



The background features a complex network of nodes (circles) and lines (edges) in various colors (teal, pink, yellow, green) on a white background, representing a data network or system architecture.

LOCATION INTELLIGENCE

Italian and UK
Justice and Public Safety

ICONULTING

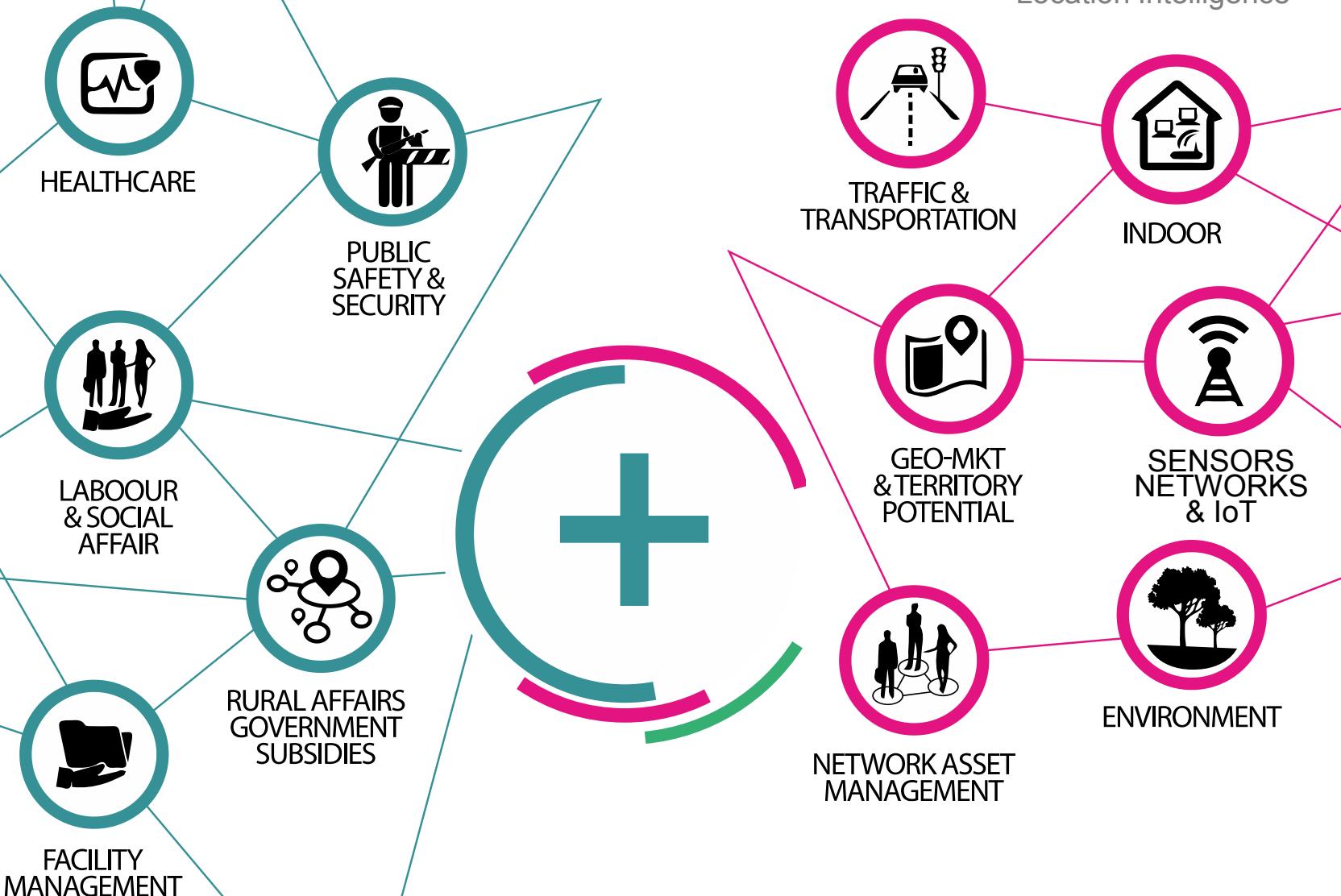


- Spin-off of a prestigious Research **University Consortium** group
- **150+ people** – **100+ customers** - **500+ projects**
- Professorship in prestigious Italian Universities and Business Schools
- Offices: Bologna - Rome - Milan – London
- **2013:**
 - Oracle Spatial and Graph Excellence Award - Washington D.C. (USA)
- **2014:**
 - UK Trade & Investment - Market Entrant Awards
 - UKOUG Business Intelligence Partner of the Year



GEOSPATIAL BIG DATA ANALYTICS

Location Intelligence



AGENDA

- **Italian Police** - Crime Analysis
- **UK County Police** – Visibility Analysis
- **Location Intelligence** – What's all about?

PUBLIC SAFETY &
SECURITY

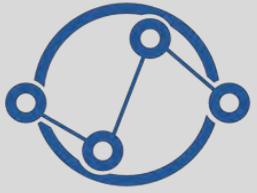


Crime Analysis
Italian
Police



ICONULTING
iconsulting.biz

CRIME ANALYSIS



Geographic
al browsing



Internal and
external
data



Hybrid
queries



Geo
What-if
analysis



Spatial
Data Mining

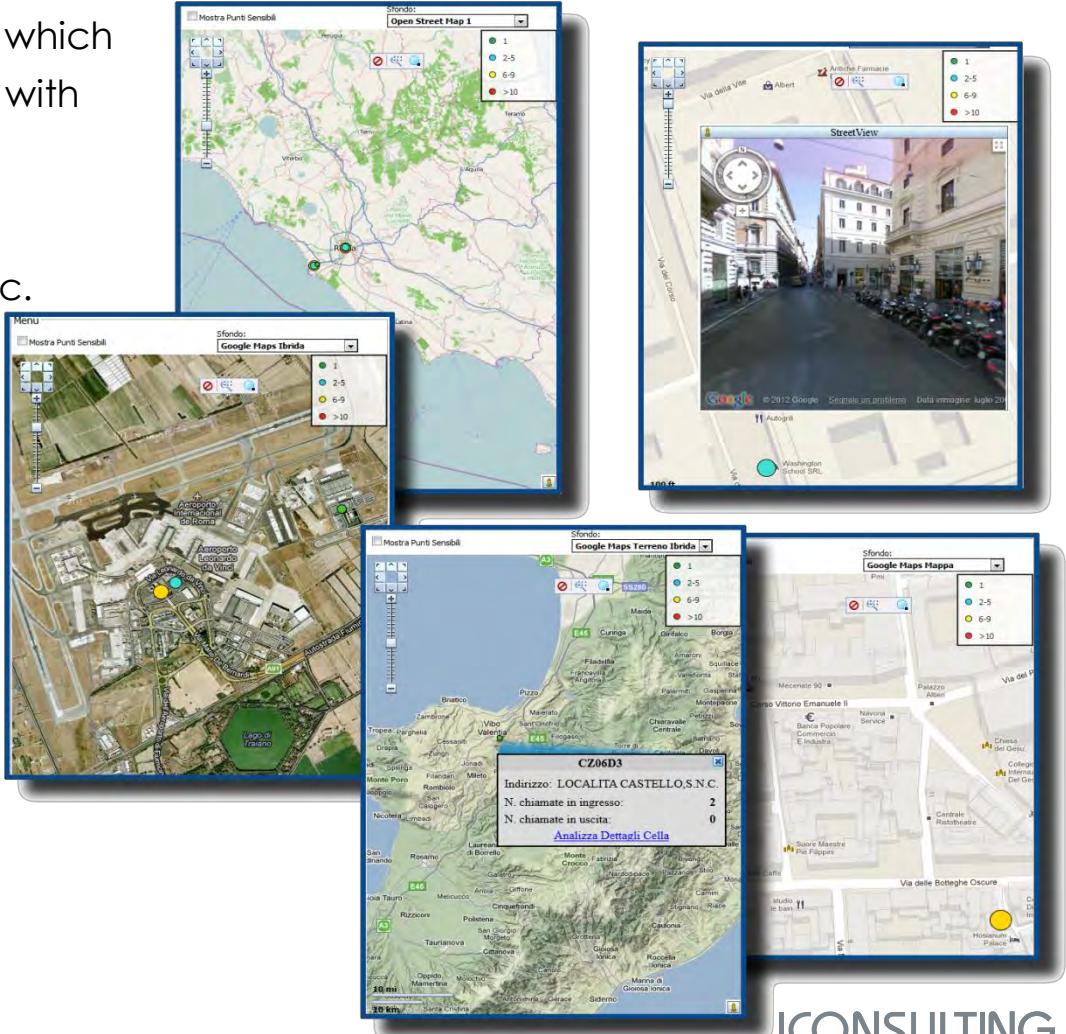
- Crime Statistics
- Crime Search
- Geo-What-if Analysis
- Crime Risk Forecasting



Integration with external map sources

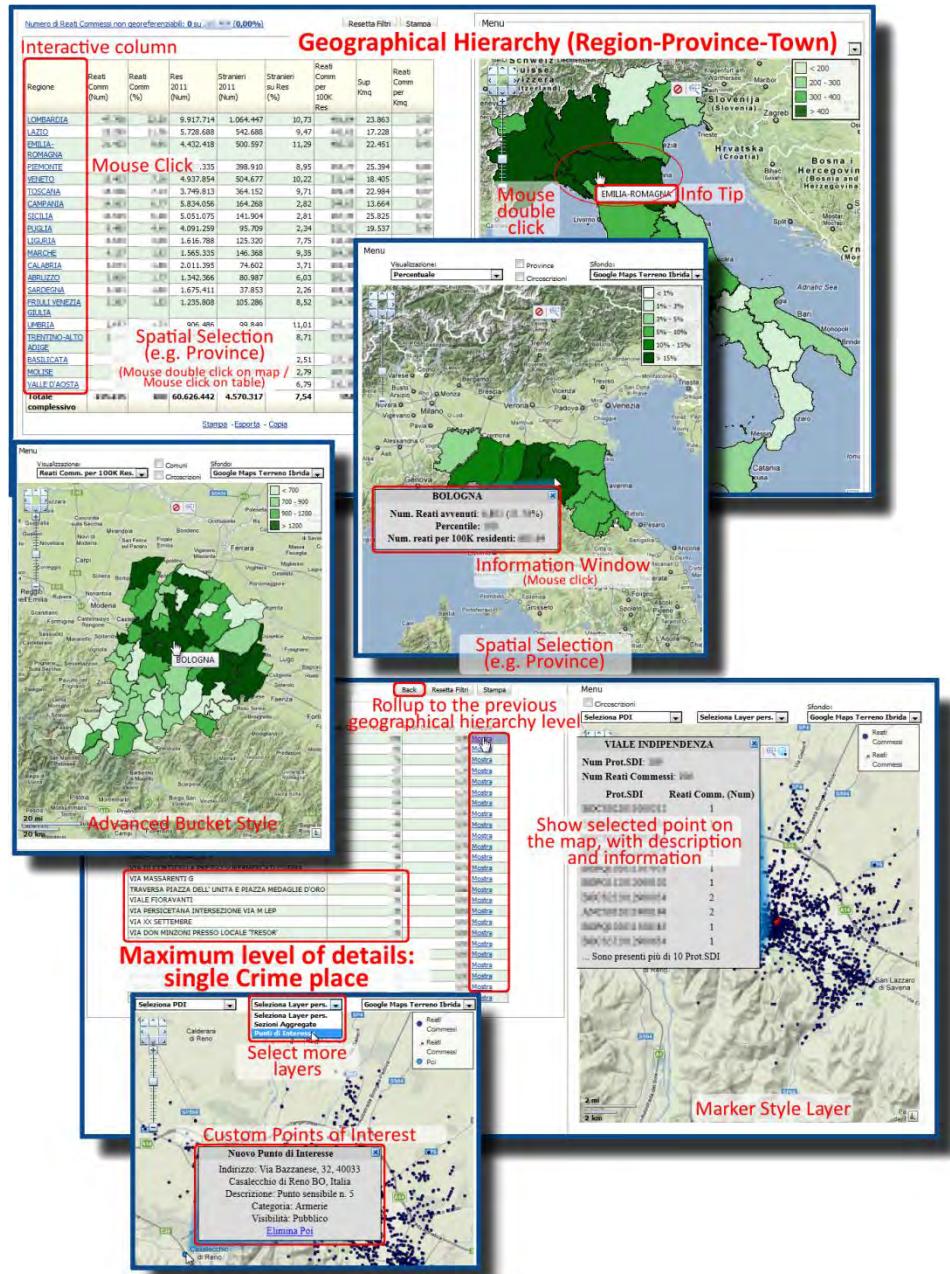
The Oracle Mapviewer technology on which our solution is based allows integration with external map layers and services:

- Google Maps, OpenStreetMap, etc.
- WMS sources.
- Google StreetView, etc.



Crime analysis: Maps navigation

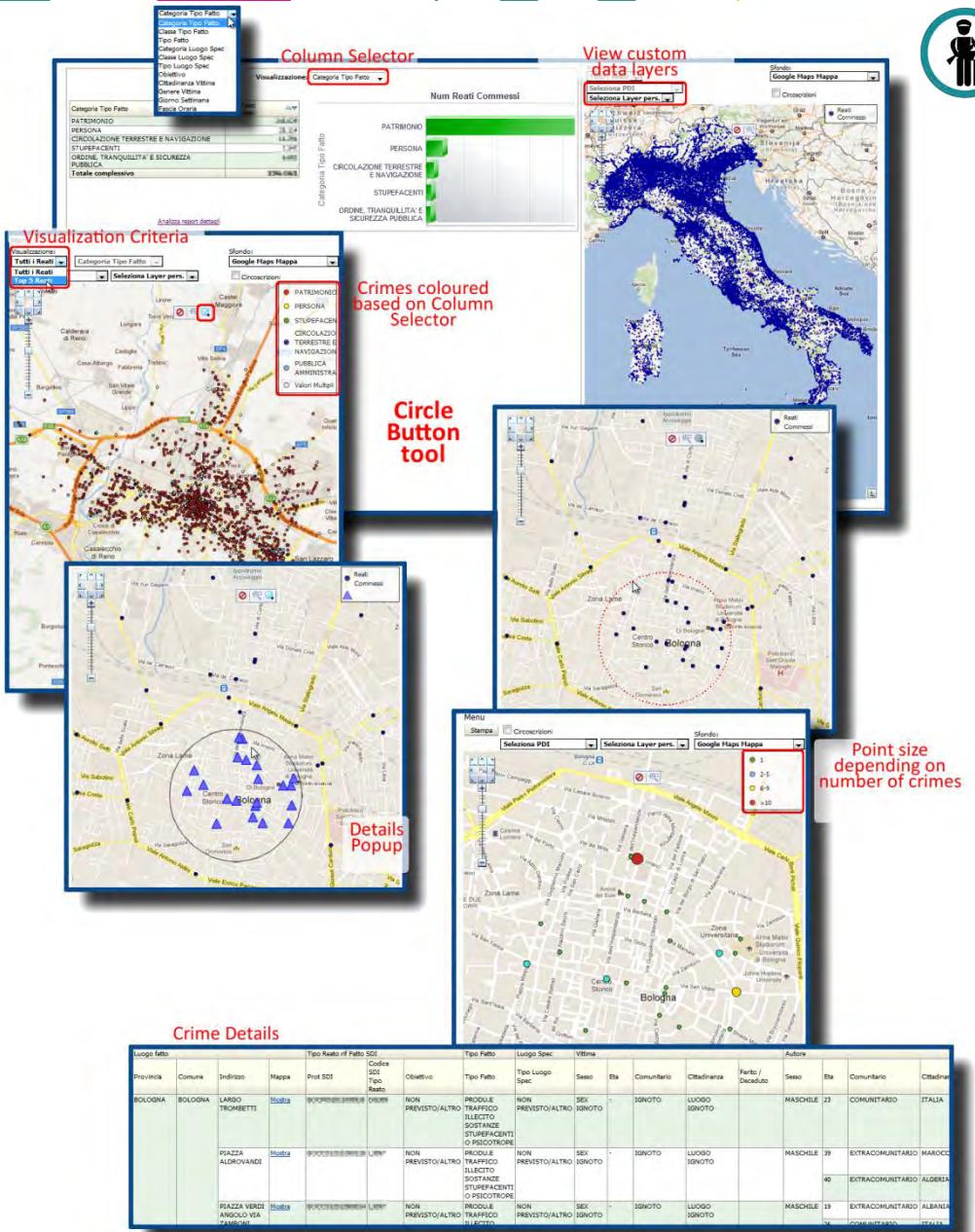
- Navigation to the level of single crime spot, drilling through a guided navigation path (e.g. Region -> Province -> Municipalities) that is analysis-oriented.





Crime analysis: detailed view

- Overall view of the distribution of a specific crime phenomenon on the territory.
- Prompt filters and Proximity analysis to select the elements and area of interest, with a direct interaction with the map.





Crime analysis: Hybrid query

- Through a simple and intuitive interface, users may perform a search that combines classical alphanumerical conditions and geospatial conditions
- Leveraging the underlying Geo-Data Warehouse, a single query is performed: the system responds astonishingly quickly

Analytical+Spatial parameters

Crimes that satisfy search conditions

Zoom (Marque zoom / Mouse double click / Navigation panel)

StreetView (available in all maps)

Crime Details

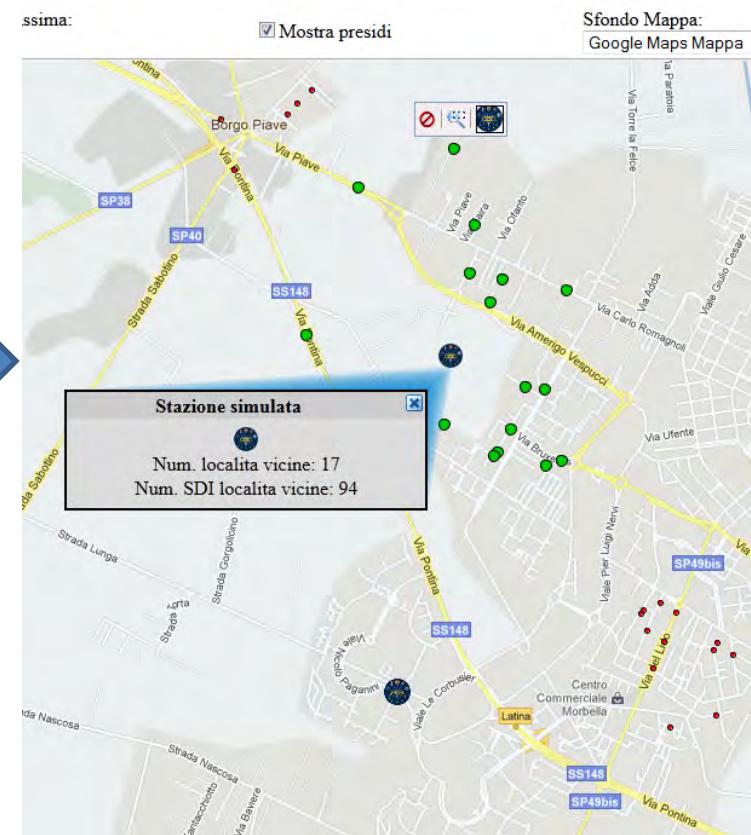
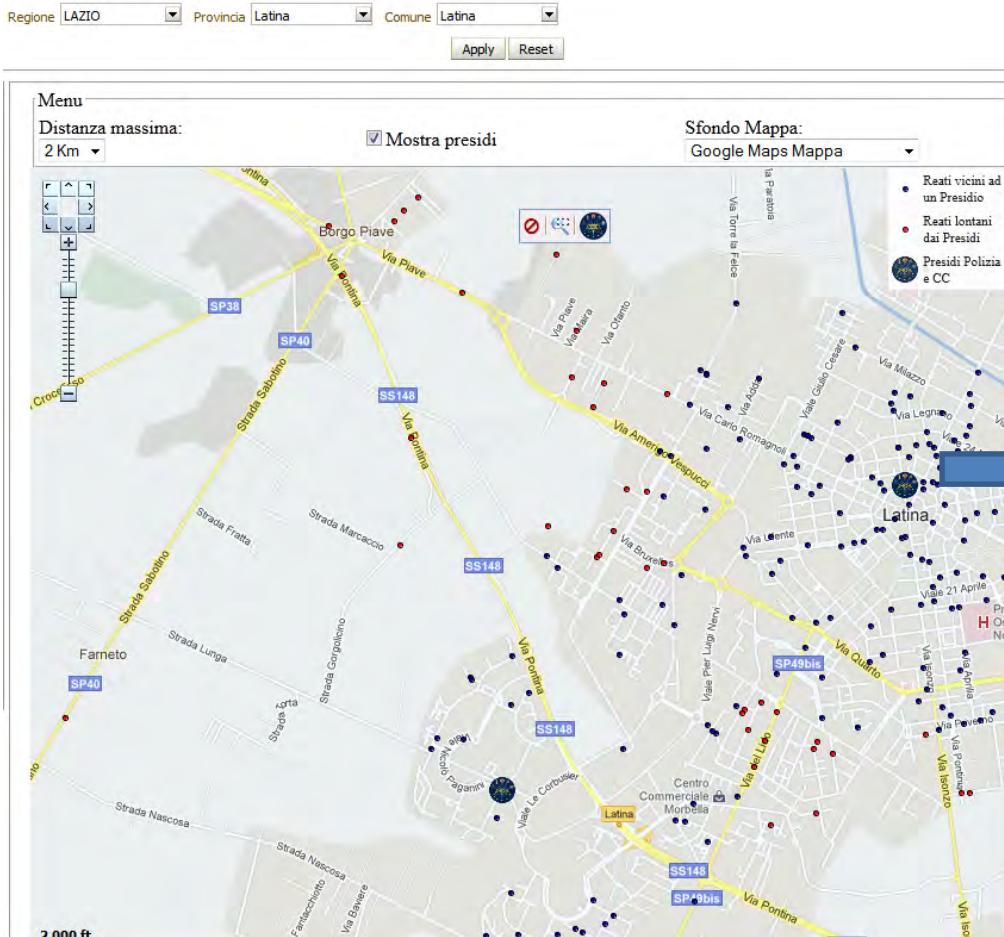
Table: Crime Details

Crime ID	Crime Type	Location	Time	Details
CRIME001	Violent Crime	Bologna, Italy	2015-01-01	murder
CRIME002	Violent Crime	Bologna, Italy	2015-01-02	murder
CRIME003	Violent Crime	Bologna, Italy	2015-01-03	murder
CRIME004	Violent Crime	Bologna, Italy	2015-01-04	murder
CRIME005	Violent Crime	Bologna, Italy	2015-01-05	murder
CRIME006	Violent Crime	Bologna, Italy	2015-01-06	murder
CRIME007	Violent Crime	Bologna, Italy	2015-01-07	murder
CRIME008	Violent Crime	Bologna, Italy	2015-01-08	murder
CRIME009	Violent Crime	Bologna, Italy	2015-01-09	murder
CRIME010	Violent Crime	Bologna, Italy	2015-01-10	murder
CRIME011	Violent Crime	Bologna, Italy	2015-01-11	murder
CRIME012	Violent Crime	Bologna, Italy	2015-01-12	murder
CRIME013	Violent Crime	Bologna, Italy	2015-01-13	murder
CRIME014	Violent Crime	Bologna, Italy	2015-01-14	murder
CRIME015	Violent Crime	Bologna, Italy	2015-01-15	murder
CRIME016	Violent Crime	Bologna, Italy	2015-01-16	murder
CRIME017	Violent Crime	Bologna, Italy	2015-01-17	murder
CRIME018	Violent Crime	Bologna, Italy	2015-01-18	murder
CRIME019	Violent Crime	Bologna, Italy	2015-01-19	murder
CRIME020	Violent Crime	Bologna, Italy	2015-01-20	murder
CRIME021	Violent Crime	Bologna, Italy	2015-01-21	murder
CRIME022	Violent Crime	Bologna, Italy	2015-01-22	murder
CRIME023	Violent Crime	Bologna, Italy	2015-01-23	murder
CRIME024	Violent Crime	Bologna, Italy	2015-01-24	murder
CRIME025	Violent Crime	Bologna, Italy	2015-01-25	murder
CRIME026	Violent Crime	Bologna, Italy	2015-01-26	murder
CRIME027	Violent Crime	Bologna, Italy	2015-01-27	murder
CRIME028	Violent Crime	Bologna, Italy	2015-01-28	murder
CRIME029	Violent Crime	Bologna, Italy	2015-01-29	murder
CRIME030	Violent Crime	Bologna, Italy	2015-01-30	murder
CRIME031	Violent Crime	Bologna, Italy	2015-01-31	murder
CRIME032	Violent Crime	Bologna, Italy	2015-02-01	murder
CRIME033	Violent Crime	Bologna, Italy	2015-02-02	murder
CRIME034	Violent Crime	Bologna, Italy	2015-02-03	murder
CRIME035	Violent Crime	Bologna, Italy	2015-02-04	murder
CRIME036	Violent Crime	Bologna, Italy	2015-02-05	murder
CRIME037	Violent Crime	Bologna, Italy	2015-02-06	murder
CRIME038	Violent Crime	Bologna, Italy	2015-02-07	murder
CRIME039	Violent Crime	Bologna, Italy	2015-02-08	murder
CRIME040	Violent Crime	Bologna, Italy	2015-02-09	murder
CRIME041	Violent Crime	Bologna, Italy	2015-02-10	murder
CRIME042	Violent Crime	Bologna, Italy	2015-02-11	murder
CRIME043	Violent Crime	Bologna, Italy	2015-02-12	murder
CRIME044	Violent Crime	Bologna, Italy	2015-02-13	murder
CRIME045	Violent Crime	Bologna, Italy	2015-02-14	murder
CRIME046	Violent Crime	Bologna, Italy	2015-02-15	murder
CRIME047	Violent Crime	Bologna, Italy	2015-02-16	murder
CRIME048	Violent Crime	Bologna, Italy	2015-02-17	murder
CRIME049	Violent Crime	Bologna, Italy	2015-02-18	murder
CRIME050	Violent Crime	Bologna, Italy	2015-02-19	murder
CRIME051	Violent Crime	Bologna, Italy	2015-02-20	murder
CRIME052	Violent Crime	Bologna, Italy	2015-02-21	murder
CRIME053	Violent Crime	Bologna, Italy	2015-02-22	murder
CRIME054	Violent Crime	Bologna, Italy	2015-02-23	murder
CRIME055	Violent Crime	Bologna, Italy	2015-02-24	murder
CRIME056	Violent Crime	Bologna, Italy	2015-02-25	murder
CRIME057	Violent Crime	Bologna, Italy	2015-02-26	murder
CRIME058	Violent Crime	Bologna, Italy	2015-02-27	murder
CRIME059	Violent Crime	Bologna, Italy	2015-02-28	murder
CRIME060	Violent Crime	Bologna, Italy	2015-02-29	murder
CRIME061	Violent Crime	Bologna, Italy	2015-03-01	murder
CRIME062	Violent Crime	Bologna, Italy	2015-03-02	murder
CRIME063	Violent Crime	Bologna, Italy	2015-03-03	murder
CRIME064	Violent Crime	Bologna, Italy	2015-03-04	murder
CRIME065	Violent Crime	Bologna, Italy	2015-03-05	murder
CRIME066	Violent Crime	Bologna, Italy	2015-03-06	murder
CRIME067	Violent Crime	Bologna, Italy	2015-03-07	murder
CRIME068	Violent Crime	Bologna, Italy	2015-03-08	murder
CRIME069	Violent Crime	Bologna, Italy	2015-03-09	murder
CRIME070	Violent Crime	Bologna, Italy	2015-03-10	murder
CRIME071	Violent Crime	Bologna, Italy	2015-03-11	murder
CRIME072	Violent Crime	Bologna, Italy	2015-03-12	murder
CRIME073	Violent Crime	Bologna, Italy	2015-03-13	murder
CRIME074	Violent Crime	Bologna, Italy	2015-03-14	murder
CRIME075	Violent Crime	Bologna, Italy	2015-03-15	murder
CRIME076	Violent Crime	Bologna, Italy	2015-03-16	murder
CRIME077	Violent Crime	Bologna, Italy	2015-03-17	murder
CRIME078	Violent Crime	Bologna, Italy	2015-03-18	murder
CRIME079	Violent Crime	Bologna, Italy	2015-03-19	murder
CRIME080	Violent Crime	Bologna, Italy	2015-03-20	murder
CRIME081	Violent Crime	Bologna, Italy	2015-03-21	murder
CRIME082	Violent Crime	Bologna, Italy	2015-03-22	murder
CRIME083	Violent Crime	Bologna, Italy	2015-03-23	murder
CRIME084	Violent Crime	Bologna, Italy	2015-03-24	murder
CRIME085	Violent Crime	Bologna, Italy	2015-03-25	murder
CRIME086	Violent Crime	Bologna, Italy	2015-03-26	murder
CRIME087	Violent Crime	Bologna, Italy	2015-03-27	murder
CRIME088	Violent Crime	Bologna, Italy	2015-03-28	murder
CRIME089	Violent Crime	Bologna, Italy	2015-03-29	murder
CRIME090	Violent Crime	Bologna, Italy	2015-03-30	murder
CRIME091	Violent Crime	Bologna, Italy	2015-03-31	murder
CRIME092	Violent Crime	Bologna, Italy	2015-04-01	murder
CRIME093	Violent Crime	Bologna, Italy	2015-04-02	murder
CRIME094	Violent Crime	Bologna, Italy	2015-04-03	murder
CRIME095	Violent Crime	Bologna, Italy	2015-04-04	murder
CRIME096	Violent Crime	Bologna, Italy	2015-04-05	murder
CRIME097	Violent Crime	Bologna, Italy	2015-04-06	murder
CRIME098	Violent Crime	Bologna, Italy	2015-04-07	murder
CRIME099	Violent Crime	Bologna, Italy	2015-04-08	murder
CRIME100	Violent Crime	Bologna, Italy	2015-04-09	murder



Crime analysis: Geo-What-if Analysis

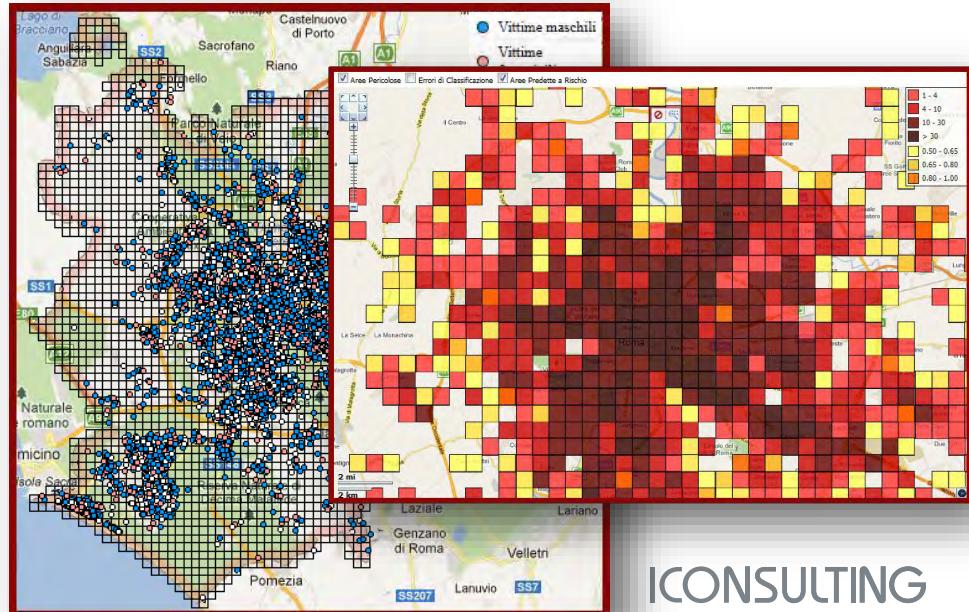
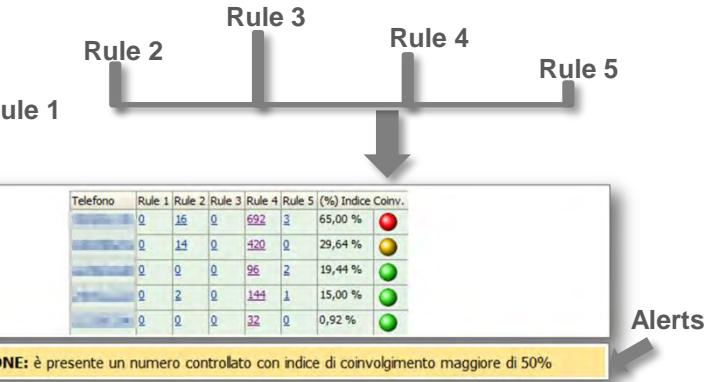
- What would happen if a new fixed/mobile station would be placed in a specific place?
- Intuitive direct interaction with the map





Advanced features: Situational Intelligence and Spatial Data Mining

- Situational Intelligence: Pattern Detection
 - Rules to detect certain repeating patterns/conditions (e.g. in logs of phone calls).
 - Proactive alerting.
- Spatial Data Mining
 - Which are the most dangerous areas that require patrolling?
 - Can patrolling be planned in an optimized way?
 - Usage of history to profile territory: a risk category, based on the number of crimes that happened in the past, is assigned to each area.
 - The Data Mining engine identifies rules that make an area dangerous. It is then possible to apply those rules to predict high-risk areas.



PUBLIC SAFETY &
SECURITY



Visibility
Reporting Solution
for
UK County Police



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POLICE VISIBILITY



South Yorkshire
POLICE

For non-emergencies call 101 in an emergency

Home About Us Help and Advice

About Us » Our Vision

Strategic priorities

The South Yorkshire Police and Crime Commissioner's Strategic Priorities are:

1. Reducing crime and antisocial behaviour
2. Protecting vulnerable people
3. Improving visible policing



Humberside Police
Protecting Communities, Targeting Criminals

Home About Us My Neighbourhood Advice and Information Recruitment News/Media

You are here: [Home](#) » [About Us](#) » Our Commitment and Purpose

OUR COMMITMENT AND PURPOSE

People have a fundamental need to be safe - safe wherever they are and whatever they are doing.

Vision

People have a fundamental need to be safe - safe wherever they are and whatever they are doing.

Humberside Police have a particular responsibility in helping people both to be and to feel safe, providing a service that is intended to protect, help and reassure all of our communities and which treats all people fairly and with respect and dignity.

OUR PURPOSE

Our purpose is to make the communities served by Humberside Police safe.

In response to public concern we are committed to:

- Reducing crime, disorder and road casualties
- Being visible and readily accessible
- Being accountable for all that we do

Visibility Reporting Solution for SYP Police UK



Police
Officer
Deployment
analysis



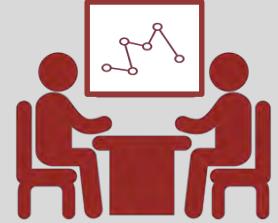
Visibility
Analysis



Hot-spots
analysis



Certified
Visibility KPIs



Near-real
time
monitoring

Location intelligence dashboards:

- Forces Analysis
- Police Stations Analysis
- Custom areas
- Deployments Analysis
- Officer Analysis



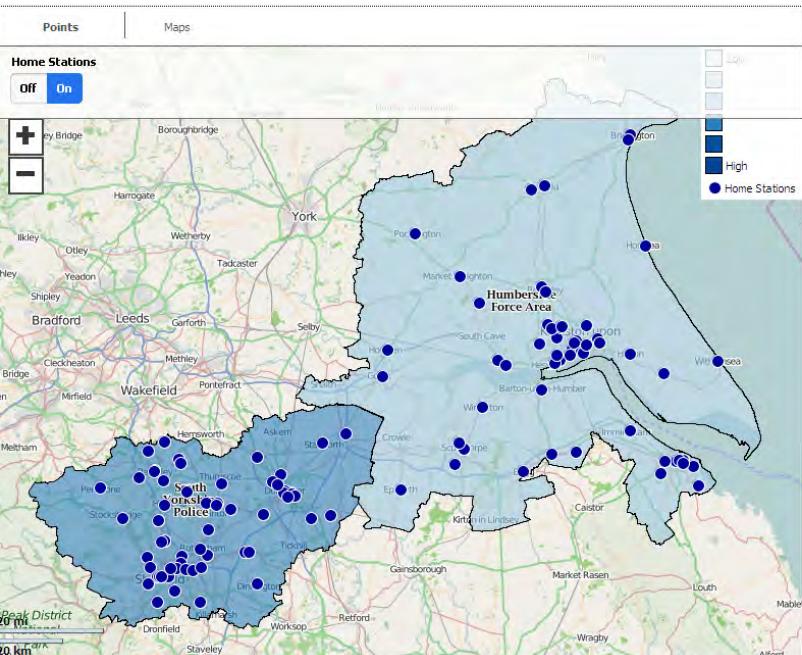
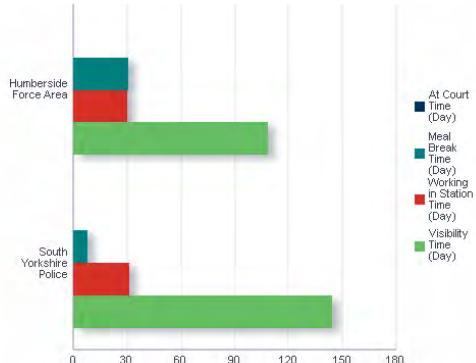
Forces Analysis



Geo Type Geography	Force or Custom Area Humberside Force	BCU or Division --Select Value--	SNA or NPT --Select Value--	SNT or Ward --Select Value--	Date Range Between 25/09/2014	Time Slot Between 00
Resource Status --Select Value--	* Search Type Continuous	Team Name --Select Value--	Call Sign --Select Value--	Days of Week MONDAY:TUESD	And 00	
						Apply Reset Drill



Resource Analysis



Force Analysis:

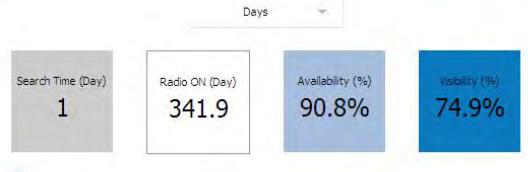
We are displaying on the map the total amount of Visibility and Availability of two Police forces, the Police Stations on the territory and the amount of time spent by all the Police Officer divided by status (etc. At Court, Meal Break, Working in Station and Visibility Time).



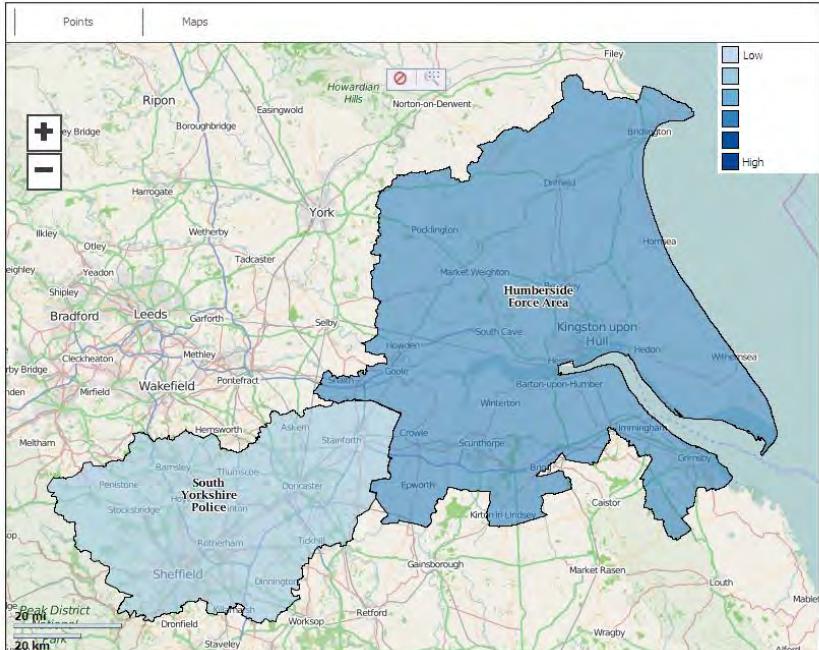
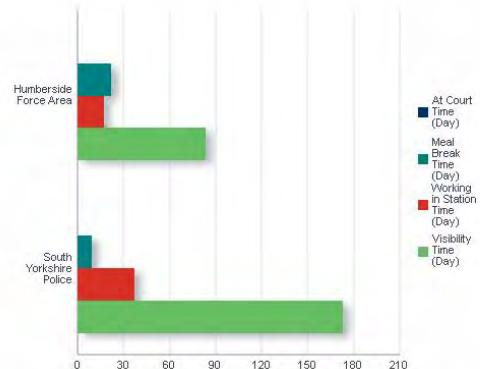
■ Forces Analysis



Geo Type	Force or Custom Area	BCU or Division	SNA or NPT	SNT or Ward	Date Range	Time Slot
Geography	Humberside Force Area	--Select Value--	--Select Value--	--Select Value--	Between 04/12/2014 <input type="button" value="Drill"/>	05/12/2014 <input type="button" value="Drill"/>
Resource Status	* Search Type	Team Name	Call Sign	Days of Week	00	00
--Select Value--	Continuous	--Select Value--	--Select Value--	MONDAY;TUESDAY;WEDNESDAY;THURSDAY;FRIDAY;SATURDAY;SUNDAY	<input type="button" value="Apply"/>	<input type="button" value="Reset"/>



 Resource Analysis

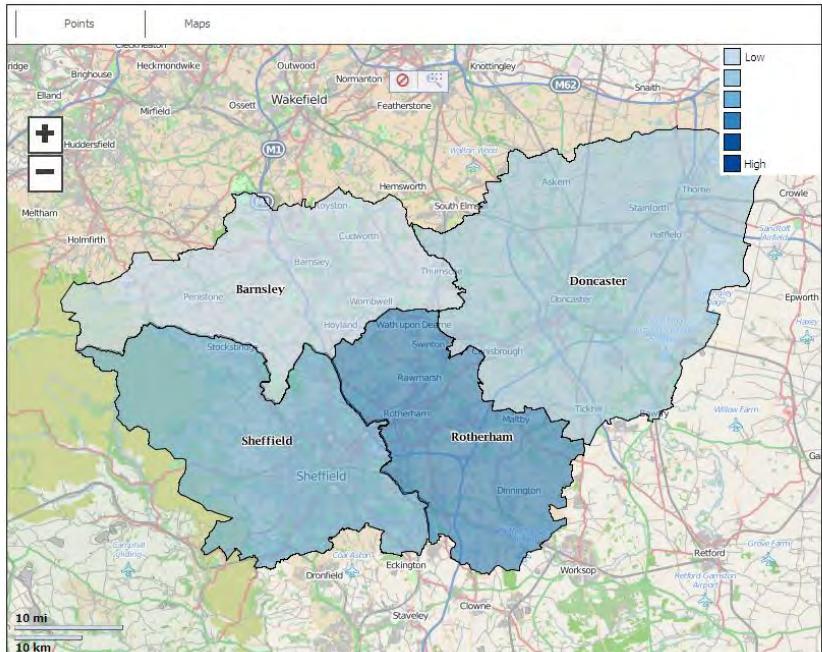
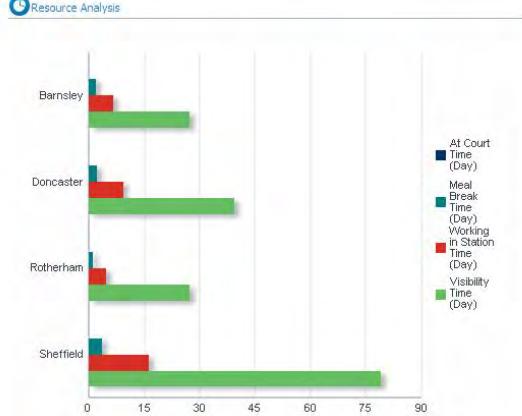




■ Forces Analysis



Geo Type	Force	BCU or Division	SNA or NPT	SNT or Ward	Date Range	Time Slot				
Geography	South Yorkshire Police	-Select Value--	-Select Value--	-Select Value--	Between 04/12/2014 <input type="button" value="Drill"/>	05/12/2014 <input type="button" value="Drill"/>	Between	00 <input type="button" value="Drill"/>	And	00 <input type="button" value="Drill"/>
Resource Status	* Search Type	Team Name	Call Sign	Days of Week			00 <input type="button" value="Drill"/>	00 <input type="button" value="Drill"/>		
-Select Value--	Continuous	-Select Value--	-Select Value--	MONDAY;TUESDAY;V						





Forces Analysis

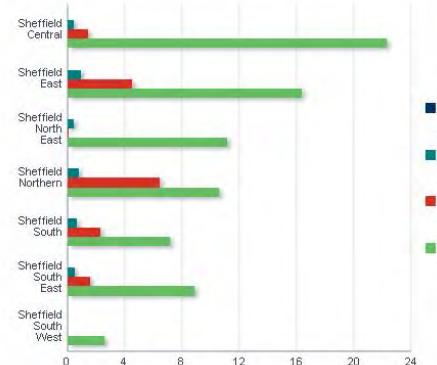


Geo Type	Force	BCU or Division	SNT or NPT	SNT or Ward	Date Range	Time Slot
Geography	South Yorkshire Police	Sheffield	-Select Value-	-Select Value-	Between 04/12/2014 00:00 - 05/12/2014 00:00	Between 00 And 00
Resource Status	* Search Type	Team Name	Call Sign	-Select Value-	Days of Week	00 00
-Select Value-	Continuous	-Select Value-	-Select Value-	-Select Value-	MONDAY;TUESDAY;W	

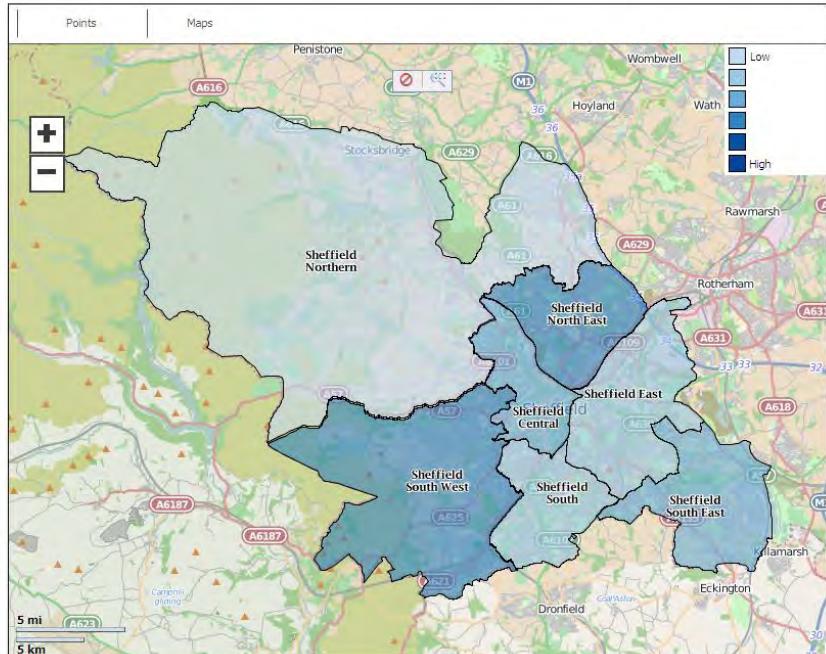
Apply | Reset | Drill



Resource Analysis



█ At Court Time (Day)
█ Break Time (Day)
█ Working In Station Time (Day)
█ Visibility (Day)



Visibility - Availability - Online Officers view



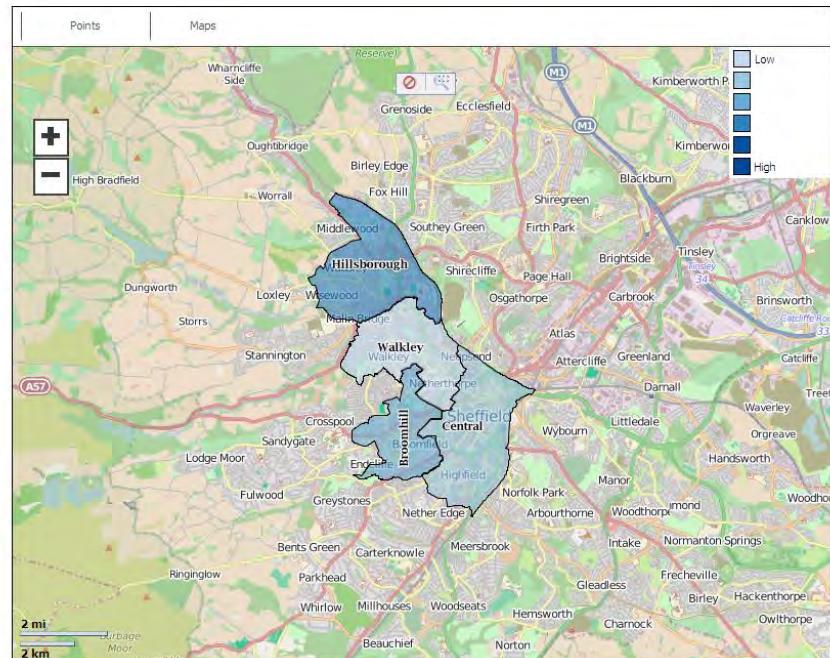
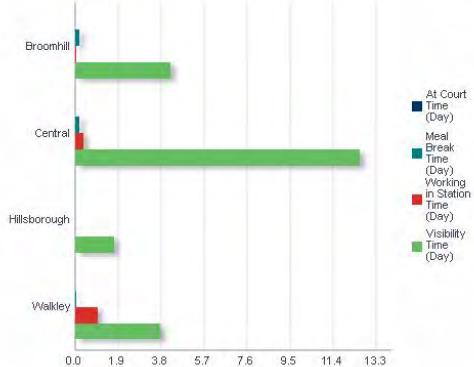
Forces Analysis



Geo Type Geography	Force South Yorkshire Police	BCU or Division Sheffield	SNA or NPT Sheffield Central	SNT or Ward --Select Value--	Date Range Between 04/12/2014 and 05/12/2014	Time Slot Between 00 And 00
Resource Status --Select Value--	* Search Type Continuous	Team Name --Select Value--	Call Sign --Select Value--	Days of Week MONDAY;TUESDAY;W...		



Resource Analysis





Forces Analysis

Oracle BI Interactive Dashboards - Visibility - Windows Internet Explorer

File Edit View Favorites Tools Help

Favorites Console Prod Console Dev Obiee User OBIEE Prod OBIEE Test OBIEE Dev

Oracle BI Interactive Dashboards - Visibility

ORACLE Business Intelligence

Visibility

Police Officer in Selected Area

04/12/2014

Visibility Time (Min)

Officer Name	Visibility Time (Min)
PAUL	25.1
JOHN	5.6
JULIA	6.1
MARIE	11.0
MARTIN	8.8
PAUL	12.3
JOHN	39.3
JULIA	17.9
MARIE	0.0
MARTIN	2.1
PAUL	15.4
JOHN	12.8
JULIA	144.4
MARIE	8.0
MARTIN	0.2
PAUL	6.2
JOHN	139.8
JULIA	12.4
MARIE	7.1
MARTIN	11.3
PAUL	24.5
JOHN	70.4
JULIA	11.4
MARIE	0.3
MARTIN	42.7
PAUL	12.0
JOHN	40.0
JULIA	13.1
MARIE	4.8
MARTIN	13.7
PAUL	8.3
JOHN	12.7
JULIA	41.1
MARIE	19.7
MARTIN	8.5
PAUL	0.0
JOHN	10.0

Date Range: Between 04/12/2014 and 05/12/2014

Time Slot: Between 00 And 00

Days of Week: MONDAY;TUESDAY;WEDNESDAY;THURSDAY;FRIDAY

Apply Reset

Points Maps

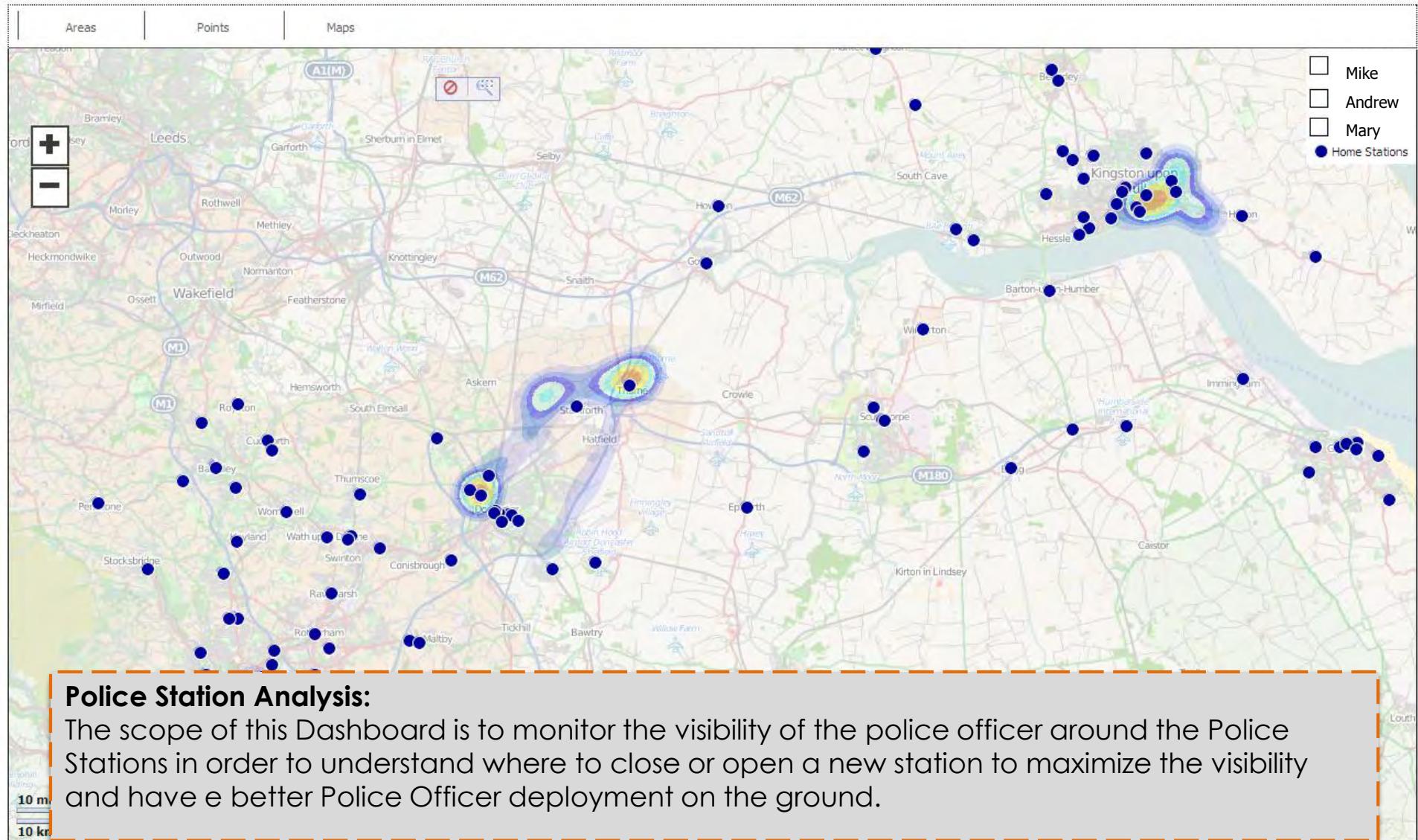
Analyse Visible Police Officers

Analyse In-Station Police Officers

Map showing police officer visibility across a geographic area with various locations labeled. A legend indicates visibility levels from Low (light blue) to High (dark blue). A callout box highlights the 'Hillsborough' area.

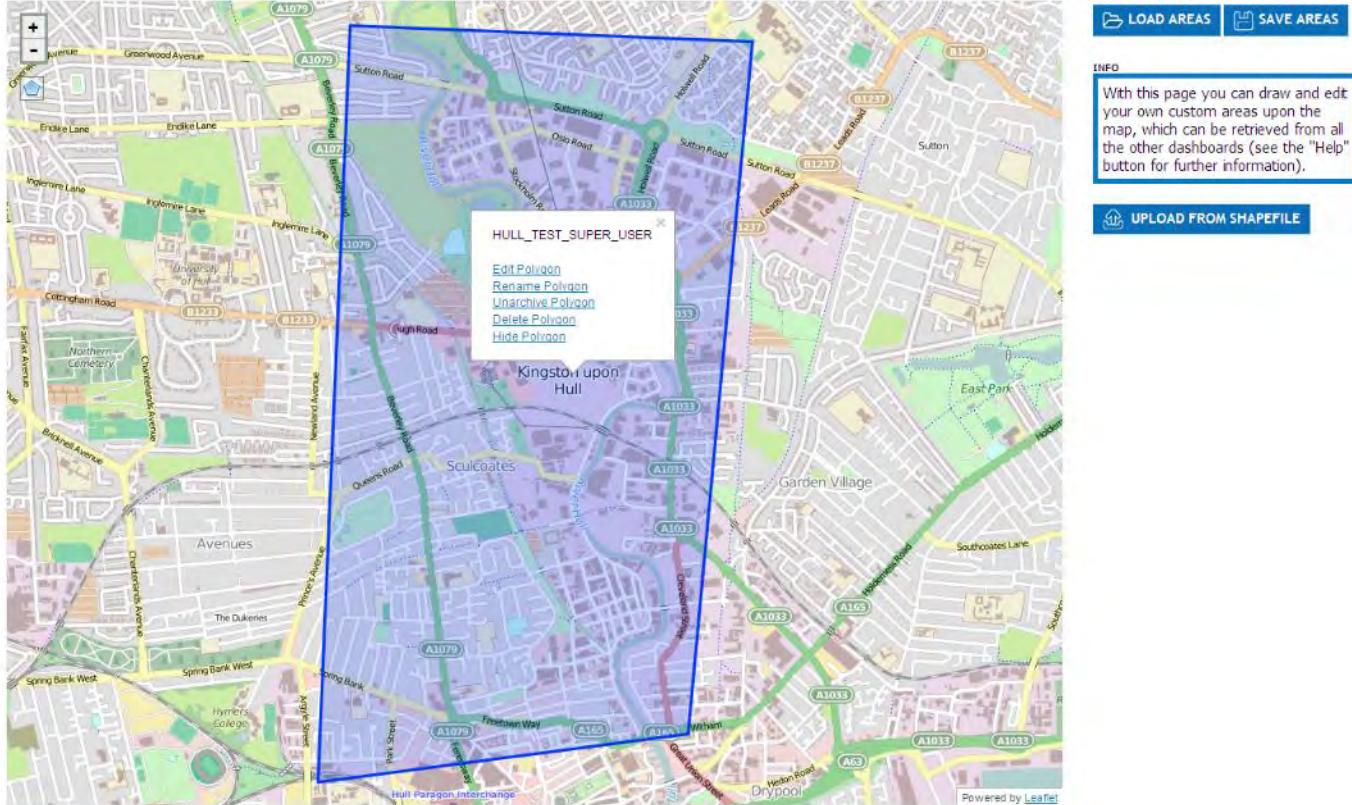


Police Stations Analysis





■ Custom Areas



Custom Areas:

On this Dashboard an analyst can draw on the map a custom area of analysis and save the area for further analysis. The analysts are using this feature to analyze hot-spots on the ground and monitor specific areas in real time without any action by the IT department.



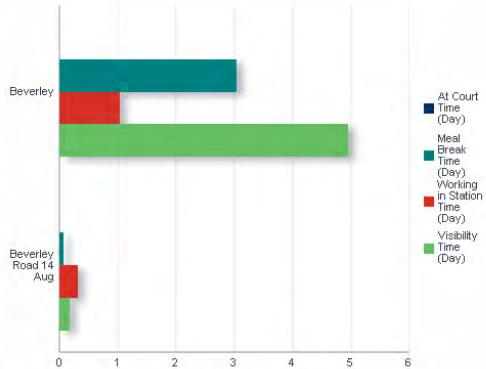
Custom Areas



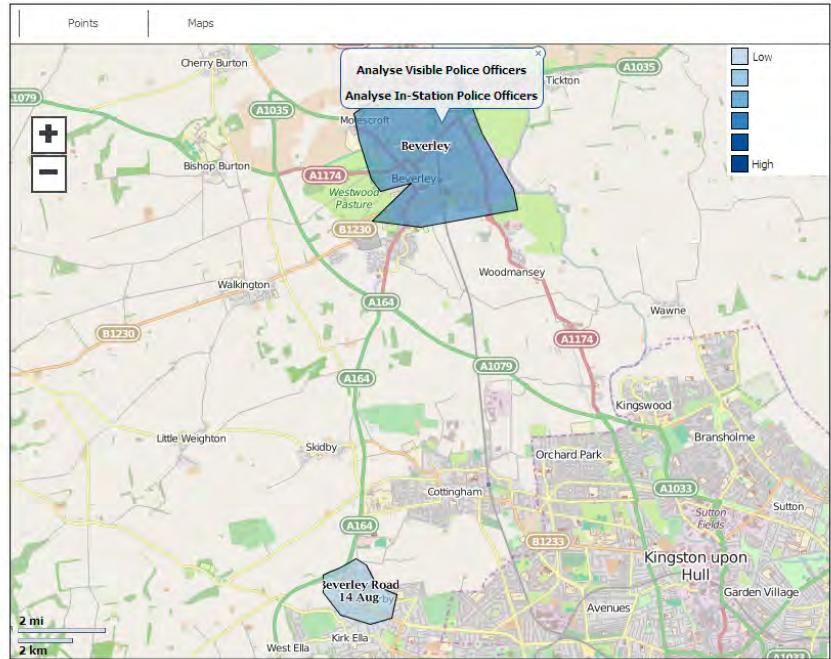
Geo Type Custom	Force or Custom Area Beverley; Beverley Rct	BCU or Division -Select Value--	SNA or NPT -Select Value--	SNT or Ward -Select Value--	Date Range Between 04/12/2014 And 05/12/2014	Time Slot Between 00 And 00	
Resource Status -Select Value--	* Search Type Continuous	Team Name -Select Value--	Call Sign -Select Value--	Days of Week MONDAY; TUESDAY; W...			
					<input type="button" value="Apply"/>	<input type="button" value="Reset"/>	<input type="button" value="Drill"/>



Resource Analysis



Visibility - Availability - Police Officers view





Deployment Analysis



Geo Type Geography	Force South Yorkshire Police	BCU or Division Sheffield	SNA or IPT Sheffield Central	SNT or Ward --Select Value--
Resource Status --Select Value--	* Search Type Continuous	Team Name --Select Value--	Call Sign --Select Value--	

Apply | Reset

Deployment Day Range 1 Between 01/11/2014 05/11/2014

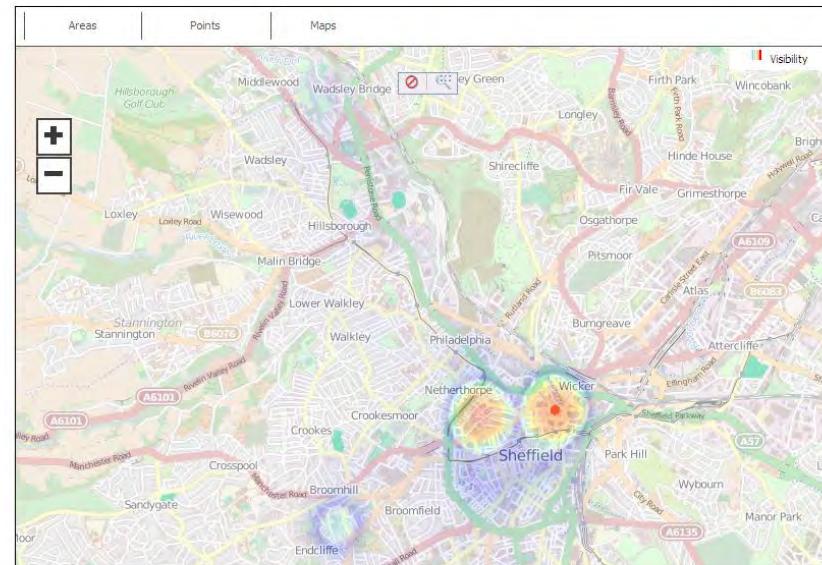
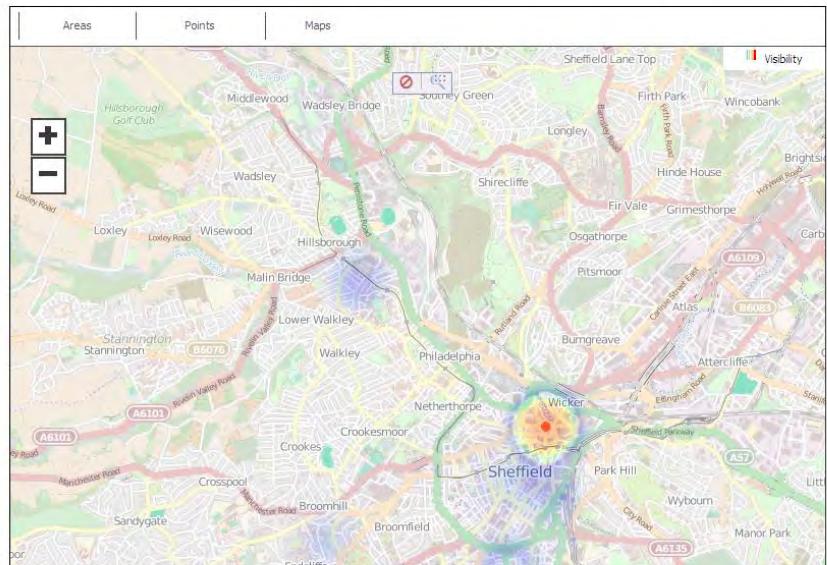
Deployment Time Slot 1 Between 00 And 00
00 00

Apply | Reset

Deployment Day Range 2 Between 03/12/2014 04/12/2014

Deployment Time Slot 2 Between 00 And 00
00 00

Apply | Reset



Deployment Analysis:

In this Dashboards the analysts are able to show on two maps different Police Officers deployments during different dates in order to compare the effect of different deployments on the visibility measures and optimize the patrolling planning on the areas.



Officer Analysis



To indicate that a Station is valid since before 01/01/2012,
please insert 01/01/1900 as Start Date.
To indicate that a Station has no expiration date, please insert
31/12/2099 as End Date.

Name	Start Date	End Date	
Adwick (Redhouse)	15/08/2012	31/12/2099	<input checked="" type="checkbox"/>
Air Operations	01/01/1900	31/12/2099	<input checked="" type="checkbox"/>
Atlas Court	01/01/1900	31/12/2099	<input checked="" type="checkbox"/>
Attercliffe Police Station	01/01/1900	31/12/2099	<input checked="" type="checkbox"/>
Barnsley District Headquarters	01/01/1900	31/12/2099	<input checked="" type="checkbox"/>
Bennethorpe	01/01/1900	31/12/2099	<input checked="" type="checkbox"/>
Bentley Police Station	01/01/1900	31/12/2099	<input checked="" type="checkbox"/>
Brinsworth Police Office	01/01/1900	31/12/2099	<input checked="" type="checkbox"/>

Officer Analysis:

From this dashboard it is possible to define the availability of a police station for a specific period of time. This will impact the Visibility calculation.



Officer Analysis



To indicate that a Team is valid since before 01/01/2012,
please insert 01/01/1900 as Start Date.
To indicate that a Team has no expiration date, please insert
31/12/2099 as End Date.

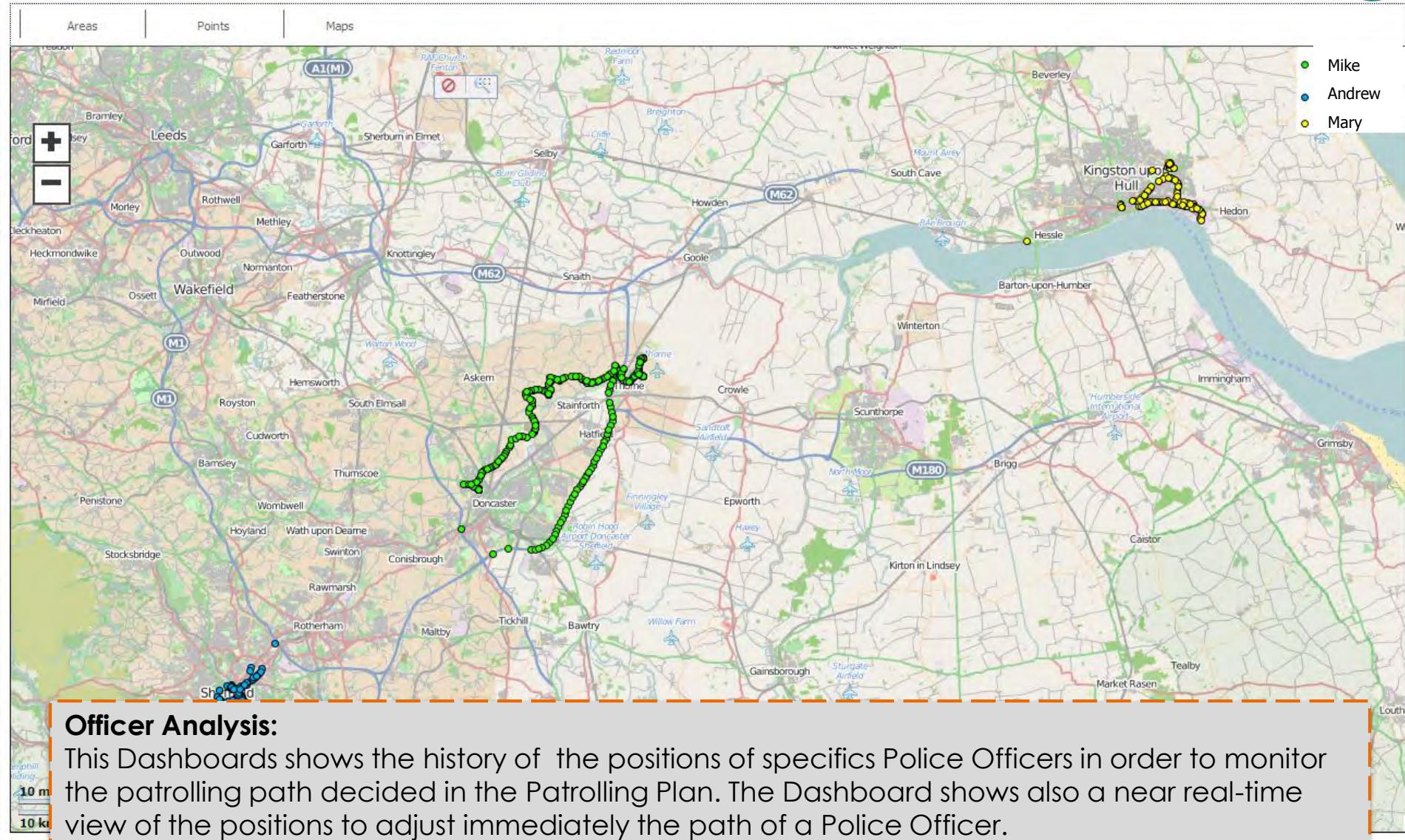
Team Name	Officers	Start Date	End Date	Active	
Team 3 Test	Q	01/01/1900	24/01/2014	Y	 
Team 4	Q	01/01/1900	31/12/2099	Y	 
Team 5	Q	01/01/1900	31/12/2099	Y	 
Team 6	Q	01/01/1900	31/12/2099	Y	 
Team 7	Q	01/01/1900	31/12/2099	Y	 
	<input checked="" type="checkbox"/>	01/01/1900	31/12/2099	Y	

Officer Analysis:

From this dashboard it is possible to create a custom team of police officers for a specific period of time. The team will then be listed within the filter prompts.



Officer Analysis



Officer Analysis:

This Dashboard shows the history of the positions of specific Police Officers in order to monitor the patrolling path decided in the Patrolling Plan. The Dashboard shows also a near real-time view of the positions to adjust immediately the path of a Police Officer.



Next Steps

- Crime Analysis
- Incident Analysis
- External Data Sources integration
 - Weather
 - Points Of Interest
 - Demographics
- What-if analysis
 - Crime prediction
 - Hot-spots identification
 - Deployment optimization

Some numbers

ITALY

- **25,000** reports per day on 8 years history
- **15,000** OBIEE users enabled with different profiles

UK

- Rows
 - **400** millions for visibility
 - **300** thousands for crime
 - **400** thousands for accidents
- **200.000** GPS points per day
- **3** years history (to be brought to 5)
- Near-real time upload: every **20min**
- ETL: Informatica to be migrated to ODI

Location Intelligence

Location intelligence is a set of tools and techniques to integrate a geographical dimension into BI platforms, aimed at enhancing their capability of better monitoring and interpreting business events.



Discovering meaningful correlations between phenomena described by indicators that share nothing but spatial proximity.



GIS

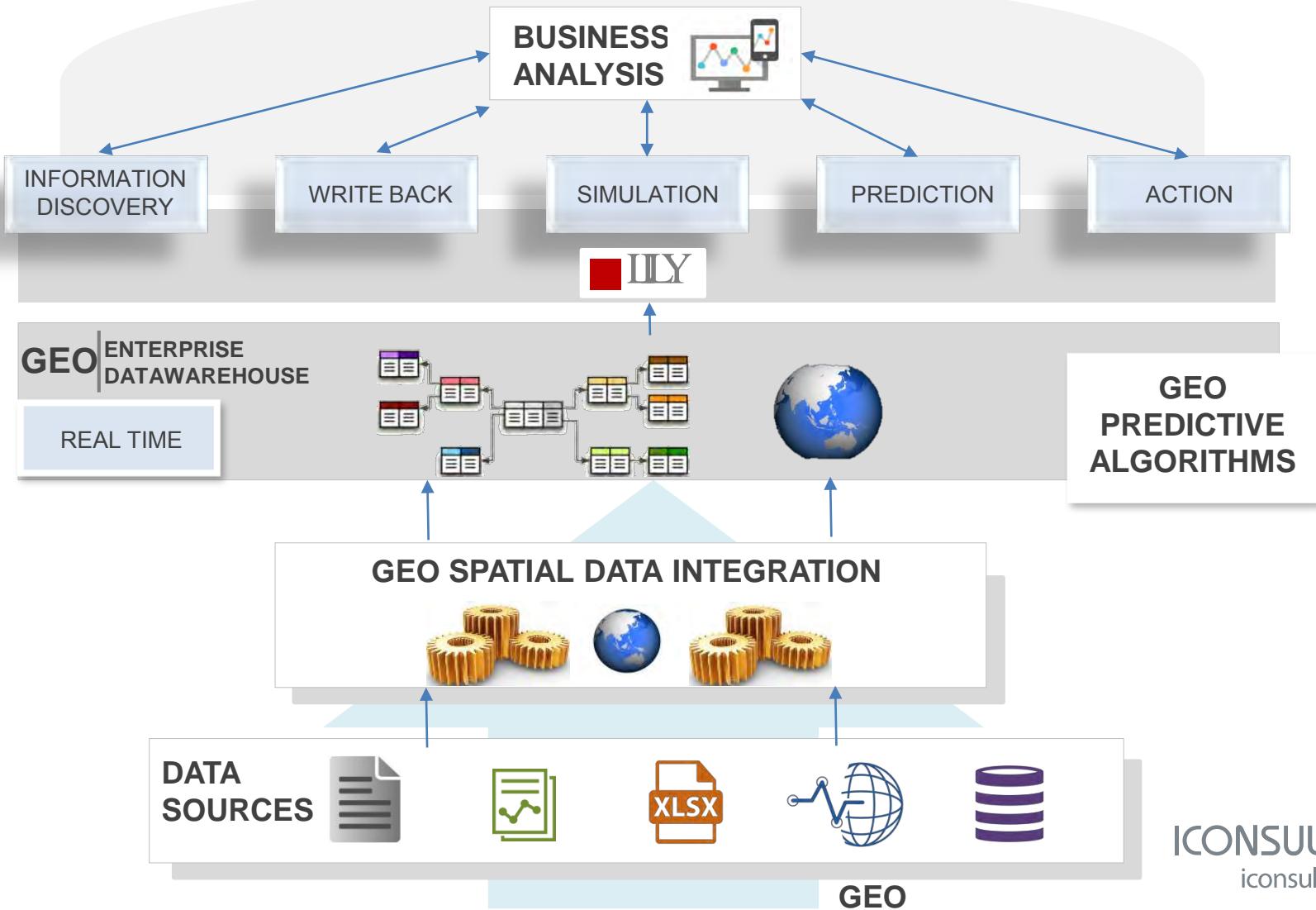
expert users
operational tasks
to achieve tactical benefits



Location Intelligence

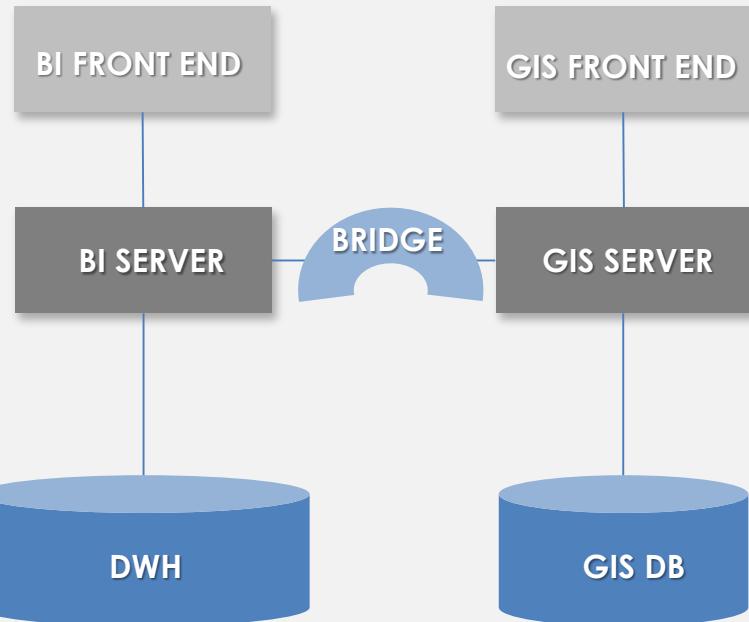
business users
decision-making tasks
to achieve strategical benefits.

Location Intelligence Architecture

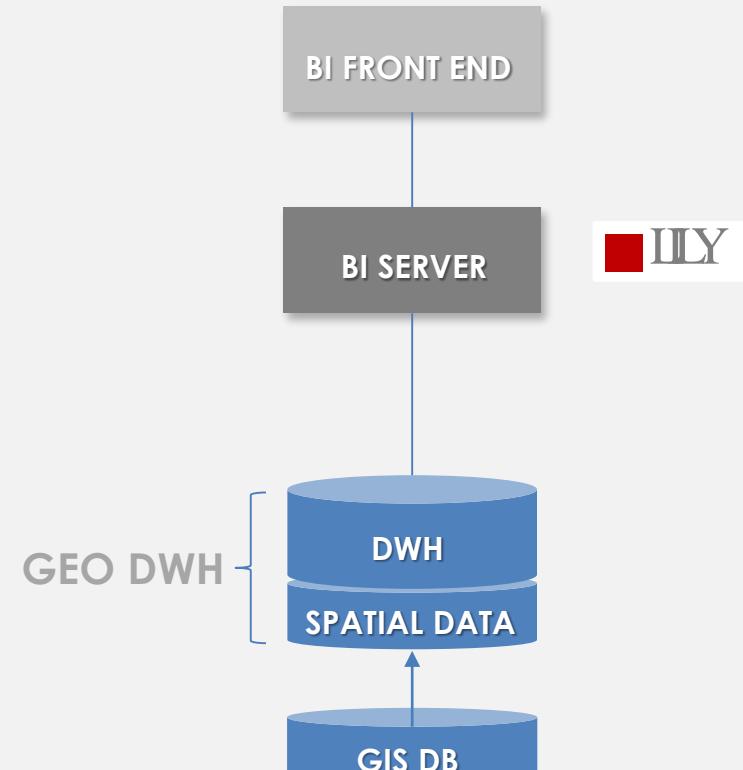


Location Intelligence Architecture

Semi-tightly coupled

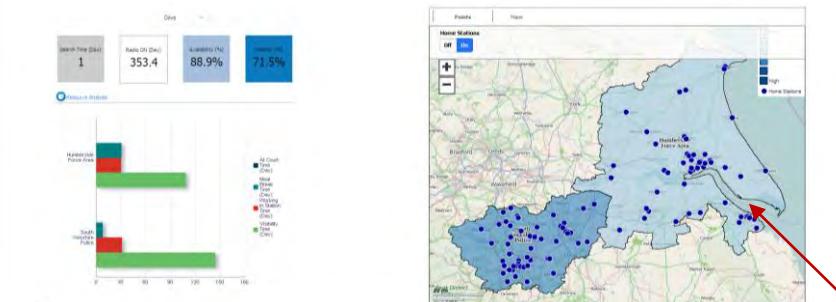


Tightly-coupled

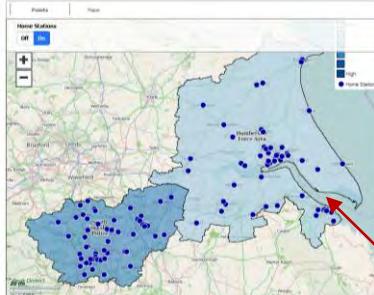


PRESENTATION LAYER

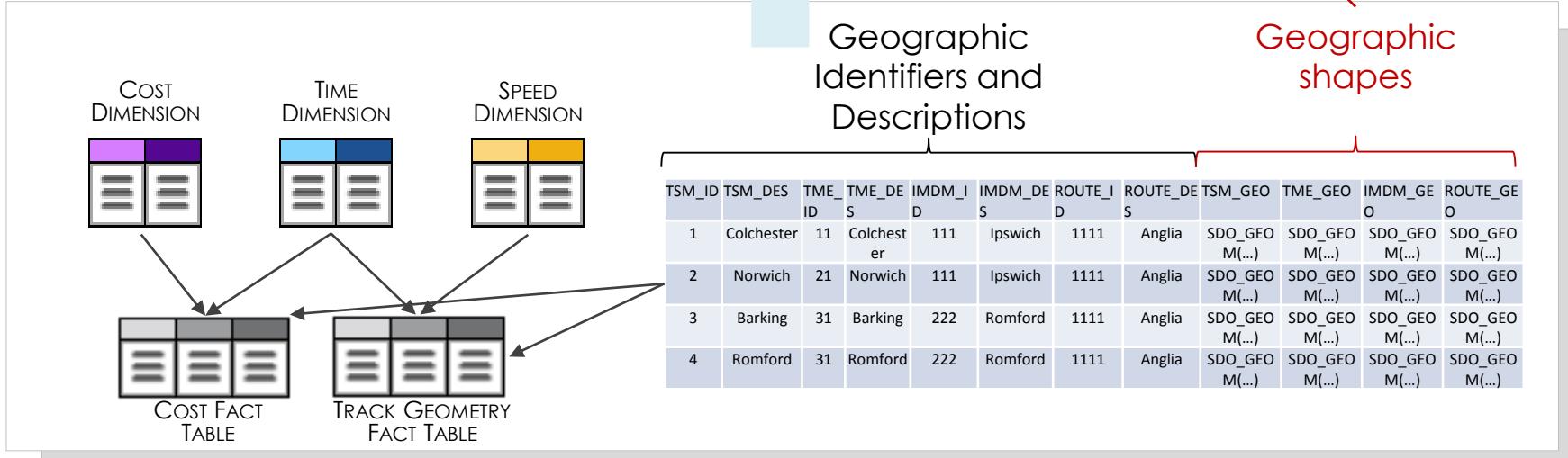
Graphs & tables



Maps report



DATA WAREHOUSE LAYER



Academic Conference Papers

From Business Intelligence to Location Intelligence with the Lily Library

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ACM Seventeenth International Workshop On Data Warehousing and OLAP (DOLAP 2014)

Co-located with
ACM CIKM 2014

Shanghai, China
November 7, 2014

Lily: A Geo-Enhanced Library for Location Intelligence

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Data Warehousing and Knowledge Discovery

15th International Conference, DaWaK 2013
Prague, Czech Republic, August 2013
Proceedings



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