

The geographic information for the critical processes management: the “Intergraph solution” for RFI



THE CHALLENGE:

Since 2004 RFI has started investments path to realize a technological “jump” for the process automation for the achievement of a modern, safe and interoperable network. This path will end within 2009 with the introduction of advanced technologies for the building of the tracks and for the trains’ circulation.

At the same time the RFI Strategies, Quality and IT Division has also started a radical transformation process moving from a project-oriented organization to a process and service oriented organization.

This transformation process has been provided by ICT framework: a set of rules and procedures that have permitted to identify roles, processes, persons responsible and a correct flow to manage it.

In this context Intergraph Italia, for over five years focused on transportation thematic (in particular rail) as RFI technical partner, has become a “RFI Supplier” that develops projects needed to support RFI to make decisions related to his business processes and collaborates with RFI to define strategies and opportunities.

Obviously the geographic information represents the joined value integrated with the dynamics of the actual processes and of the future ones.

At this point the step for the realization of DSS “integrated” with the geographic information is very brief; infact, you must consider as the geographic localization and the definition of a territorial context can sensibly speed up and enrich an analysis related to railways network processes. We can think,

PROFILE: RFI

Name – Rete Ferroviaria Italiana s.p.a. – “Ferrovie dello Stato” Group

Web site – <http://www.rfi.it/default.asp>

RFI is a company of the “Ferrovie dello Stato” Group and it manages the Italian railway infrastructure.

The Italian government has entrusted RFI with the tasks assigned to railway Infrastructure Managers by EU Directives and national laws, on account of the know-how accumulated during the years.

RFI plays a central role in Italy’s deregulated market, in which licensed transport companies can operate railway services; its main mission is to define and implement the investments for the construction of new railway lines.

Size - Some numbers to define the managed infrastructure: over 16,200 km of rail tracks, 9,200 of which electrified; 6,300 km of double track, for a total overall length of 28,000 km; about 2,700 passenger stations, 1,380 km of tunnels and 8.500 km of power lines. A workforce of around 36.000 ensures the circulation of 9,200 trains per day. The highest peak of traffic is 10.000 trains on Fridays and the lowest peak is 5,000 trains on Sundays.

KEY BENEFITS:

The main target of the core project was to integrate the “territorial” view in the ERP system that supports all the management and maintenance processes of RFI. Starting from that point a lot of specific solutions were made in order to sustain critical tasks. Specific benefits could be underlined in:

- To use the real world under GIS perspective in order to better understand complex phenomena;
- Manage interactions between processes, assets and data using their spatial rigorous (but not easy to find) relations;
- Ability to produce complex and easy to understand thematic maps and geoReports based on ERP data.

for example, at the operations' rooms (central and/or peripheral) for the rail efficiency control (technical control, maintenance schedule, rail line diagnostic)

"The Intergraph solution" is based on a standard technology that meets the customer requirements and directives: a three tiers architecture based on a web platform with the use of SOA and web services according to OGC standard for the achievement of the maximum interoperability and modularity.

The selection process was started years ago based on different key factors. The most relevant were the ability of the software to integrate several platforms (ERP, Business Intelligence, Reporting and so on) based on a growing SOA paradigm, the "live" access to standard and proprietary data based on dataserver technology, the presence of the vendor in the OpenGis board. Another key factor was the ability of the technology partner to support the complete life cycle of the project starting from the architecture design till the delivery and support. Last but not least the large number of references acquired worldwide by the provider in large enterprise systems.

PRODUCTS USED:

- Geomedia Professional
- Geomedia Standard
- Geomedia Standard
- GeoMedia WebMap
- Geomedia Transportation Manager
- Web services OGC and custom web services

THE PROJECT OBJECTIVES:

- To define a methodology to integrate and to manage the geographic data base to geometric and topology validation rules as metadata description rules.
- To develop systems with standard technologies for the achievement of the maximum interoperability and modularity.
- To achieve a complete integration between cartographic data and business management systems (maintenance (IN.RETE) and traffic control (PIC))
- To manage data in a sustainable way through:
 - use of standard technologies
 - continuous acquisition and storage of railway data (from planning and engineering workflow)
 - Use of commercial geographic data for general organization and thematic map
 - Use of multimedia data, as videos, for an integrated and multimedia data base

THE SOLUTION:

The following are three topic processes described in which Intergraph Italia has used its own technology and the competence of a team with high value and professionalism:

- Real time video system;
- Natural phenomenons impacts;
- Railway line faults management.

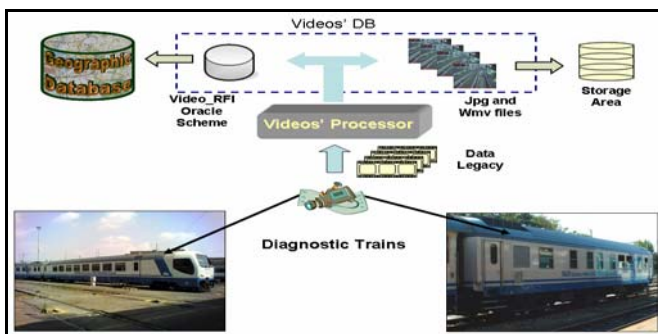
The first process arises from the customer's need to build and to quickly use a friendly multimedia data base defined by videos along the tracks. These videos are generated by

cameras placed on board of diagnostic trains that recognize the entire rail net twice a month.

The cameras placed on board of diagnostic trains produce videos in a legacy format.

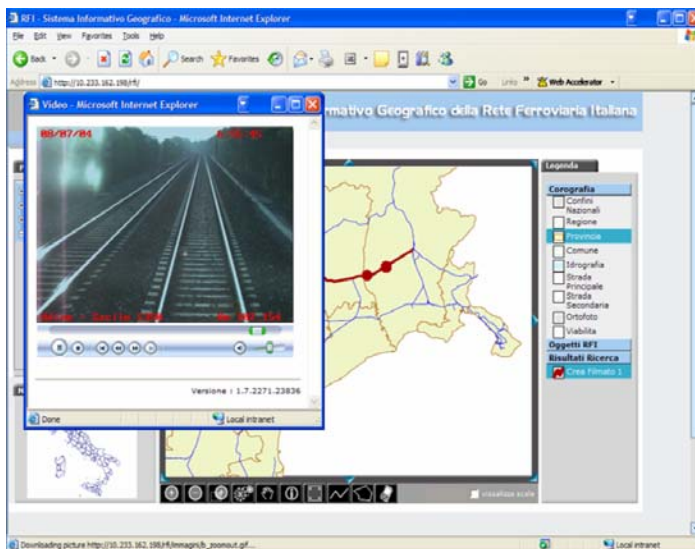
Intergraph has developed a processor that transforms these videos in a Video DataBase. This video data base consists of a Oracle scheme in the Cartographic Data Base and a set of jpg files and wmv files saved on a storage area.

The solution provided by Intergraph is to make easily accessible by web interface, entirely integrated in the RFI web application, the “informative value” derived by videos’ consultation with a simultaneous geographic view.



Caption 1: BD VIDEO-architecture

The value of this system is first, the monitoring and logging of the rail line in its modifications and evolution; second, it's remarkable the advantage that the video recognition technology could do at validation and updating processes of the cartographic data base.

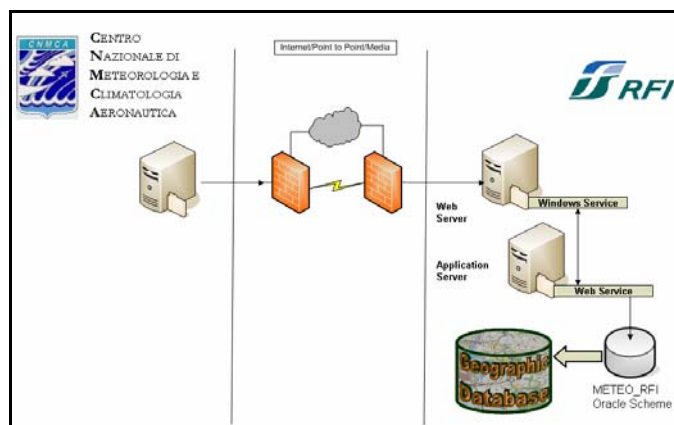


Caption 2: Real time video system

In the figure above within a frame it shows the video selected and on the map it's highlighted the line related to video and the start and the end point defining the video portion

The second process arises from the customer's need to generate an "alert monitor" related to natural phenomenon impacts on the rail infrastructure and on the trains' circulation.

The solution provided by Intergraph uses an architecture linking the RFI data processing center and the Italian Air Force one.



Caption 3: METEO SYSTEM-architecture

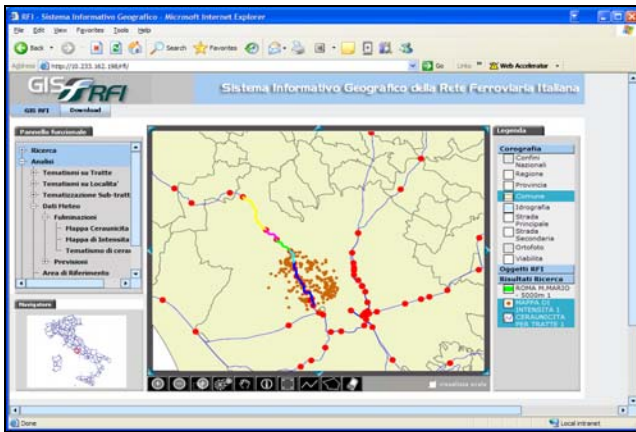
The treated data presents two formats: measures and forecasts. In particular the measures regard the geographic location, the intensity value and the date of lightning; the forecasts regard, instead, the temperature value, the wind's intensity and direction, the cloud cover percentage, the precipitations' value.

This information is available on a server of Italian Air Force (with yearly agreement with RFI) and is updated every 5 minutes regarding lightning's measures; while, forecast data cover a period of three days (including present day) with 3 hours intervals and are updated every 12 hours. The interaction with this data is provided by web interface, entirely integrated in the RFI web application, and it permits to highlight critical and "probably critical" situations. With the lightning measures it's possible to handle damage objections and define a better planning of the rail insulations as regards to "ceraunicità" index (lightning's number)

With the forecast indicators it's possible to identify the following forecast scenarios:

- Rail overheating because of high temperature;
- Trains' "difficult circulation" because of snow;
- Landslide alert because of great rainfall;
- Freight trains' "difficult circulation" because of intense winds.

For each scenario, the "decision maker" takes the adequate countermeasures and defines the correct action plan.



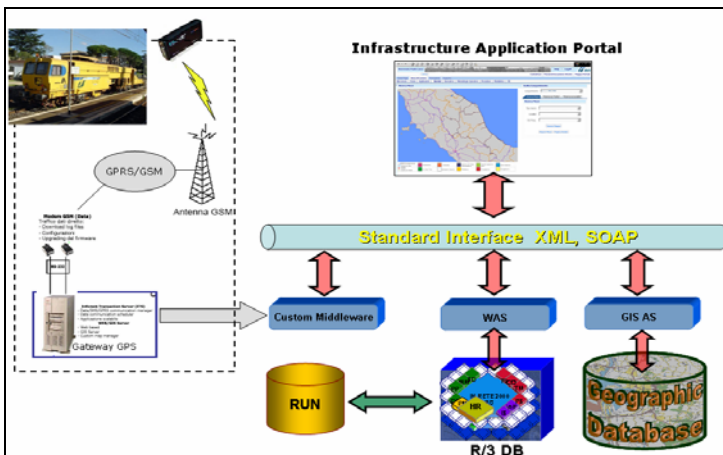
Caption 4: Natural phenomenons impacts

In the figure above it shows the result of the "Ceraunicità Tratte" functionality; inserting some parameters related to a set of rail segments, the application will thematic selected rail segments in base al number of lightnings for km (in this case., about 12 lightnings/km and about 172 lightnings/km)

The third process regards the problematic of corrected localization in real time of fleet maintenance vehicles and of work teams.

This process becomes "critical" when the same vehicles and related teams are used in activity of emergency and in programmed maintenance.

The critical element that must be taken into consideration regards the correct choice of the tracking device for the vehicles, and on the other hand all the procedures for the registration, retrieving and on board data analysis, (with particular attention to the efficacy, availability, activation characteristics).



Caption 5: Railway line faults management

The solution provided by Intergraph in cooperation with other technological providers, is finalized into the integration and retrieving of such information in a technological open standard format, characterized by platforms based on the standards of interoperability (software and protocol) for the fleet management in ordinary and extraordinary situations.

These applications are entirely integrated within RFI Enterprise SAP Portal

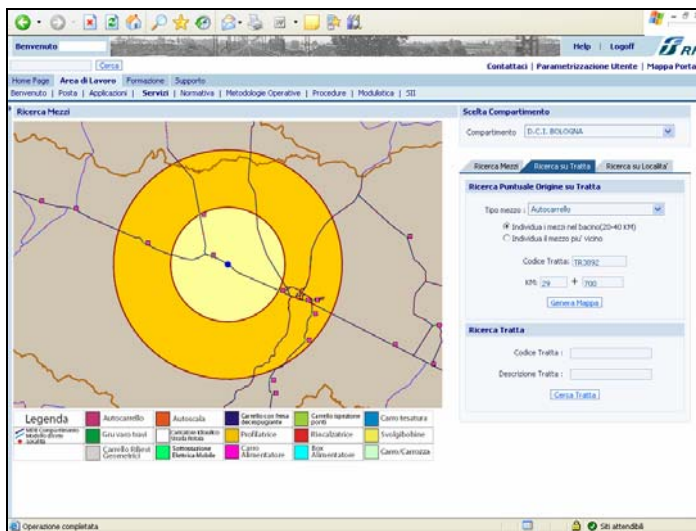
The vehicle localization is provided by two methods:

The first one by informations saved in the SAP system related to georeferenced layer (for example the railway station where the vehicle is in parking)

The second one is by a technology developed and managed by Intergraph; this technology consists of sw and hw and in particular some gps tool have been placed on board of vehicles and with an dedicated hw and sw (in particular,web service) the application is able to storage and to present the geographic position of vehicles and permits to monitor these vehicles during its movements on the rail line.

In this last metod, it's very useful the historical trace functionality that permits to represent on the map the movements of the vehicle in a time period.

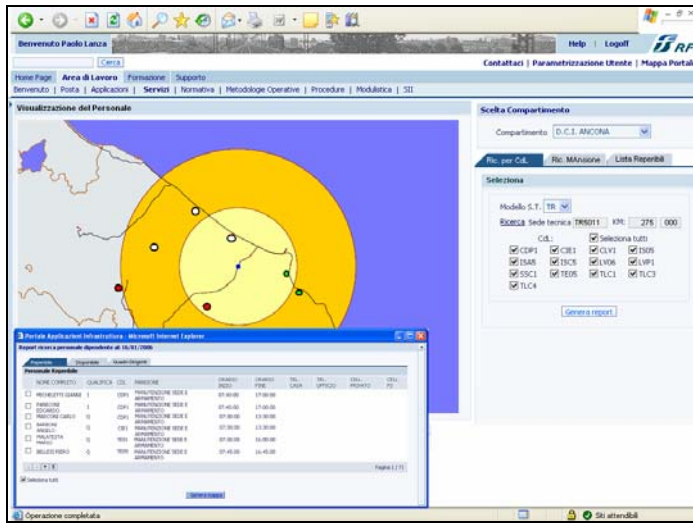
It has been realized a functionality to represent dinamically the path of the vehicle.



Caption 6: Vehicles localization application

In the other application, we can see a similar application in which it's possible to localize on the map the persons to compose the technical teams to manage the fault on the rail line

The localization is related to the address of the persons stored in SAP module, HR, and retrieved by dedicated web services developed in SAP and in GIS environment.



Caption 7: Personnel localization application

THE FUTURE:

The project grows year by year involved in business areas that aren't already covered by GIS processes. The core architecture is now completed and stable and can provide value added services also to other companies. The approach follow so far (to build application for real needs) has been winning and will be used also in the future.

About Intergraph

Intergraph Corporation is the leading global provider of spatial information management (SIM) software. Security organizations, businesses, and governments in more than 60 countries rely on the company's spatial technology and services to make better and faster operational decisions. Intergraph's customers organize

vast amounts of complex data into understandable visual representations, creating intelligent maps, managing assets, building and operating better plants and ships, and protecting critical infrastructure and millions of people around the world. For more information, visit www.intergraph.com/.

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