

# The E. I. E. L Project: An Experience of a GIS Development

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EC – GI & GIS 2003

# OVERVIEW

- **Introduction** ←
- **The E. I. E. L. Project: Motivation**
- **The E. I. E. L. Data Model**
- **Tasks and Software Modules**
- **Conclusions and Further Work**

# INTRODUCTION

## ➤ Funding

- Provincial Council of A Coruña (Diputación Provincial).
- Agreement with the University of A Coruña.

## ➤ Objectives

- Making a survey on infrastructure and equipment for the province of A Coruña.
- Building a database consisting of both conventional and geographic data.
- Developing applications for the maintenance and exploitation of the data.

# INTRODUCTION

## ➤ The Province of A Coruña

- 7.951 km<sup>2</sup>
- 94 municipalities with 4.064 population centers.
- 1.108.980 inhabitants.
- Local administration (Diputación Provincial)
  - Needs of information

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# THE E. I. E. L. PROJECT: MOTIVATION

- **Survey of Local Infrastructure and Equipment (E. I. E. L.)**
  - Ministry of Public Administrations requires from each Provincial Council every five years
    - Information about the condition of the infrastructure and equipment in the province
      - Alphanumeric information (DBF files).
      - Thematic Maps (hard copies)
        - One map of each municipality: Roads, Population centres.
        - Three maps of each population centre: Streets, water supply, sewage.
- **Geographic Information is not Integrated with Alphanumeric Information**
  - Impossible to use in other applications.
  - Difficulties in Data Maintenance for subsequent surveys.

# THE E. I. E. L. PROJECT: MOTIVATION

## ➤ E. I. E. L 2000

- Diputación undertakes a more ambitious project.
- Alphanumeric and Geographic Data integrated into a huge Geographic Database
  - Eases the Surveys of Subsequent Years.
  - Enables the Provincial Council to provide each of its municipalities with Geographic Information of its territory.
  - Enables the future incorporation of Geographic Information, in other applications of the Provincial Council.

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# THE E. I. E. L. DATA MODEL

## General Remarks

- **Alphanumeric Data Model given by the Ministry**
- **Two Levels of Information**
  - (a) Municipality. (b) Population Centre
- **Two types of Entities**
  - (a) Surveyed (with info.) (b) Not surveyed (ref.)
- **Attributes are added to Surveyed Entities for Geographic reference**
  - Vector Spatial Representation.
  - Point, Line and Surface Data types.
  - Various Spatial attributes for various scales

# THE E. I. E. L. DATA MODEL

## Overview

### ➤ Huge Database

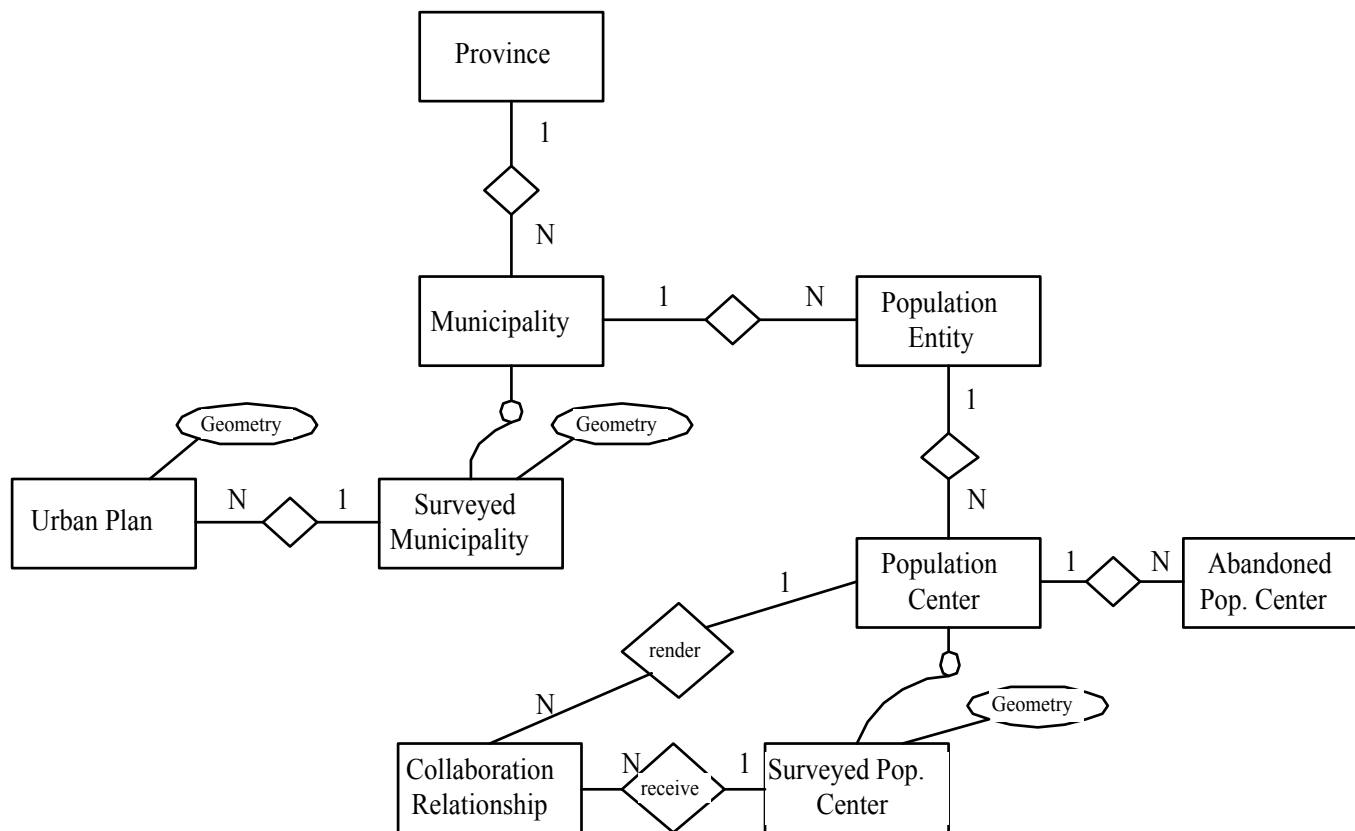
- 155 tables
  - Some of them consisting of more than 2,5 million tuples.
  - More than 4,5 GB of Geographic and Alphanumeric Information

### ➤ 4 main types of data

- Territory Structure, Relationships and Urban Planning
- Road and street network
  - 35.521 road stretches, 41.839 street stretches, etc.
- Water Cycle
  - more than 30.000 pipes of water supply and sewage, etc.
- Equipment
  - more than 1.000 cemeteries, more than 1.000 sport facilities, etc.

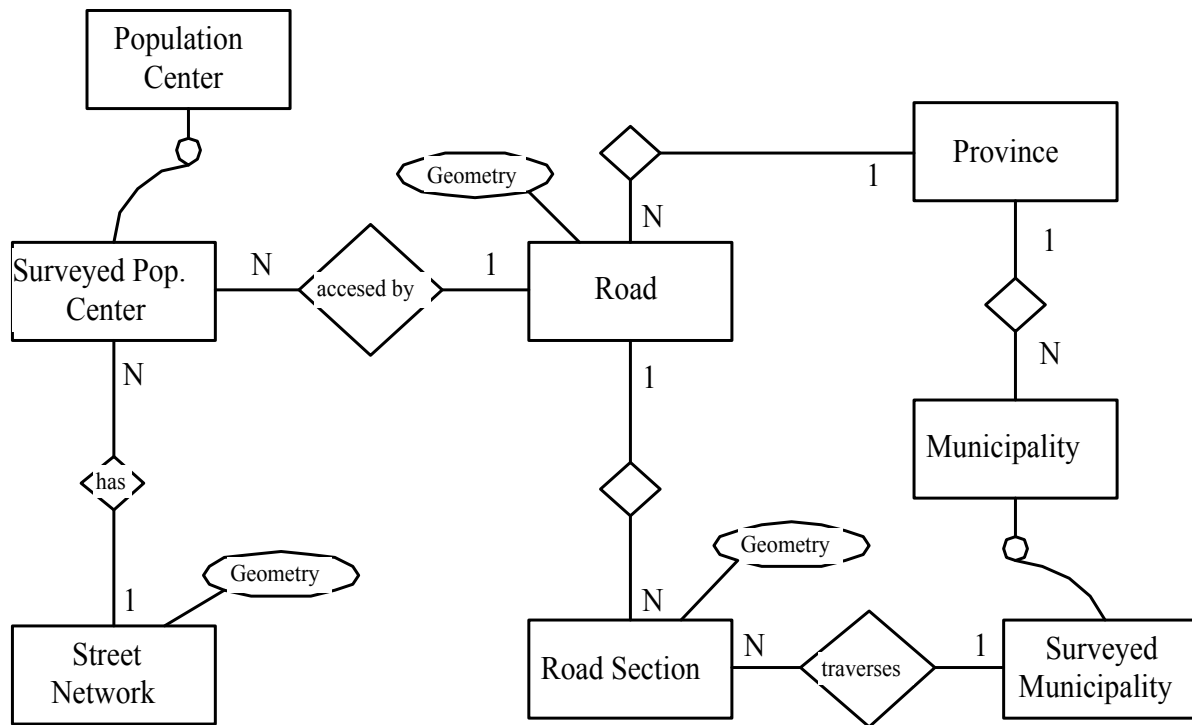
# THE E. I. E. L. DATA MODEL

## Territory Structure, Relationships and Urban Planning



# THE E. I. E. L. DATA MODEL

## Road and street network information



# THE E. I. E. L. DATA MODEL

## Water Cycle Information

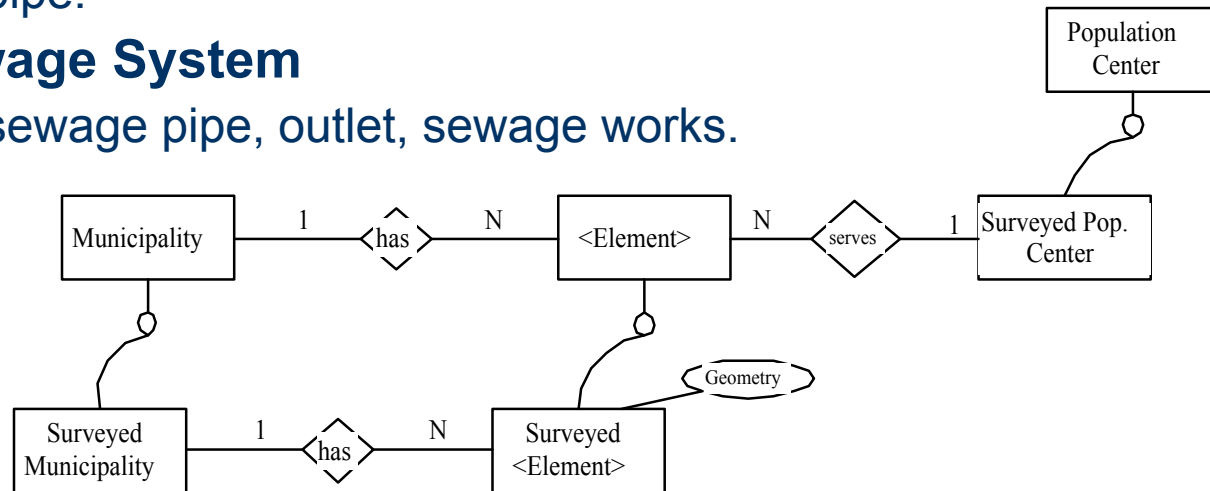
### ➤ <Element>

- **Water supply system**

- dumping site, water source, water conduction pipe, water tank, water treatment plant, water distribution pipe.

- **Sewage System**

- sewage pipe, outlet, sewage works.

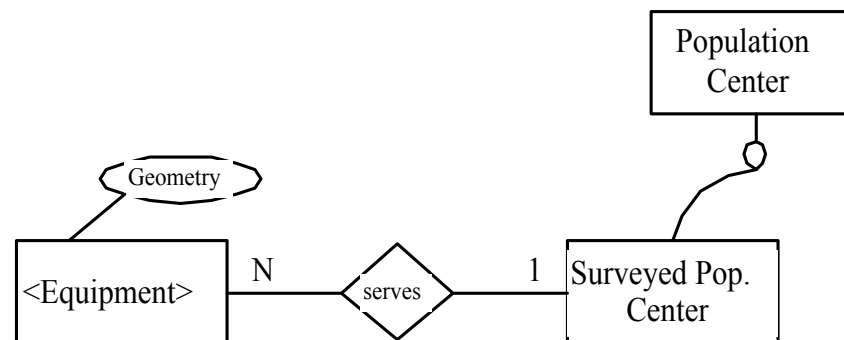


# THE E. I. E. L. DATA MODEL

## Equipment Information

### ➤ <Equipment>

- street lighting, teaching institution, town hall, unused public building, civilian volunteer center, market, sport facility, park, cultural center, slaughterhouse, cemetery, morgue, health-care facility, and welfare center



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# TASKS AND SOFTWARE MODULES

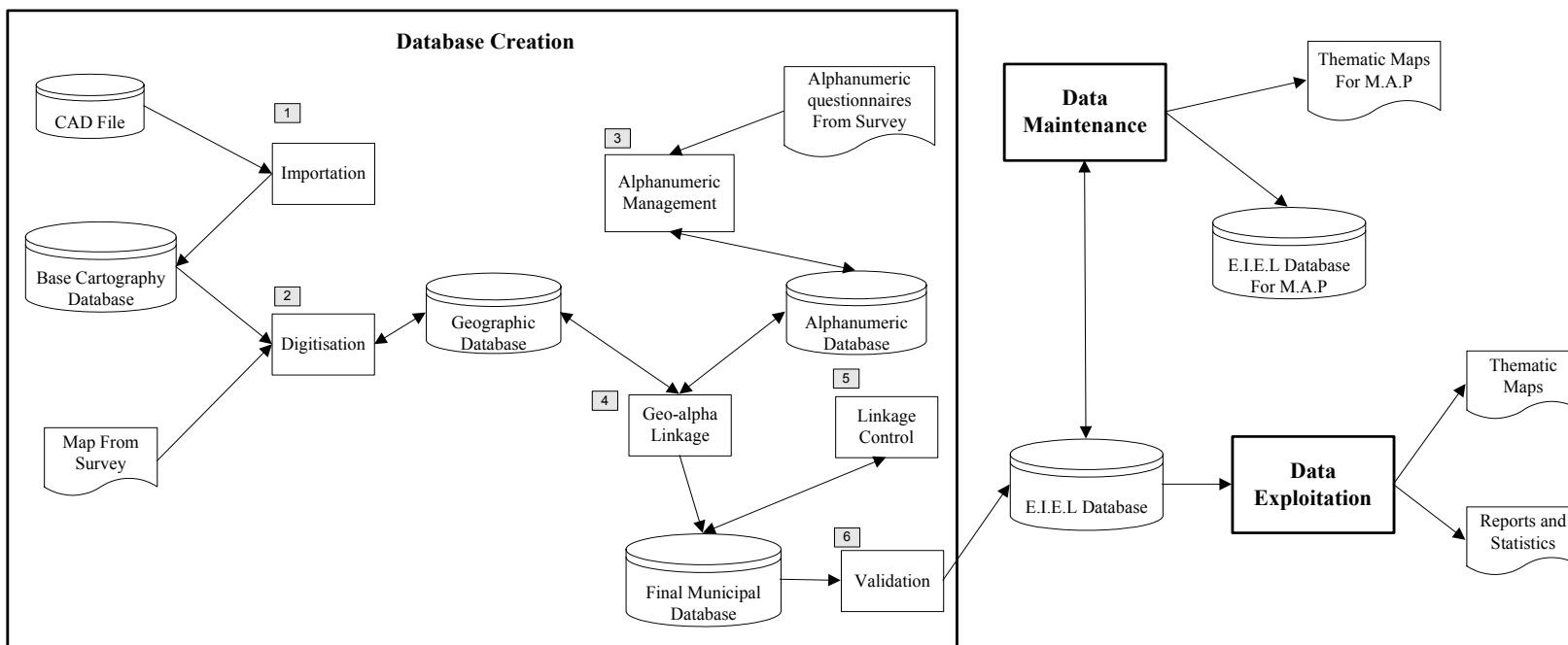
## The Team

- **Big Team composed of 5 groups of experts**
  - **Experts:** Civil Engineering, Architecture and Computer Science Schools
  - 3 groups in charge of: (6 Organizers, 85 Scholars)
    - Data collection: (a) Tables (b) Maps
    - Alphanumeric Data Insertion
    - Linkage of Alphanumeric and Geographic Data
  - 1 group of Cartography: (2 Organizers, 39 Scholars)
    - Digitisation of geographic elements
  - 1 group of Computer Science (DBLAB, UDC):
    - Analysis, design and implementation of GIS applications
    - Technical support to other groups



# TASKS AND SOFTWARE MODULES

## Overview



# TASKS AND SOFTWARE MODULES

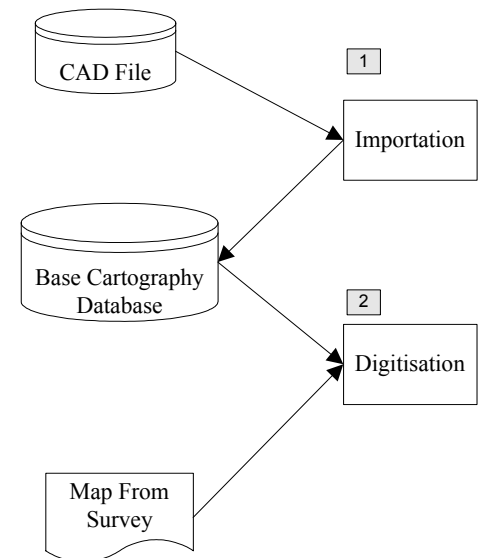
## Description

### ➤ [1] Importation

- **Objective:** To Produce Required Digital Cartography.
- **Problem:** Original CAD Cartography of Low Quality
- **Solution:** Direct Use of a Commercial GIS Tool
  - Intergraph Geomedia Professional 4.0.

### ➤ [2] Digitisation

- **Objective:** To Digitize Required Geographic Entities.
- **Solution:** Development of a new GIS application



# TASKS AND SOFTWARE MODULES

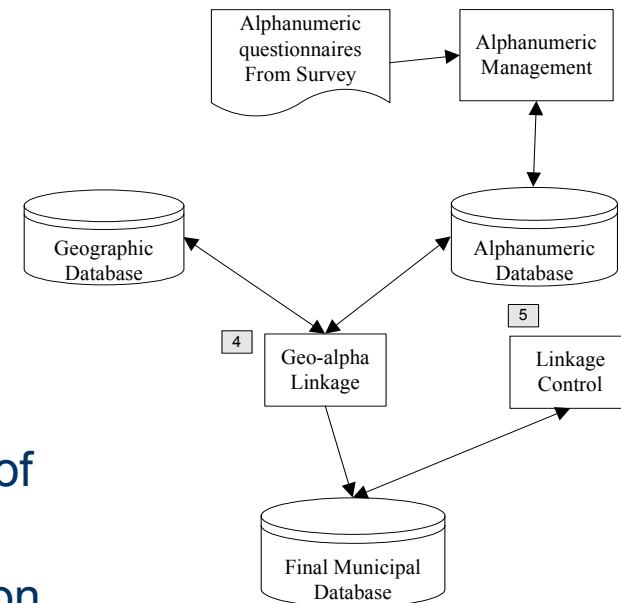
## Description

### ➤ [3] Alphanumeric Management

- **Objective:** To Build a database with the alphanumeric data collected in the survey.
- **Solution:** Development of a typical application for alphanumeric data management.

### ➤ [4] [5] Geo-Alpha Linkage

- **Objective:** To link the alphanumeric data of each element [3] with its geometry [2].
- **Solution:** Development of a GIS application



# TASKS AND SOFTWARE MODULES

## Description

### ➤ [6] Validation

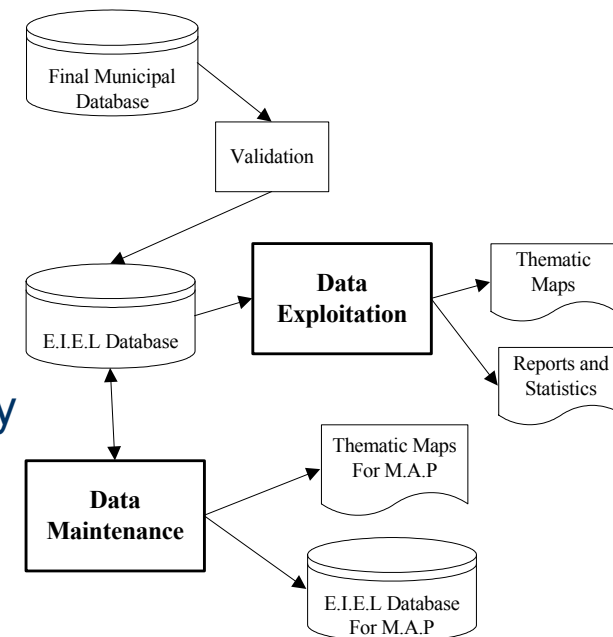
- **Objective:** To Validate Geographic and alphanumeric data
- **Solution:** Development of GIS application

### ➤ [7] Data Maintenance

- To Insert, Delete and Update Geographic and alphanumeric Data
- Generation of Data required by the Ministry

### ➤ [8] Data Exploitation

- To Generate Thematic Maps.
- To Generate indicators (quality).
- Web Technology: Small Municipalities



# TASKS AND SOFTWARE MODULES

## Technology

### ➤ Conventional GIS Applications

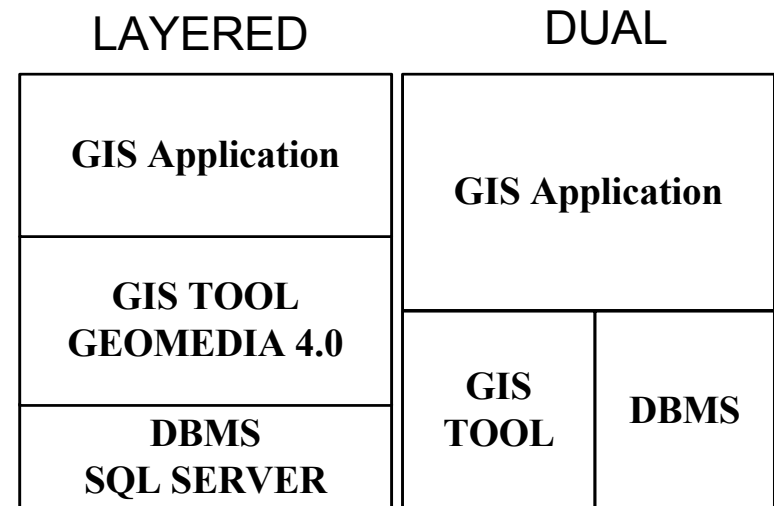
- Geomedia Professional 4.0, 5.0
  - ActiveX Controls, COM
- Microsoft SQL Server 7.0
- Visual Basic 6.0

### ➤ Web GIS Application

- Geomedia Web Map Server 5.0
- Active Server Pages (ASP)
- Internet Information Server (IIS)

### ➤ Second Generation Layered Architecture

- DBMS not aware of spatial data



Encuesta sobre Infraestructura y Equipamientos Locales. Fase IV - Microsoft Internet Explorer

Red viaria  
 Red eléctrica  
 Otras infraestructuras  
 Elementos de abastecimiento  
 Tuberías de abastecimiento  
 Elementos de saneamiento  
 Tuberías de saneamiento  
 Edificios públicos  
 Servicios  
 Educación y cultura  
 Centros educativos  
 Centros culturales  
 Ocio  
 Planeamiento  
 Relieve e hidrografía  
 Etiquetas

Centro de enseñanza: FACULDADE DE INFORMÁTICA

Datos del Centro de enseñanza - Microsoft Internet Explorer

Centro de enseñanza	
Denominación (parroquia)	Coruña (A)
Denominación (núcleo)	Coruña (A)
Nombre	FACULDADE DE INFORMÁTICA
Ámbito	Comarcal
Titular	Centros Estatales
Estado	Bueno
Superficie cubierta (m2)	0
Superficie al aire libre (m2)	0
Superficie del solar (m2)	0

[cerrar ventana](#)

Situación General  
 Mapa  
 Ancho: 0.5 km.  
 Alto: 0.3 km.  
 X: 54786973 m.  
 Y: 479807226 m.  
 Escala: 1 : 3000 (aprox.)

Zoom Gráfico

Mensajes

DU Meter  
 Intranet local

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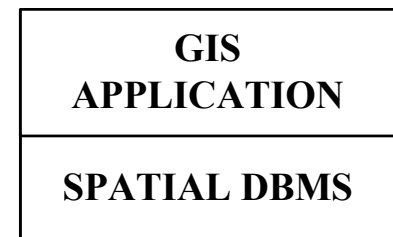
# CONCLUSIONS AND FURTHER WORK

## ➤ Conclusions

- Data Model Extended with Spatial Attributes
  - Various Spatial attributes for Various Scales
- GIS Applications Developed
  - Eases the building of the Huge Database
  - Enables non-expert users to access Geographic Data
- Use of 2nd generation spatial architecture and vector spatial representation

## ➤ Further Work

- Migration to a 3rd generation spatial architecture
  - Spatial DBMS, Spatial Indexing, Spatial SQL, etc.
- Incorporation of ISO and OpenGIS standards
  - SFS SQL (SQL/MM), WMS, etc.
- Extension to Spatio-temporal (Transaction Time Recording).





# CONTACT INFORMATION



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