</th>
<th>Note</th>
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</thead>
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</tr>
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<td>DateTime stamp</td>
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</tr>
<tr>
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<td>Last operation</td>
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<td>Integer</td>
<td>This field is used for the harvesting process</td>
</tr>
<tr>
<td>4</td>
<td>owner</td>
<td>The Person who has maximum rights to this Object</td>
<td>1</td>
<td>Unspecified</td>
<td>Urid</td>
<td>Urid</td>
<td>Usually the creator</td>
</tr>
</tbody>
</table>
### 3.1.2 Person

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<th>Name</th>
<th>Description</th>
<th>Multiplicity</th>
<th>Order</th>
<th>Value space</th>
<th>Data type</th>
<th>Note</th>
</tr>
</thead>
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<td>givenName</td>
<td>Given name or first name</td>
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<td>Unspecified</td>
<td>CharacterString</td>
<td>foaf:givenName</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>familyName</td>
<td>Family name or last name / surname</td>
<td>1</td>
<td>Unspecified</td>
<td>CharacterString</td>
<td>foaf:familyName</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>birthDate</td>
<td>Date of birth</td>
<td>0..1</td>
<td>Unspecified</td>
<td>Date</td>
<td>bio:event -&gt; bio:Birth -&gt; and bio:date</td>
<td></td>
</tr>
<tr>
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<td>gender</td>
<td>Gender of the Person</td>
<td>0..1</td>
<td>Unspecified</td>
<td>EUN Gender Values</td>
<td>VocabularyTerm</td>
<td>foaf:gender</td>
</tr>
<tr>
<td>5</td>
<td>description</td>
<td>Description of the Person</td>
<td>0..1</td>
<td>Unspecified</td>
<td>CharacterString</td>
<td>dct:description</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>tag</td>
<td>Free tags (descriptive word or phrase) for this Person</td>
<td>0..* (100)</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>category</td>
<td>The category of a Person</td>
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<td>EUN Person Category Values</td>
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<tr>
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<td>The role of a Person</td>
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<td></td>
</tr>
<tr>
<td>9</td>
<td>img</td>
<td>A URL to the image of this Person</td>
<td>0..1</td>
<td>Unspecified</td>
<td>URL</td>
<td>CharacterString</td>
<td>In LinkedDate: foaf:Img. (But it might be resolved differently)</td>
</tr>
<tr>
<td>10</td>
<td>address</td>
<td>Postal address of the Person</td>
<td>0..1</td>
<td>Unspecified</td>
<td>CharacterString</td>
<td></td>
<td></td>
</tr>
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</tr>
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</tr>
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<td></td>
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<td>-----</td>
<td>------</td>
<td>-----------------------------</td>
<td>------------------------------------------------</td>
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<td>11</td>
<td>mbox</td>
<td>1</td>
<td></td>
<td>CharacterString, a valid email address</td>
<td>In LinkedData: foaf:mbox</td>
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<td></td>
</tr>
<tr>
<td>12</td>
<td>website</td>
<td>0..1</td>
<td></td>
<td>URL</td>
<td>CharacterString foaf:homepage</td>
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<td></td>
</tr>
<tr>
<td>13</td>
<td>languageMother Tongue</td>
<td>0..1</td>
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<td>Language</td>
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<tr>
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<td>15.2</td>
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</tr>
<tr>
<td>16</td>
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</tr>
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<td>18</td>
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<td></td>
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<td></td>
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<tr>
<td>19</td>
<td>cost</td>
<td>0..1</td>
<td></td>
<td>EUN General Yes-No Values. Default: no</td>
<td>VocabularyTerm The purpose of participating is</td>
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<td></td>
</tr>
<tr>
<td>101</td>
<td>knows</td>
<td>0..* (10000)</td>
<td>Unordered</td>
<td>UriId</td>
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<td></td>
</tr>
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<td>A relation indicating a User trusts this Person</td>
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<td>Unordered</td>
<td>UriId</td>
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<td></td>
</tr>
<tr>
<td>-----</td>
<td>-------</td>
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<td>-----------</td>
<td>-------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>103</td>
<td>tool</td>
<td>The tools used by this Person</td>
<td>0..* (1000)</td>
<td>Unordered</td>
<td>UriId</td>
<td>The data type depends on the final decision on how this element is managed.</td>
<td></td>
</tr>
</tbody>
</table>
### 3.1.3 Event

<table>
<thead>
<tr>
<th>Nr</th>
<th>Name</th>
<th>Description</th>
<th>Multiplicity</th>
<th>Order</th>
<th>Value space</th>
<th>Data type</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>name</td>
<td>The name of the Event</td>
<td>1</td>
<td>Unspecified</td>
<td></td>
<td>LangString</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>eventStart</td>
<td>Starting data/time of the Event</td>
<td>0..1</td>
<td>Unspecified</td>
<td></td>
<td>Date</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>eventEnd</td>
<td>Ending data/time of the Event</td>
<td>0..1</td>
<td>Unspecified</td>
<td></td>
<td>Date</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>recurrence</td>
<td>The recurrence of this event</td>
<td>0..1</td>
<td>Unspecified</td>
<td></td>
<td>CharacterString</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>subject</td>
<td>Tags indicating the educational subject of this event</td>
<td>0..&quot;(100)</td>
<td>Unordered</td>
<td>EUN Subject Values</td>
<td>VocabularyTerm</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>description</td>
<td>Event description</td>
<td>0..1</td>
<td>Unspecified</td>
<td></td>
<td>LangString</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>tag</td>
<td>Free tags (descriptive word or phrase) for this Event</td>
<td>0..&quot;(100)</td>
<td>Unordered</td>
<td></td>
<td>CharacterString</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>intendedAudience</td>
<td>Description of the intended audience</td>
<td>0..1</td>
<td>Unordered</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8.1</td>
<td>personCategory</td>
<td>Category of person</td>
<td>0..&quot;(100)</td>
<td>Unordered</td>
<td>EUN Person Category Values</td>
<td>VocabularyTerm</td>
<td>Age range is applicable if 8.1 is learner</td>
</tr>
<tr>
<td>8.2</td>
<td>ageRange</td>
<td>Age Range</td>
<td>0..&quot;(100)</td>
<td>Unordered</td>
<td>EUN Age Range Values</td>
<td>VocabularyTerm</td>
<td></td>
</tr>
<tr>
<td>8.3</td>
<td>educationLevel</td>
<td>Level of educational subject</td>
<td>0..&quot;(100)</td>
<td>Unordered</td>
<td>EUN Educational Context Values</td>
<td>VocabularyTerm</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>location</td>
<td>Place of the Event</td>
<td>0..1</td>
<td>Unspecified</td>
<td></td>
<td>CharacterString</td>
<td></td>
</tr>
<tr>
<td>9.1</td>
<td>name</td>
<td>Name of the Place of the Event</td>
<td>0..1</td>
<td>Unspecified</td>
<td></td>
<td>CharacterString</td>
<td></td>
</tr>
<tr>
<td>9.2</td>
<td>streetAddress</td>
<td>The street of a postal address</td>
<td>0..1</td>
<td>Unspecified</td>
<td></td>
<td>CharacterString</td>
<td></td>
</tr>
<tr>
<td>9.3</td>
<td>postalCode</td>
<td>The postal code of a postal address</td>
<td>0..1</td>
<td>Unspecified</td>
<td></td>
<td>CharacterString</td>
<td></td>
</tr>
<tr>
<td>9.4</td>
<td>locality</td>
<td>The locality of a postal address</td>
<td>0..1</td>
<td>Unspecified</td>
<td></td>
<td>CharacterString</td>
<td></td>
</tr>
<tr>
<td>9.5</td>
<td>country</td>
<td>Country where the event takes place</td>
<td>0..1</td>
<td>Unspecified</td>
<td></td>
<td>ISO Country Code List Values</td>
<td>VocabularyTerm</td>
</tr>
<tr>
<td>9.6</td>
<td>category</td>
<td>Location category of the event</td>
<td>0..1</td>
<td>Unspecified</td>
<td></td>
<td>EUN Event Place Values</td>
<td>VocabularyTerm</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Type of Event</td>
<td></td>
<td></td>
<td>EUN Event Type Values</td>
<td>Vocabulary Term</td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>----------------</td>
<td>---</td>
<td>---</td>
<td>------------------------</td>
<td>-----------------</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>eventType</td>
<td>Type of Event</td>
<td>0..*(100)</td>
<td>Unspecified</td>
<td>EUN Event Type Values</td>
<td>Vocabulary Term</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>online</td>
<td>Indicator whether the event is online</td>
<td>0..2</td>
<td>Unspecified</td>
<td>online in-person</td>
<td>Vocabulary Term</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>language</td>
<td>Language of the Event</td>
<td>0..*(100)</td>
<td>Unordered</td>
<td>Language</td>
<td>The order of entry is preserved</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>website</td>
<td>Website of the Event</td>
<td>0..1</td>
<td>Unspecified</td>
<td>URL</td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>organizer</td>
<td>Name of the organizer</td>
<td>0..*(100)</td>
<td>Ordered</td>
<td>CharacterString</td>
<td></td>
<td></td>
</tr>
<tr>
<td>14,1</td>
<td>name</td>
<td>Name of the organizer</td>
<td>0..1</td>
<td>Unspecified</td>
<td>CharacterString</td>
<td></td>
<td></td>
</tr>
<tr>
<td>14,2</td>
<td>url</td>
<td>URL of the organizer</td>
<td>0..1</td>
<td>Unspecified</td>
<td>CharacterString</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>cost</td>
<td>Whether this event is free of charge or not</td>
<td>0..1</td>
<td>Unspecified</td>
<td>EUN General Yes-No Values. Default: no</td>
<td>Vocabulary Term</td>
<td></td>
</tr>
<tr>
<td>100</td>
<td>tools</td>
<td>Supporting tools.</td>
<td>0..*(100)</td>
<td>Unordered</td>
<td>UriId</td>
<td>For example FlashMeeting</td>
<td></td>
</tr>
</tbody>
</table>
4 VOCABULARIES

iTEC vocabularies are stored and managed in the European Schoolnet's Vocabulary Bank for Education (VBE\(^7\)). The VBE service makes it possible to manage a range of multilingual, controlled lists relevant to iTEC and learning in the European Union. It also stores a thesaurus used to describe educational topics. The VBE is provided as a web application enabling users to search or browse stored vocabularies in order to find out more about the terms used, their relationships, contexts and translations. The repository of published vocabularies is available for anyone to view via a web browser and the VBE can be searched and browsed to locate iTEC vocabularies or individual terms without registration or logging in. In order to be able to download vocabularies users must register. The VBE also offers a REST API allowing other iTEC tools and services to access the iTEC vocabularies and their translations in VDEX, Zthes\(^8\), and SKOS formats.

http://europeanschoolnet-vbe.lexaurus.net/vbe/

The iTEC directory information model references the following vocabularies:

4.1 EUN AGE RANGE VALUES

This vocabulary has values 1-24 and 25+.

4.2 EUN EDUCATIONAL CONTEXT VALUES

- college/university
- lower secondary school
- post-secondary institution other than university
- pre-primary school
- primary level school
- university granting advanced degrees
- upper secondary school

4.3 EUN EVENT PLACE VALUES

- aquarium
- art museum
- garden
- history museum
- home
- movie theater
- park
- performing arts venue
- planetarium
- playground
- school campus
  - class room
- science museum
- stadium

\(^7\) The VBE was developed in the ASPECT project
\(^8\) See http://zthes.z3950.org/
- street
- university campus
- virtual
- zoo
- other

4.4 **EUN EVENT TYPE VALUES**

- virtual meeting
- in service training
- school event
- community event
- hot seat
- workshop
- seminar
- conference

4.5 **EUN GENDER VALUES**

- male
- female

4.6 **EUN GENERAL YES-NO VALUES**

- yes
- no

4.7 **EUN ICT CHANNEL VALUES**

- AIM
- facebook
- jabber
- linkedin
- MSN
- skype
- twitter
- YM

4.8 **EUN PERSON CATEGORY VALUES**

- author
- counsellor
- expert
- learner
- manager
- parent
- teacher
• OTHER

4.9 EUN PERSON ROLE IN ORGANISATION VALUES

• administration manager
• advertising and public relations manager
• careers adviser
• comenius assistant
• curriculum specialist
• database architect
• educational counsellor
• educational psychologist
• education manager/principal
• guide
• ICT coordinator
• ICT service manager
• ICT support staff
• information professional
• information technology trainer
• inspector
• journalist
• learner
• master teacher
• migrant education teacher
• multimedia designer
• museum curator
• other
• policy and planning manager
• pre-school teacher
• primary school teacher
• professional services manager
• public relations professional
• research and development manager
• secondary education teacher
• senior government official
• special education teacher
• teacher intern
• training professional
• translator
• university lecturer/professor
• vocational education teacher
• web and multimedia developer
• writer

4.10 EUN PHONE TYPE VALUES

• fax
• home
• mobile
• work
4.11 EUN SUBJECT VALUES

This vocabulary is taken from eTwinning⁹.

- art
- astronomy
- biology
- chemistry
- citizenship
- classical languages
- cross curricular
- design and technology
- drama
- economics
- environmental education
- ethics
- european studies
- foreign languages
- geology
- health studies
- history
- history of culture
- home economics
- Informatics / ict
- language and literature
- mathematics / geometry
- media education
- music
- natural sciences
- philosophy / logic
- physical education
- physics
- politics
- pre-school subjects
- primary school subjects
- psychology
- religion
- social studies / sociology
- special needs education
- technology
- OTHER (specify)

4.12 ISO COUNTRY CODE LIST VALUES

The vocabulary for Country is taken from ISO 3166.

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⁹ eTwinning is part of Comenius, the EU programme for schools
5 THE SERVICE-ORIENTED ARCHITECTURE (SOA)

The iTEC Directory architecture is implemented following a Service-Oriented approach. The iTEC Directory back-end is exposed through a Representational State Transfer (REST) interface. The REST interface is situated between the blue and green boxes of figure 2.1.

5.1 THE JSON BINDING

When implementing a web-based SOA the number of calls should be minimised and therefore more complex structures than relational tables in third normal form are used for communicating with the REST service. A REST service can handle in principle any valid Internet media type. However, this is often JSON, XML, or YAML. JSON\(^\text{10}\) is promoted as a low-overhead alternative to XML as both of these formats have widespread support for creation, reading and decoding in the real-world situations where they are commonly used. JSON is gaining in popularity because of the fact that a JSON string represents a data structure in JavaScript and other languages used to build web front-ends. This is an important aspect in the context of widgets being implemented in iTEC. In addition JSON strings are more readable. Therefore a JSON binding has been chosen.

The API provides methods that take objects, as described in the information model of section 3, in the form of a JSON string as part of the parameters. The correspondence between the information model and JSON strings is as follows:

<table>
<thead>
<tr>
<th>iTec data type</th>
<th>JSON data type</th>
</tr>
</thead>
<tbody>
<tr>
<td>CharacterString</td>
<td>String</td>
</tr>
<tr>
<td>Number</td>
<td>Number</td>
</tr>
<tr>
<td>Boolean: true</td>
<td>true</td>
</tr>
<tr>
<td>Boolean: false</td>
<td>false</td>
</tr>
<tr>
<td>DateTime</td>
<td>String</td>
</tr>
<tr>
<td>Duration</td>
<td>String</td>
</tr>
<tr>
<td>Language</td>
<td>String</td>
</tr>
<tr>
<td>UriId</td>
<td>String</td>
</tr>
<tr>
<td>LangString</td>
<td>{Language: String}</td>
</tr>
<tr>
<td>VocabularyTerm</td>
<td>String(^\text{11})</td>
</tr>
</tbody>
</table>

The API works under the closed world assumption. This means that if a value for a field is missing, it is supposed not to exist in the world that the information model is describing. The value ‘null’ indicates a missing value. In some cases, values might not be known although one is sure that a corresponding situation does exist in the real world. For example, gender of a person, will always exist but might be unknown. If it is important for applications to make this distinction, such applications should provide a JSON string with appropriate values such as “unknown” or “undefined”.

\(^\text{10}\) See [http://www.json.org/](http://www.json.org/)

\(^\text{11}\) The simplified form String can be used given that the ‘source’ of the vocabulary is always the VBE.
### Multiplicity

If the multiplicity in the information model specifies '0..*' or '1..*', then the values are given as a JSON array. For example:

```
"languageOther": [
  "en",
  "fr",
  "de"
],
```

### Compound data elements

Compound data elements such as 'ictChannels' take JSON objects or a JSON array of JSON objects as values

```
"ictChannels": [
  {
    "channel": "linkedIn",
    "connection": "blahblah"
  },
  {
    "channel": "skype",
    "connection": "ehcssanavf"
  }
],
```

### Example JSON Binding

Table 5.1 gives an example person.

```
{
  "id": "http://itec-directory.eun.org/Person/305",
  "givenName": "Frans",
  "familyName": "Van Assche",
  "loginName": "fvanassche",
  "languageMotherTongue": "nl",
  "languageOther": ["fr","en","de"],
  "mbox": "frans.van.assche@plok.com",
  "website": "www.mywebsite.be/fvanassche",
  "gender": 1,
  "cost": "no",
  "description": "I'm working on this great project called iTEC",
  "birthDate": "1948-11-26",
  "streetAddress": "iTEC street, 108",
  "postalCode": "B-1000",
  "locality": "Brussels",
  "country": "BE",
  "expertise": [{"field":"11020","level":9}, {"field":"11022","level":6}],
  "otherMboxes": [{"connection":"frans.va@plok.be"}],
  "ictChannels": [{"name":"skype", "connection":"fvanassche"},
  {"name":"twitter", "connection":"fva"},
  {"name":"facebook", "connection":"fvanassche"}],
  "phones": [{"name":"home", "connection":"+3217123456"},
  {"name":"mobile", "connection":"+32469123456"}]
}```
5.2 THE REST INTERFACE

Representational state transfer (REST) is a style of software architecture for distributed systems such as the World Wide Web. REST has emerged over the past few years as a predominant Web service design model. REST has increasingly displaced other design models such as SOAP and WSDL due to its simpler style. The iTEC Directory uses HTTP to implement its REST services using the http verbs GET, POST, PUT, and DELETE. The requests, payload, status codes, and responses are as described in the tables underneath.

The <object type> may be ‘Person’ or ‘Event’. The <id> is an integer assigned by an iTEC component. All integer identifiers in iTEC have a suffix according to the identifier generating authority. KU Leuven is the identifier generating authority for the iTEC Directory and creates identifiers with the suffix ‘05’. The expression <path> refers to the URI path used for the REST services.

The iTEC URI identifier (see 8.1.7) can be constructed from the <objectType>/<id> described here by prefixing it by the Person and Event directory namespace prefix http://itec-directory.eun.org/.

GET <path>/<object type>/<id>
This verb is used to get an object with a specific id. The response is as follows:

<table>
<thead>
<tr>
<th>Status code</th>
<th>When</th>
<th>Response Entity</th>
</tr>
</thead>
<tbody>
<tr>
<td>200</td>
<td>If OK</td>
<td>The object requested, returned as a JSON string.</td>
</tr>
<tr>
<td>404</td>
<td>If the object with id &lt;id&gt; can not be found</td>
<td>The standard 404 response as generated by the server</td>
</tr>
<tr>
<td>400</td>
<td>In all other cases</td>
<td>A JSON string of the format {&quot;error&quot;: {&quot;code&quot;: &lt;code&gt;, &quot;message&quot;: &lt;message&gt;}}</td>
</tr>
</tbody>
</table>

GET <path>/<object type>/search?q=<query string>
This verb is used to get a collection of objects that fulfil the criteria of the <query string>. The <query string> is a JSON array of JSON elements. The interpretation is a conjunction of all elements of the Array. Each element of the array can be either a JSON Object or a JSON array, the latter representing a disjunction of its elements. The response is as follows:

<table>
<thead>
<tr>
<th>Status code</th>
<th>When</th>
<th>Response Entity</th>
</tr>
</thead>
<tbody>
<tr>
<td>200</td>
<td>If OK</td>
<td>A collection of objects (including an empty collection). The collection is returned as a JSON array.</td>
</tr>
<tr>
<td>404</td>
<td>If the object with id &lt;id&gt; can not be found</td>
<td>The standard 404 response as generated by the server</td>
</tr>
</tbody>
</table>

Table 5.1 Example JSON binding for Person
<table>
<thead>
<tr>
<th>Status Code</th>
<th>Description</th>
<th>Error Message Format</th>
</tr>
</thead>
<tbody>
<tr>
<td>400</td>
<td>In all other cases</td>
<td>A JSON string of the format <code>{&quot;error&quot;: {&quot;code&quot;: &lt;code&gt;, &quot;message&quot;: &lt;message&gt;}}</code></td>
</tr>
</tbody>
</table>
POST <path>/<object type>
This verb is used to create a new object of the specified object type. The payload is a JSON string.

<table>
<thead>
<tr>
<th>Status code</th>
<th>When</th>
<th>Response Entity</th>
</tr>
</thead>
<tbody>
<tr>
<td>201</td>
<td>If OK</td>
<td>A JSON string with the created object id. If the payload contains an id, it will be discarded and be overwritten.</td>
</tr>
<tr>
<td>400</td>
<td>In all other cases</td>
<td>A JSON string of the format {&quot;error&quot;: {&quot;code&quot;: &lt;code&gt;, &quot;message&quot;: &lt;message&gt;}}</td>
</tr>
</tbody>
</table>

PUT<sup>12</sup> <path>/<object type>/<id>
This verb is used to update an existing object of the specified object type. The payload is a JSON string. If the payload contains an id, that id will be overwritten by the id in the URI. If the <id> has a suffix ’05’, the object must exist. Otherwise a 410 will be returned. To this general rule there is an exception. If the suffix of the id is different from ’05’, the object will be created if it does not exist.

<table>
<thead>
<tr>
<th>Status code</th>
<th>When</th>
<th>Response Entity</th>
</tr>
</thead>
<tbody>
<tr>
<td>200</td>
<td>If OK</td>
<td>Null</td>
</tr>
<tr>
<td>410</td>
<td>if the id can not be found</td>
<td>The standard 410 response as generated by the server</td>
</tr>
<tr>
<td>400</td>
<td>In all other cases</td>
<td>A JSON string of the format {&quot;error&quot;: {&quot;code&quot;: &lt;code&gt;, &quot;message&quot;: &lt;message&gt;}}</td>
</tr>
</tbody>
</table>

DELETE <path>/<object type>/<id>
This verb is used to delete an existing object of the specified object type.

<table>
<thead>
<tr>
<th>Status code</th>
<th>When</th>
<th>Response Entity</th>
</tr>
</thead>
<tbody>
<tr>
<td>200</td>
<td>If OK</td>
<td>Null</td>
</tr>
<tr>
<td>410</td>
<td>if the id can not be found</td>
<td>The standard 410 response as generated by the server</td>
</tr>
<tr>
<td>400</td>
<td>In all other cases</td>
<td>A JSON string of the format {&quot;error&quot;: {&quot;code&quot;: &lt;code&gt;, &quot;message&quot;: &lt;message&gt;}}</td>
</tr>
</tbody>
</table>

If none of the above patterns fit, the REST service responds with a status code ‘405: Method Not Allowed’. If the payload is not a valid JSON string, the REST service will respond with ‘406: Not Acceptable’. If the payload is not a JSON string the service will return a ‘415: Unsupported Mediatype’.

<sup>12</sup> There is also a PUT variant implemented that allows privileged users to update an object and if the object does not exist, it is created.
6 AUTHENTICATION AND AUTHORIZATION

This section gives the overall description of the authentication and authorization mechanisms for the iTEC Person and Event directory as well as a summary table of the authorizations.

6.1 OVERALL DESCRIPTION

The iTEC Directory back-end uses the so-called iTEC User Management and Access Control (UMAC) system developed in WP7. This is a separate system that works together with the authentication/authorization modules of the iTEC Directory. Authentication and Authorization is based on the OAUTH protocol. The OAUTH implicit authorization grant type\(^{13}\) is chosen because the iTEC Directory exposes a REST interface to be used by clients such as browsers or widgets using HTML and JavaScript. Such clients are incapable of maintaining the credentials confidential (for authenticating with the authorization server).

As a redirection-based flow, the client must be capable of interacting with the resource owner's user-agent (typically a web browser) and capable of receiving incoming requests (via redirection) from the authorization server.

Unlike the authorization code grant type in which the client makes separate requests for authorization and access token, the client receives the access token as the result of the authorization request.

Using the implicit grant type does not include client authentication since the client is unable to maintain their credential confidentiality (the client resides on the resource owner's computer or device which makes the client credentials accessible and exploitable). Because the access token is encoded into the redirection URI, it may be exposed to the resource owner and other applications residing on its computer or device.

The flow illustrated in Figure 6.1 includes the following steps:

1. The client initiates the flow by directing the resource owner's user-agent to the authorization endpoint. The client includes its client identifier, requested scope, local state, and a redirection URI to which the authorization server will send the user-agent back once access is granted (or denied).
2. The authorization server authenticates the resource owner (via the user-agent) and establishes whether the resource owner grants or denies the client's access request.
3. Assuming the resource owner grants access, the authorization server redirects the user-agent back to the client using the redirection URI provided earlier. The redirection URI includes the access token in the URI fragment.
4. The user-agent follows the redirection instructions by making a request to the web server (does not include the fragment). The user-agent retains the fragment information locally.
5. The web server returns a web page (typically an HTML document with an embedded script) capable of accessing the full redirection URI including the fragment retained by the user-agent, and extracting the access token (and other parameters) contained in the fragment.
6. The user-agent executes the script provided by the web server locally, which extracts the access token and passes it to the client.

\(^{13}\) This is fully described on [http://tools.ietf.org/html/draft-ietf-oauth-v2-23#section-4.2](http://tools.ietf.org/html/draft-ietf-oauth-v2-23#section-4.2)
Figure 6.1 The Implicit Grant Flow

Additional information on the whole process and motivation for OAuth can be found in iTEC Internal Deliverable 7.2: "Authentication & Authorization in iTEC".

The behavior of the REST interface of the iTEC Directory with respect to authentication and authorization is as follows:

<table>
<thead>
<tr>
<th>Status code</th>
<th>When</th>
<th>Response Entity</th>
</tr>
</thead>
<tbody>
<tr>
<td>401</td>
<td>If the request requires user authentication.</td>
<td>The standard 401 response as generated by the server</td>
</tr>
<tr>
<td>403</td>
<td>If the server understood the request, but is refusing to fulfill it because of authorization rule violation.</td>
<td>The standard 403 response as generated by the server</td>
</tr>
</tbody>
</table>
6.2 AUTHORIZATION SUMMARY TABLE

The authorization summary table (see table 6.1) has the following elements:

- Use case that is subject to authorization
- Roles. The cells underneath the roles indicate whether this role is authorized (Y) or not (N). N/A means not applicable; a Y! means that the role is authorization is implied because of another role. For example an admin role can search because he is a logged-in user.
- Method. This is the http method.
- Action. The action requested through the REST API
- Payload. Indicating whether the request carries a payload or not.
### Use Cases

<table>
<thead>
<tr>
<th>Use Cases</th>
<th>Roles</th>
<th>Method</th>
<th>Action</th>
<th>Payload</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Persons</strong></td>
<td>Admin</td>
<td>Owner</td>
<td>Trusted user</td>
<td>Logged-in user</td>
</tr>
<tr>
<td>Create profile</td>
<td>Y</td>
<td>N/A</td>
<td>N/A</td>
<td>Y</td>
</tr>
<tr>
<td>Edit Person.X</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>N</td>
</tr>
<tr>
<td>Delete profile.X</td>
<td>Y</td>
<td>Y</td>
<td>N</td>
<td>N</td>
</tr>
<tr>
<td>Get the details of a Person</td>
<td>Y!</td>
<td>Y!</td>
<td>Y!</td>
<td>Y</td>
</tr>
<tr>
<td>I know a Person.X found</td>
<td>Y!</td>
<td>Y!</td>
<td>Y!</td>
<td>Y</td>
</tr>
<tr>
<td>Undo 'I know a Person.X'</td>
<td>Y</td>
<td>Y</td>
<td>N</td>
<td>N</td>
</tr>
<tr>
<td>I trust a Person.X found</td>
<td>Y!</td>
<td>Y!</td>
<td>Y!</td>
<td>Y</td>
</tr>
<tr>
<td>Undo 'I trust a Person.X'</td>
<td>Y</td>
<td>Y</td>
<td>N</td>
<td>N</td>
</tr>
<tr>
<td>Search</td>
<td>Y!</td>
<td>Y!</td>
<td>Y!</td>
<td>Y</td>
</tr>
<tr>
<td>Harvest Person updates</td>
<td>Y</td>
<td>N</td>
<td>N</td>
<td>N</td>
</tr>
<tr>
<td>Harvest/Export Persons as widgets</td>
<td>Y</td>
<td>N</td>
<td>N</td>
<td>N</td>
</tr>
<tr>
<td>Authorize</td>
<td>Y</td>
<td>Y</td>
<td>N</td>
<td>N</td>
</tr>
<tr>
<td><strong>Events</strong></td>
<td>Admin</td>
<td>Owner</td>
<td>Trusted user</td>
<td>Logged-in user</td>
</tr>
<tr>
<td>Create</td>
<td>Y</td>
<td>N/A</td>
<td>N/A</td>
<td>Y</td>
</tr>
<tr>
<td>Edit Event.X</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>N</td>
</tr>
<tr>
<td>Delete Event.X</td>
<td>Y</td>
<td>Y</td>
<td>N</td>
<td>N</td>
</tr>
<tr>
<td>Get the details of an Event</td>
<td>Y!</td>
<td>Y!</td>
<td>Y!</td>
<td>Y</td>
</tr>
<tr>
<td>Like Event.X</td>
<td>Y!</td>
<td>Y!</td>
<td>Y!</td>
<td>Y</td>
</tr>
<tr>
<td>Undo 'I like event.X'</td>
<td>Y</td>
<td>Y</td>
<td>N</td>
<td>N</td>
</tr>
<tr>
<td>Create my Annotation for Event.X</td>
<td>Y!</td>
<td>Y!</td>
<td>Y!</td>
<td>Y</td>
</tr>
<tr>
<td>Delete my Annotation for Event.X</td>
<td>Y</td>
<td>Y</td>
<td>N</td>
<td>N</td>
</tr>
<tr>
<td>Search</td>
<td>Y!</td>
<td>Y!</td>
<td>Y!</td>
<td>Y</td>
</tr>
<tr>
<td>Harvest Event updates</td>
<td>Y</td>
<td>N</td>
<td>N</td>
<td>N</td>
</tr>
<tr>
<td>Harvest/Export Events as widgets</td>
<td>Y</td>
<td>N</td>
<td>N</td>
<td>N</td>
</tr>
<tr>
<td>Authorize</td>
<td>Y</td>
<td>Y</td>
<td>N</td>
<td>N</td>
</tr>
</tbody>
</table>
7 USER INTERFACES

This section describes the user interfaces for editing persons and events, as examples, in order to demonstrate what users can submit, edit, and retrieve.

7.1 THE USER INTERFACE FOR PERSON

The user interface for persons is a tabbed user interface allowing editing parts of the person information. Figure 7.1 addresses the general details of a person. Figure 7.2 addresses the expertise a person might have in different fields. The expertise is modelled on a scale from 1 to 10.

![Figure 7.1 Personal details](image-url)
Figure 7.2 Expertise of a person

Figure 7.2 shows also that expertise fields can be added (see ‘Add Expertise’ button) and deleted (see the pop-up delete button). When a section is modified, it is shown in the tab. The languages that the person is familiar with are given in the language section. See Figure 7.3.

Figure 7.3 Languages of a person

Figure 7.4 shows the address information of the person. This information is for example used to make recommendations to teachers and learners taking into account proximity of the recommended person.
Figure 7.4 Address information of the person

Figure 7.5 shows the different channels through which persons can be contacted. Again this is used in the recommendations making a match between the contact channels of the persons giving and receiving recommendations.

Figure 7.5 Contact channels of the person
Figure 7.6 shows the facetted search. The search can be limited by facets on the right hand side. Details can be shown by clicking on the name of a person.
7.2 THE USER INTERFACE FOR EVENTS

The user interface for events is a tabbed user interface allowing editing parts of the event information. Figure 7.7 addresses the general details of an event. In this figure we see also the popup calendar for specifying the start date and time of the event as well as its end date and time. Figure 7.8 allows specifying the location and location type of the event. An event may have more than one language, as illustrated in Fig 7.9, may be related to more than one learning subject as given in figure 7.10, and finally the intended audience may be specified as depicted in figure 7.11.

![Figure 7.7 General information about the event](image)

![Figure 7.8 Location of the event](image)
Figure 7.7 Languages used in the event

Figure 7.10 Learning subjects related to the event
Figure 7.11 Learning subjects related to the event

Figure 7.12 shows the facetted search. The search can be limited by facets on the right hand side. Details can be shown by clicking on the name of an event.

Figure 7.12 Faceted search of events
8 CONCLUSION AND FUTURE WORK

This document provides a description of the iTEC directory, its requirements, architecture, information model, authentication and authorization, and technologies. The information model and its vocabularies have been updated, aligning it with existing practice in WP4. The Service-Oriented Architecture opens up the iTEC Directory for other systems. This also requires a proper authentication/authorization service to be integrated into the system.

The current implementation allows for sharing information about persons and events, by proper registration, editing, and search functionality. As such it constitutes an important milestone. The directory will be part of an integrated release planned for December 2012 to be used in the cycle 4 piloting in 2013.

Future work will:
- further elaborate the integration with the iTEC User Management and Access Control System (WP7). This will be part of the cycle 4 release.
- investigate what information can be gathered from external sources.
- develop a system for recording usage data. It is planned for cycle 5 piloting.
- investigate how the current functionality can be deployed as easy to install widgets. This is a request by WP7 that will be investigated.
- investigate the use of paradata\(^\text{14}\) of Persons and Events. This has been suggested at the first review and will be investigated after the cycle 4 release.

\(^{14}\) Paradata are data about what people say about something or do about something. In our case it could for example be usage data such as search, inspect Person details, or say they like and Event and annotate it with free text description and/or ratings.
## APPENDIX 1 : LIST OF ABBREVIATIONS

<table>
<thead>
<tr>
<th>ACRONYM</th>
<th>MEANING</th>
</tr>
</thead>
<tbody>
<tr>
<td>FOAF</td>
<td>Friend of a Friend</td>
</tr>
<tr>
<td>IANA</td>
<td>Internet Assigned Numbers Authority</td>
</tr>
<tr>
<td>ICT</td>
<td>Information and Communications Technologies</td>
</tr>
<tr>
<td>ISO</td>
<td>International Standards Organisation</td>
</tr>
<tr>
<td>JSON</td>
<td>JavaScript Object Notation</td>
</tr>
<tr>
<td>LARG</td>
<td>Learning Activity &amp; Resource Guide</td>
</tr>
<tr>
<td>RDF</td>
<td>Resource Description Framework</td>
</tr>
<tr>
<td>REST</td>
<td>Representational state transfer</td>
</tr>
<tr>
<td>SDE</td>
<td>Scenario Development Environment</td>
</tr>
<tr>
<td>SIL</td>
<td>Summer Institute of Linguistics. The full name is not used anymore in favour of SIL international.</td>
</tr>
<tr>
<td>SKOS</td>
<td>Simple Knowledge Organization System</td>
</tr>
<tr>
<td>UML</td>
<td>Unified Modelling Language</td>
</tr>
<tr>
<td>URI</td>
<td>Universal Resource Identifier</td>
</tr>
<tr>
<td>URL</td>
<td>Universal Resource Locator</td>
</tr>
<tr>
<td>VBE</td>
<td>Vocabulary Bank for Education</td>
</tr>
<tr>
<td>VDEX</td>
<td>IMS - Vocabulary Definition Exchange</td>
</tr>
<tr>
<td>W3C</td>
<td>World Wide Web Consortium</td>
</tr>
<tr>
<td>XML</td>
<td>eXtensible Markup Language</td>
</tr>
<tr>
<td>YAML</td>
<td>YAML Ain't Markup Language</td>
</tr>
</tbody>
</table>
APPENDIX 2 : DATA TYPES

The naming convention for object types and their data elements is camel case. The object type names start with an uppercase character, the data elements start with a lowercase character. The iTEC information model supports the following data types:

8.1.1 **CharacterString**
A string of characters in Unicode.

8.1.2 **Number**
An integer or a real. See [http://www.w3.org/TR/xmlschema-2/#isoformats](http://www.w3.org/TR/xmlschema-2/#isoformats)

An integer has a lexical representation consisting of a finite-length sequence of decimal digits (#x30-#x39) with an optional leading sign. If the sign is omitted, "+" is assumed.

A real has a lexical representation consisting of a mantissa followed, optionally, by the character "E" or "e", followed by an exponent. The exponent must be an integer.

8.1.3 **Boolean**
Boolean takes the values 'true' or 'false'.

8.1.4 **DateTime**
This element is based on ISO 8601 and contains date and time information. The format follows Date and Time Formats as specified by the W3 consortium. See [http://www.w3.org/TR/NOTE-datetime](http://www.w3.org/TR/NOTE-datetime) or [http://www.w3.org/TR/xmlschema-2/#isoformats](http://www.w3.org/TR/xmlschema-2/#isoformats)

`YYYY[-MM][-DD][Thh:mm:ss[.ss][TZD]]` where:

- `YYYY` = four-digit year
- `MM` = two-digit month
- `DD` = two-digit day of month
- `hh` = two digits of hour (00 through 23)
- `mm` = two digits of minute (00 through 59)
- `ss` = two digits of second (00 through 59)
- `s` = one or more digits representing a decimal fraction of a second
- `TZD` = time zone designator ("Z" for UTC or +hh:mm or -hh:mm)

At least the four digit year must be present. If additional parts of the DateTime are included, the character literals ",", ",T", ",", and ",." are part of the character lexical representation for the DateTime. If the time portion is present, but the time zone designator is not present, the time zone is interpreted as being UTC.

8.1.5 **Duration**
This element contains information about an interval in time.

`P[yY][mM][dD][T[hH]][mM][s1][.s2]S` where:
y = number of years (integer, > 0)
m = number of months (integer, > 0)
d = number of days (integer, > 0)
h = number of hours (integer, > 0)
n = number of minutes (integer, > 0)
s1 = number of seconds (integer, > 0; or integer >= 0 if s2 > 0)
s2 = fraction of seconds (integer, > 0)

See http://www.w3.org/TR/xmlschema-2/#isoformats
The character literal designators "P", "Y", "M", "D", "T", "H", "M", "S" must appear if the corresponding nonzero value is present. If the value of years, months, days, hours, minutes or seconds is zero, the value and corresponding designation (e.g., "M") may be omitted, but at least one designator and value must always be present. The designator "P" is always present. The designator "T" shall be omitted if all of the time (hours/minutes/seconds) are zero.

8.1.6 Language

In order to specify a language such as in a data element or in any language string, the following coding scheme is used. The first applicable format should be used.

1. use a 2 letter code from ISO 639-1
2. use a 3 letter code from ISO 639-2. See: http://www.loc.gov/standards/iso639-2/normtext.html (it does not matter between bibliographic & terminology since they only differ for languages that have 2-letter codes)
3. add the ISO Country code (ISO 3166) when necessary, separated by a dash.
4. use IANA registered language tags, prefixed with i-
5. use SIL Ethnologue 3-letter codes, prefixed with x-E-
6. make up a name for token languages prefixed with x-t-
7. make up a name, prefixed with 'x-' for user defined languages. A specific category of user defined languages are formal languages. They have a 'x-f-' prefix.

Examples are:

<table>
<thead>
<tr>
<th>Code</th>
<th>Language</th>
</tr>
</thead>
<tbody>
<tr>
<td>nl</td>
<td>Dutch</td>
</tr>
<tr>
<td>aus</td>
<td>Australian Languages</td>
</tr>
<tr>
<td>i-klingon</td>
<td>IANA registered Klingon</td>
</tr>
<tr>
<td>x-E-pcd</td>
<td>Picard</td>
</tr>
<tr>
<td>x-none</td>
<td>Not possible to identify a language</td>
</tr>
<tr>
<td>x-f-ccRDF</td>
<td>Creative Commons expression in RDF format</td>
</tr>
</tbody>
</table>

8.1.7 UriId

UriId is an URI identifier pointing to an object in the iTEC back-end. It is constructed as <name space prefix>/<objecttypename>/<integer>.

- the <name space prefix> for the Person and Event directory is ‘http://itec-directory.eun.org’.
- the <objecttypename> is the object type name as given in the next section.
- the <integer> is a positive integer, ending with two digits ‘05’ which are specific for objects generated by the Person & Events directory

An example URI identifier is http://itec-directory.eun.org /Person/12305.
8.1.8 LangString

LangString data elements contain Language and String parts, allowing the same information to be recorded in multiple languages.

<table>
<thead>
<tr>
<th>Nr</th>
<th>Name</th>
<th>Description</th>
<th>Multiplicity</th>
<th>Order</th>
<th>Value space</th>
<th>Data type</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>langStr</td>
<td>A datatype that represents one or more character strings. A LangString value may include multiple semantically equivalent character strings, such as translations or alternative descriptions.</td>
<td>1..* (100)</td>
<td>Unspecified</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td></td>
<td>language</td>
<td>Human or formal language of the character string.</td>
<td>1</td>
<td>Unspecified</td>
<td>See section 8.1.6</td>
<td>CharacterString</td>
<td></td>
</tr>
<tr>
<td></td>
<td>string</td>
<td>Actual character string.</td>
<td>1</td>
<td>Unspecified</td>
<td>-</td>
<td>CharacterString</td>
<td></td>
</tr>
</tbody>
</table>

8.1.9 VocabularyTerm

VocabularyTerm data elements are constrained in such a way that their entries have to be chosen from a controlled list of terms - composed of source-value pairs - with the source containing the name of the list of terms being used and the value containing the chosen term. In general, the source element will be omitted in iTEC, given that all vocabularies come from the same source; viz. the iTEC vocabularies. However, external vocabularies could be used in the future.

<table>
<thead>
<tr>
<th>Nr</th>
<th>Name</th>
<th>Description</th>
<th>Multiplicity</th>
<th>Order</th>
<th>Value space</th>
<th>Data type</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>source</td>
<td>An indication of the source of the value, for instance through a URI.</td>
<td>0..1</td>
<td>Unspecified</td>
<td>&lt;URI to an external vocabulary&gt;</td>
<td>CharacterString (smallest permitted maximum: 1000 char)</td>
<td>-</td>
</tr>
<tr>
<td>2</td>
<td>value</td>
<td>The actual value.</td>
<td>1</td>
<td>Unspecified</td>
<td>-</td>
<td>LangString (smallest permitted maximum: 1000 char)</td>
<td>If the vocabulary is used by machines then value would be typically a machine readable token; for example an identifier.</td>
</tr>
</tbody>
</table>