Imogene

A solution to develop Data Collection Information Systems

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**MEDES**

* Economic Group of Interest
  - Private non-profit organisation
  - Members: CNES (30%), Toulouse University Hospitals (25%) and other French Universities and hospitals (12.5 %), open rights (32.5)

* MEDES missions
  - To develop expertise in space medicine, clinical trials in this field
  - To promote applications of space in the health field

* Funding
  - Space Agencies: ESA, CNES and others
  - EC
  - Others: national funding, companies
Initiative

- MEDES supports the promotion by space agencies of the **applications of satellites in the field of health**
  - Telemedicine
  - Disaster medicine
  - Epidemiology
- **Added value of satellites:**
  - Satellite communications
    - Extend surveillance networks
    - Connect remote areas with remote experts ...
  - Satellite navigation
    - Geolocalisation
  - Earth Observation products
    - Risk mapping, resource mapping ...
**Initiative**

Generic needs encountered in projects for telemedicine, disaster medicine and epidemiology

Data collection systems common needs
- Mobility situations
- Remote contexts
- Flexible needs

A tool to quickly model, generate and update this type of system

*imogene framework*
Imogene in a few words

Information System

GIS

Prediction algorithms

Data

Data Collection

Reporting

imogene
Components

IS development Studio

Graphical Modeling Tool
Application generators

Data Collection Information System

Mobile Application
Synchro Application
Web Application
Desktop Application
Dedicated Database

Model driven architecture: modeling/generation principle

Independent and dedicated data collection information system for each generation
Modeling features

- Forms
- Fields
- Relations
- Validation rules
- Security roles
- Actors

Fields

- Forms
- Users
- Roles

- Date
- Text
- Barcode
- GPS
- List

- Multimedia
- Numeric
- Yes/No
- Sub Form
- ...

Text
Graphical modeling

Project editor

Tree view editor

Forms
Field groups
Fields
Information system architecture

- Android application
- Desktop application
- Web browser
- Local DB
- Internet
- Dedicated Business Database
- Synchronization application

Online/Offline
Internet
Generated application features

- Typed form fields (Text, Date, …)
- Create/Read/Update/Delete forms
- Field validation
- Conditional field access
- Hierarchical lists
- Data filtering
- User privileges management
- Internationalized user interfaces
- Alert sending
Android client

- Photo/Video/Sound acquisition
- Geographical coordinates acquisition
- Barcode acquisition
- Cartographic visualization
Offline client

• Desktop application
• Available on all platforms
• Work as a container for the web application
Offline client

- Embedded browser
- Embedded server (Jetty server)
- Web Application
- Synchronization tools
- Database (Derby database)
- Offline Rich Client Platform
- Eclipse RCP
- Centralized server
Offline client

- Embedded browser
- Jetty server
- Derby database
- Eclipse RCP application
- Synchronization
- Automatic updates
Offline applications

- Bidirectional data synchronization
- Manual or automatic
- Interrupted synchronization resumes (at the nearest byte)
- Crash reports
- Remote updates
  - RCP: based on eclipse update framework (p2)
  - Android: home made
## Technologies

### Multi-platform applications

<table>
<thead>
<tr>
<th>Desktop</th>
<th>Mobile</th>
<th>Web</th>
<th>Synchronization server</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Mac OS X&lt;br&gt;- Linux&lt;br&gt;- Windows</td>
<td>- Android Phones</td>
<td>- Firefox&lt;br&gt;- Safari&lt;br&gt;- Chrome&lt;br&gt;- Internet Explorer</td>
<td>- Architecture running JEE server</td>
</tr>
</tbody>
</table>

### Use of standard and open-source components

<table>
<thead>
<tr>
<th>Studio</th>
<th>Desktop</th>
<th>Mobile</th>
<th>Web</th>
<th>Synchro.</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="eclipse" /></td>
<td><img src="image" alt="eclipse" /></td>
<td><img src="image" alt="Android" /></td>
<td><img src="image" alt="spring" /></td>
<td><img src="image" alt="jetty" /></td>
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License

* Imogene published as free & open source in February 2011

- Promote accessibility to a high number of users and user communities
- http://code.google.com/p/imogene/
Use cases
Use case 1 – Safe Haïti

- Syndrome surveillance
- Project duration: 2011 – 2012
- Syndrome surveillance in schools for health early warning
- Detection of the source of an epidemic and the treatment of cases
- Registration using both data connection and SMS
Use case 1 – Safe Haïti

- **Web application to consult the data / to redact the feedback**
- **Information system, central server**
- **Database**
- **Web application**
- **Application logic**
- **GSM modem**
- **Communication satellite**
- **Satellite terrestrial gateway**
- **Data collection using the smartphone**
- **SMS by a country telecom provider**
- **Data collection using the satellite phone**
- **SMS by satellite**
Use case 1 – Safe Haïti
Use case 1 – Safe Haïti
Use case 1 – Safe Haïti

Envoyer une déclaration de symptômes

La déclaration s’effectue de manière codée, par SMS, chaque information ayant un codage particulier.

Exemple de code :

SD_YL23011976_M8_T397_HDCE_K1B2C3

Dénouement du système de codage :
Séparer les groupes d’information par un espace (représente donc l’exemple par _)

1- SD pour « Syndrome Déclaration »

2- Identifiant du patient : initiales, prénom et nom puis date de naissance

3- Sexe et classe d’âge : Sexe (M ou F) puis classe d’âge (voir tableau)

4- Température : T puis la température sans virgule ni espace

5- Symptômes généraux : Les mettre les uns à la suite des autres, sans importance sur l’ordre (voir tableau pour l’utilisation des codes)

6- Localisation et types de symptômes cutanés. Associer ensemble une lettre (localisation) et un chiffre (type de symptômes), faire au maximum d’associations que nécessaire (Voir graphique et tableau pour le codage)

1 Les 3 premiers groupes d’information sont obligatoires pour l’identification du patient.
Use case 2 – Vecmap

- Tick, mosquito, larvae sampling
- Project duration: 2012
- Surveillance of population on the field
- Trap localization and navigation
Use case 2 – Vecmap

MEDES contribution
Use case 2 – Vecmap
Use case 2 – Vecmap

- Use of mobile terminals, Android Smartphone type
- Predefined forms for sampling mosquitoes and ticks
- Service available both in connected and disconnected modes
- Bidirectional data synchronization
- Geo-localization of collected data
- Online mapping and navigation
Use case 3 – Diabsat

* Management of diabetes cases with complications
* Project duration: 2010 – 2012
* Develop and evaluate new services for the education of diabetes patients
* Telemedicine tools for the prevention and management of diabetes cases with complications
* The system is operational and running:
  - About 500 cases collected in mobility and synchronized with the central server
  - About 20 forms
Use case 3 – Diabsat
Use case 3 – Diabsat
Use case 4 – Expand TB Cameroon

- Multi-drug resistant tuberculosis detection
- Project duration: 2012 – 2013
- Drug susceptibility tests registration and following up of the laboratory tests using both online and offline modes
- Notification of the results via SMS / Email
Use case 4 – Expand TB Cameroon
Use case 4 – Expand TB Cameroon
Questions?