Location Intelligence helps Italian Government against Crime

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Introduction

It is well known that a major portion of organizations' data has a Spatial connotation. In some specific fields like Crime Analysis, Location plays a key role not only for analysis and statistical purposes, but also to pursue effective actions to contrast and prevent crimes.
The most important Italian Government institution dealing with police forces and crime needed to go beyond the classical BI solutions, mainly used for statistical reporting.

Iconsulting implemented an integrated Geo-Data Warehouse and Location Intelligence solution, evolving the existing Data Warehouse, leveraging the complete Oracle stack: Oracle Database with Oracle Spatial and Oracle Data Mining, Oracle Mapviewer, Oracle Business Intelligence.
By exploiting Spatial attributes, crime data has been integrated with external information sources to discover new patterns among data.
The design and implementation process of such a sophisticated infrastructure (including OBIEE/Spatial modelling best practices) will be explained and a live demo will demonstrate most of the highly-interactive features of that solution, including map-driven data navigation, hybrid Spatial/Analytical queries, Spatial what-if analysis, predictive Location features for Crime Forecasting.
Thanks to this new Crime Location Intelligence system, the Italian government now benefits of a better support for decisions, that lead to a better use of police and public resources, with the aim of improving Public Safety.

Crime Analysis

Advances in technology, which allow analyses of large quantities of data, are the foundation for the relatively new field known as *crime analysis.*
Crime analysis is the breaking up of acts committed in violation of laws into their parts to find out their nature and reporting statements of these findings. The objective of most crime analysis is to find meaningful information in vast amounts of data and disseminate this information to officers and investigators in the field to assist in their efforts to apprehend criminals and suppress criminal activity. Assessing crime through analysis also helps in crime prevention efforts. Preventing crime costs less than trying to apprehend criminals after crimes occur (*Introduction to Crime Analysis* - Osborne, and Wernicke, 2003).

Historically, crime analysis is defined as a set of systematic, analytical processes directed at providing timely and pertinent information relative to crime patterns and trend correlations to assist operational

and administrative personnel in planning the deployment of resources for the prevention and suppression of criminal activities, aiding the investigative process, and increasing apprehensions and the clearance of cases (*Crime Analysis: From First Report to Final Arrest* - Gottlieb, Arenberg, and Singh, 1994).

Location Intelligence solution

The goal of a Location Intelligence solution is to provide a centralized, unique analytical platform that enables every kind of analysis that support both police forces on the field during the investigative phase and those analysts who observe patterns and trends aimed at planning actions to be taken (how to assign patrols, where to put new police stations, etc.)

The key of the infrastructure that sustains this solution is the **Geo-Data Warehouse**, as you can see in figure 1.
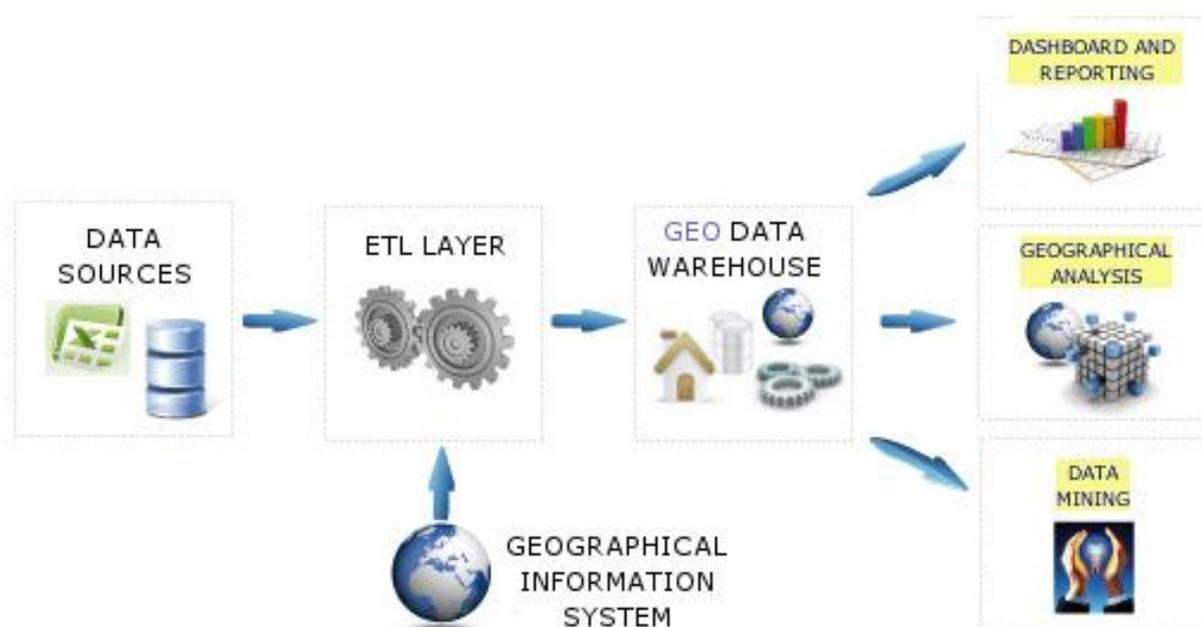

Illustration 1: High-level infrastructure of a Location Intelligence system based on a Geo-Data Warehouse.

A Geo-Data Warehouse lets you concentrate all the data that belongs to the information domain, even from several heterogeneous sources, into one unique, clean and certificated point of storage, both the standard alpha-numerical data and the geo-spatial information.

Iconsulting developed a full-Oracle solution that exploits several products:
- Oracle Database with Oracle Spatial and Oracle Data Mining options
- Oracle MapViewer
- Oracle Business Intelligence

The two-ways integration of the geographical part within the traditional BI environment is granted by Oracle MapViewer and Oracle Maps intermediate layer, that has been extended by a self-developed Ajax-based API called "Iconsulting GeoBI": this library introduces flexibility and more analytical power, introducing brand new features (e.g. correlation analysis over a 2-dimension plot, proximity

analysis, predictive analytics and geo-what if analysis, etc.) and a new way of designing directional and operational dashboards.
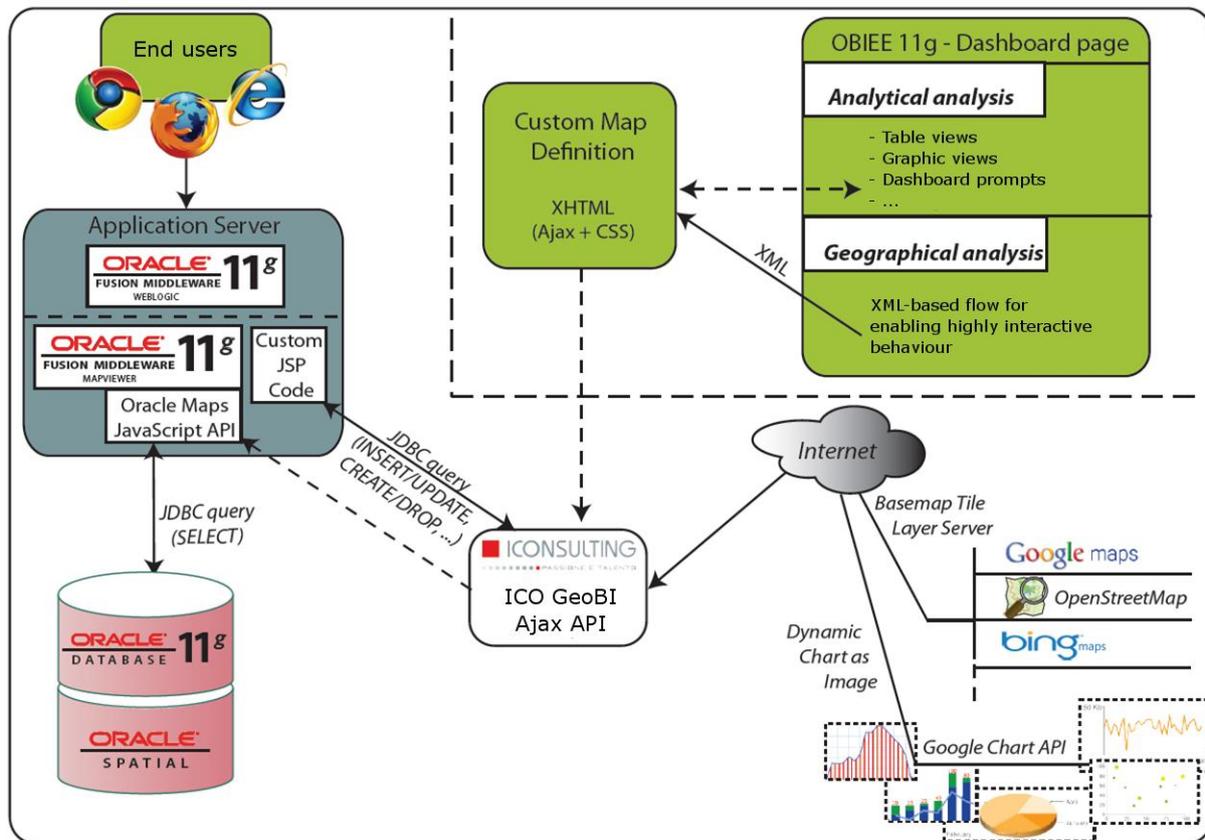
This framework is depicted in figure 2.

Illustration 2: *The underlying framework is composed by a full-Oracle technological stack.*

Let's review the main aspects that represent the added value a Location Intelligence platform will provide:

- **Data Enrichment** with external data sources
  You may mix internal data specific of the domain you want to analyse by producing derived KPI and dimension of analysis by integrating external data coming from other actors (OpenData; national research institute, public agency, private data provider, etc.). For instance you can put together crime data with socio-demographic, income, weather condition, etc.

- **Geographical navigation**
  You can begin your analysis by viewing the overall situation at the higher level of detail (e.g. country level divided in regions) and then drill-down into more detailed administrative layers, like provinces, municipality, addresses and street numbers, or alternative hierarchies that represent an interesting point of view.

  Given that the map representation is fully-integrated and consistent with table and graphic views, a Location Intelligence solution enables new ways of exploration of a specific topic by

letting the user filtering the current context either by means of the traditional prompt menus or through proximity analysis applied directly into the map.

Moreover, you can independently choose which view (tabular, map, etc.) fits better your daily needing because each of them are highly-interactive and guide the user discovering insight and obtaining the information that has been looked for.

- **Hybrid queries**

  A specific capability of a Location Intelligence solution based on a Geo-Data Warehouse is to run <u>one unique</u> query that contains both alpha-numerical and geospatial conditions (e.g. the distance from a specific category of point of interests) and that is answered by the system in real time.

- **Geo-What if analysis** and Predictive analytics

  What would it happen if a new fixed or mobile police station had been set up inside a hot spot?

  Every time you can address a scenario by synthesize a proper model that relates the hearth surface, the Location Intelligence framework enables the possibility of introducing a proactive tool that lets the user not only discover what happened in the past, but also to forecast what could happen in the future.

- **Spatial DataMining**

  By exploiting well-known and consolidated algorithms you may analyse the probability that a specific geographical area is less or more dangerous, for instance because of the contemporary presence (*co-location*) of particular category of points of interest.

  Based on these insights, police forces may focus their more often limited-budged effort and contrast actions over hot spots with high-risk profiles.

About the Authors

ICONSULTING (www.iconsulting.biz) plays a leading role in the Italian consulting sector, developing and implementing Decision Support Systems.

It was founded in 2001 by a group of consultants and researchers highly specialized in Data Warehousing, Business Intelligence and Business Performance Management.

The research-oriented and innovative spirit, which identifies the company in the Italian scenario, is made possible through the continual experimentation carried out by the in-house Research and Development Laboratory, the driving force for technological improvement and constant update of our staff. The most innovative areas in which Iconsulting has been investing on in the last few years comprehend Location Intelligence, Semantic Intelligence, Sentiment Analysis, Situational Intelligence, Data Mining.

Expertise, experience and constant attention to new solutions have led Iconsulting to be trusted by many renowned national and international companies.

The mission of the company is to be a center of excellence, a standard in the Consulting market, where quality, professionalism and enthusiasm are at the service of customers' satisfaction.

This distinctive choice enables its consultants to select the most suitable technological solution, uniquely chosen to meet the needs of the Customer.

ICONSULTING aims at becoming the ideal partner of those pursuing quality and care for details, making use of the expertise acquired all over the years working with top-rank companies operating in different sectors.

Today ICONSULTING has successfully carried out more than 300 projects and counts a staff of about 80 consultants selected on the basis of excellent curricula.

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