Spatial Objects in the Domain Model of the Public Property Management System

GIS for the Police’s Property Management Case study

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Fundamentals

- **A spatial database** is a database that is optimized to store and query **data that is related to objects located on the Earth’s surface**.

- To process spatial data types (points, lines and polygons) additional functionality needs to be added for databases.

- The **ISO 19100 standards** formulate methodology for spatial data modelling, maintenance, exchanging and publishing providing **interoperability**.

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**Fundamentals**

- ISO 19103 – Conceptual schema language
- ISO 19107 – Spatial schema
- ISO 19109 – Rules for application schema
- ISO 19110 – Methodology for feature cataloguing
- ISO 19111 – Spatial referencing by coordinates
- ISO 19125 – Simple Feature Access
- ISO 19152 – Land Administration Domain Model (LADM)
- ............................................................

- **Geographic/spatial data** - Data with **implicit or explicit** reference to a location relative to the Earth
- **Feature** - abstraction of real world phenomena
Spatial Objects in Property Management System

Spatial objects in LADM
Property management typically involves the managing of property that is owned by another party or entity.

Management of land and buildings and premises include activities such as:

- keeping buildings in good condition,
- organizing the renting of property,
- preserving the value of the property while generating income.
Aims of the System:
1. Significant increase in Police's property management.
2. Analysis/reporting of costs, expenses and form of rights of individual property.
3. Overall statistics and analysis.
4. Identification of redundant properties.
5. Multiuser access to the System.
6. Data security and protection.
7. Interoperability with other systems.

Basic Assumptions

- **Modular Structure**
  - allows adapt to the increasing number of users, and facilitate the expansion of functionality

- **GIS Module**
  - Viewing location
  - Spatial analysis

- **Data**
  - update at every organizational level
  - tailored to the needs of the Police
Data

- Location
- Costs of maintenance
- Investments
- Technical conditions
- Employees
- Other (e.g. total area, No of rooms, rights)

Stages of project implementation

- UML diagrams
  - Business model
  - Domain model
- ERD diagrams
  - 96 classes
  - 25 packages
- Standardised methodology proposed by ISO
- Case Tools
System Domain Model

Integrating standarised schema
Schema integration
### Feature Catalogue

**List of packages containing spatial objects**

<table>
<thead>
<tr>
<th>Package name</th>
<th>Object class</th>
<th>Spatial representation</th>
</tr>
</thead>
<tbody>
<tr>
<td>AdministrativeDivision</td>
<td>Voivodship (wojewodztwo)</td>
<td>polygon</td>
</tr>
<tr>
<td></td>
<td>County (powiat)</td>
<td>polygon</td>
</tr>
<tr>
<td></td>
<td>Commune (gmina)</td>
<td>polygon</td>
</tr>
<tr>
<td></td>
<td>Town</td>
<td>polygon</td>
</tr>
<tr>
<td></td>
<td>Street</td>
<td>linestring</td>
</tr>
<tr>
<td>RealEstateAndLand</td>
<td>Parcel</td>
<td>polygon</td>
</tr>
<tr>
<td></td>
<td>Building</td>
<td>surface</td>
</tr>
<tr>
<td>RestorationZone</td>
<td>RestorationZone</td>
<td>polygon</td>
</tr>
<tr>
<td>PoliceBusinessObject</td>
<td>PoliceBusinessObject</td>
<td>point</td>
</tr>
<tr>
<td>PoliceInstitution</td>
<td>PoliceInstitution</td>
<td>surface</td>
</tr>
</tbody>
</table>

### Feature catalogue

- **PoliceBusinessObject**
  - **Attribute**: name
    - **Type**: Character string
    - **Definition**: Name of the Police business object
    - **Description**: 
  - **Attribute**: Id_inventory
    - **Type**: Character string
    - **Definition**: Inventory number
    - **Description**: 
  - **Attribute**: Geometry
    - **Type**: GM_Object
    - **Definition**: Geometry of the Police Business Object
    - **Description**: As much as possible, the geometry should be a single point
    - **Attribute**: beginLifespan
    - **Type**: Data time
    - **Definition**: Date and time at which this version of the spatial object was inserted or changed in the spatial data set.
    - **Max: single**
  - **Attribute**: endLifespan
    - **Type**: Data time
    - **Definition**: Date and time at which this version of the spatial object was superseded or retired in the spatial data set.
    - **Max: single**
Logical model
ERD diagram
1. The ISO 19100 methodology provides a set of standardized application schema that should be implemented in user's application schema to ensure interoperability.

2. An application schema should be platform independent.

3. Spatial object are visualized in the map.

4. A number of spatial analyses could be done.

Thank you for attention

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