Geographically Thinking Railroad Management at CVRD

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Abstract

Companhia Vale do Rio Doce (CVRD) is one of the most important players in the logistics sector in Brazil. It runs an extensive network of railroads, ports, and terminals. It also operates coastal shipping routes and offers the most complete intermodal service to the Brazilian market. The company provides both integrated and personalized logistics solutions. CVRD owns the biggest railway in Brazil (9,306 km). The complexity of this operation drives the Company to a continuous search for improvements in its supporting information systems. The Railroad GIS project was conceived to provide CVRD with an integrated railroad management system supported by geospatial information. One of the goals is to provide users with better management tools, based on visual (geographic) information of the different types of events that occur along the railroad, integrated with existing corporate systems. This paper will present the concepts and the current status of this ongoing project.

Introduction

The inception phase of the Railroad GIS system, presently being developed at CVRD, produced a view of the system that comprised two important business processes. The first one related to the railroad monitoring, and the second one associated with the planning and maintenance of the railroad.

In the first business process the idea is to provide the CVRD staff with tools that will give them a better understanding of the different types of events that take place along the path of the railroad area by introducing the geospatial dimension integrated with an existing system used to report these events.

As to the second business process the idea is to support the planning and maintenance activities focusing in risk control and reduction of environmental impacts. That means to provide spatially enabled tools to enhance the business process.

System Modules

GOFER Module

The GOFER module is responsible for providing the geospatial view of the events recorded in a corporate system, also called GOFER (Fig 1), which is currently used to monitor the railroad operation based only in alphanumeric information.

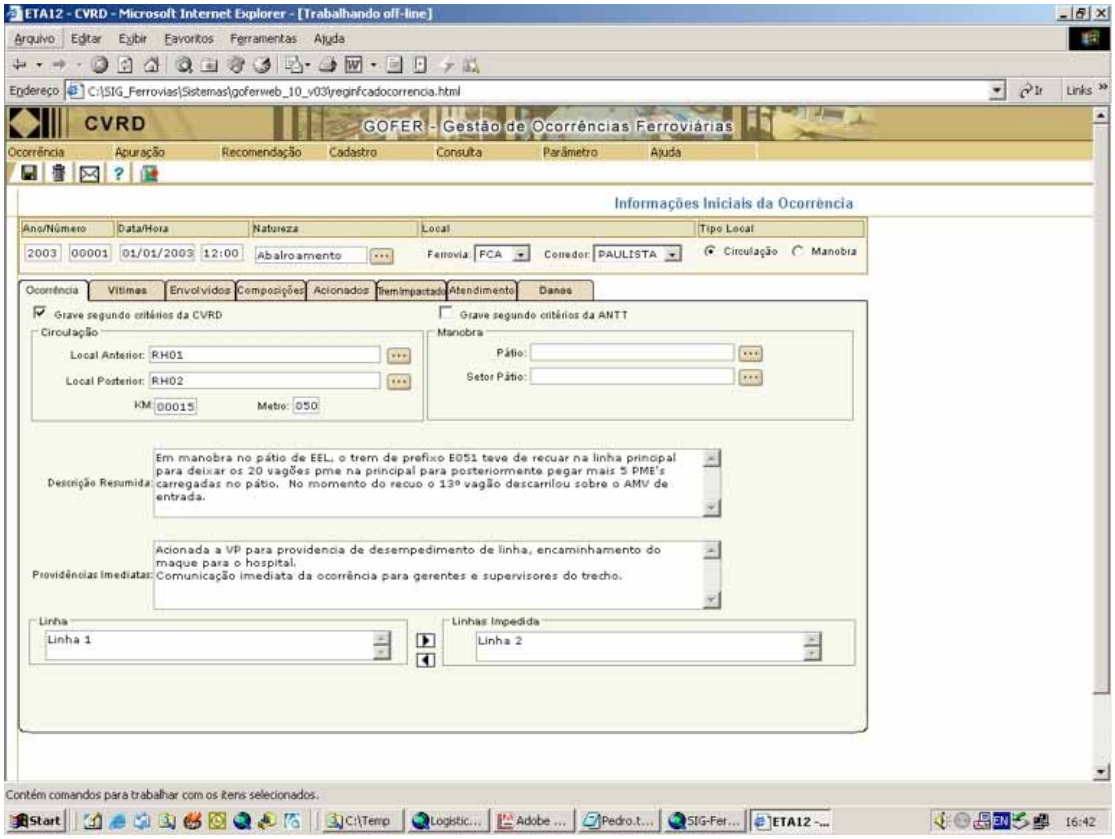

Fig 1. GOFER Module.

To perform this task the GOFER Module (Fig 2) will provide managers with geographic layers of information and analytical functions. With these tools they will be able to view and manage the entire railroad, as well as detailed critical segments, combined with alphanumeric information kept by the existing GOFER system. With this in hands managers will be able to respond more accurately and rapidly to events that might threaten the environment along the railroad influence area. Layering environmental, human and topographical information with the location of a given event, the system provides the necessary spatial analysis environment to support decision-making, shortly after the event occurrence.

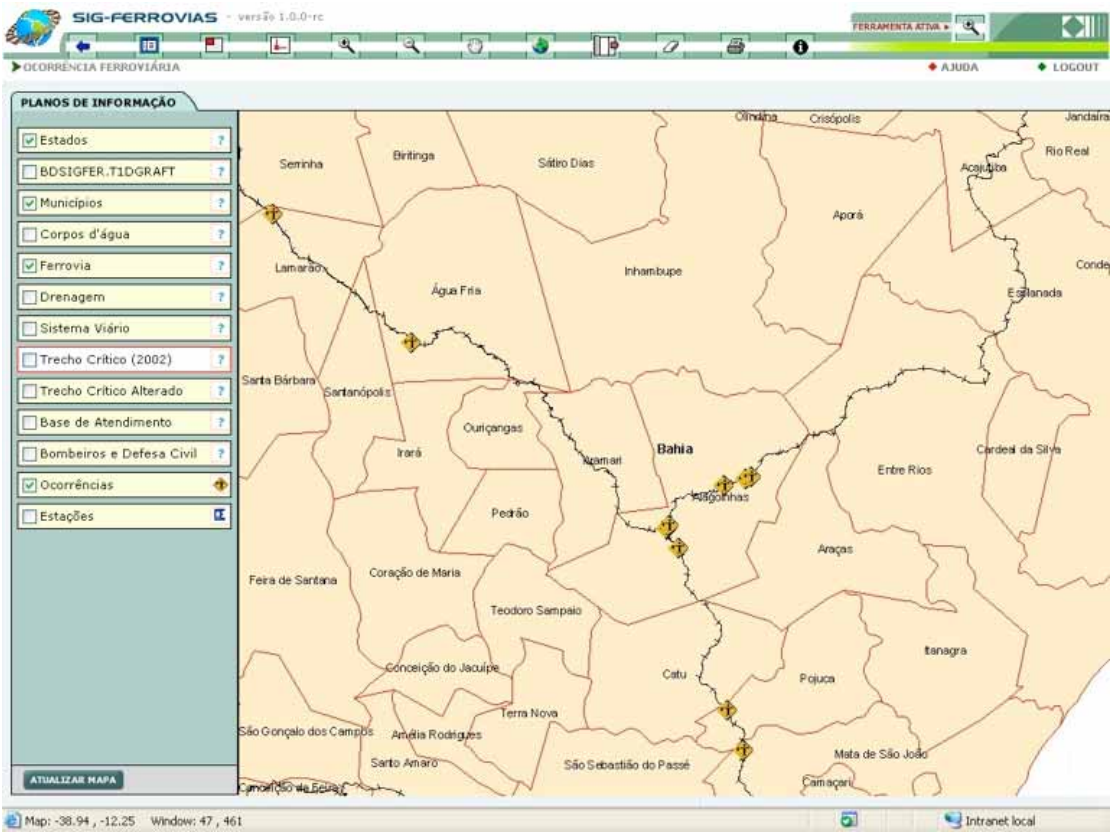

Fig 2. GOFER layers of information.

PGR Module

The PGR module will be responsible for providing tools for planning and maintenance of the railroad powered by geographic information. The entire railroad has been surveyed in order to find its critical points. Critical factor indexes were developed and the PGR module (Fig 3) will provide managers with tools to evaluate and maintain the critical factors indexes. The idea is to analyze which factor has more influence in a given segment, and update its values based on corrective measures applied to the segment.

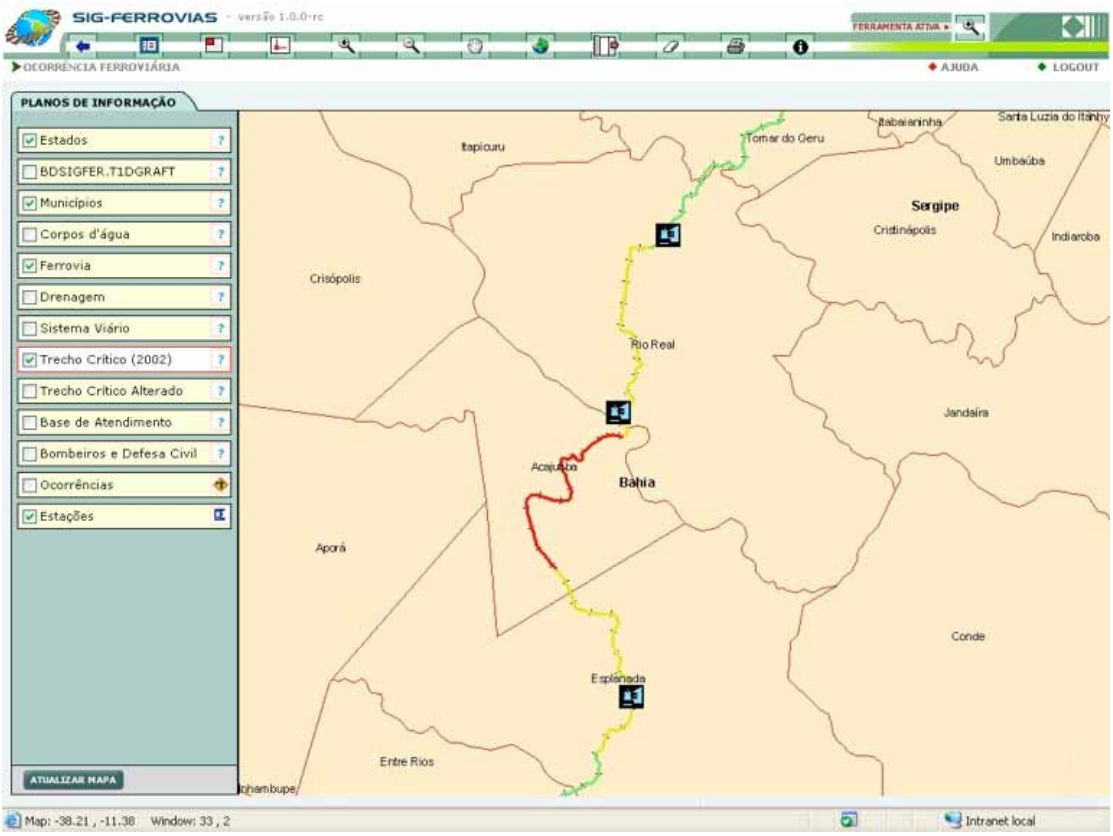

Fig 3. PGR Module.

One of the main features of this module will be the ability to analyze different scenarios when planning corrective actions to a given segment. The managers will have a clear view of all parameters involved such as type of rail. With this management will be able decide what investment will drive the critical factor indexes to desired levels optimizing the cost-benefit relation. (Fig 4 and Fig 5)

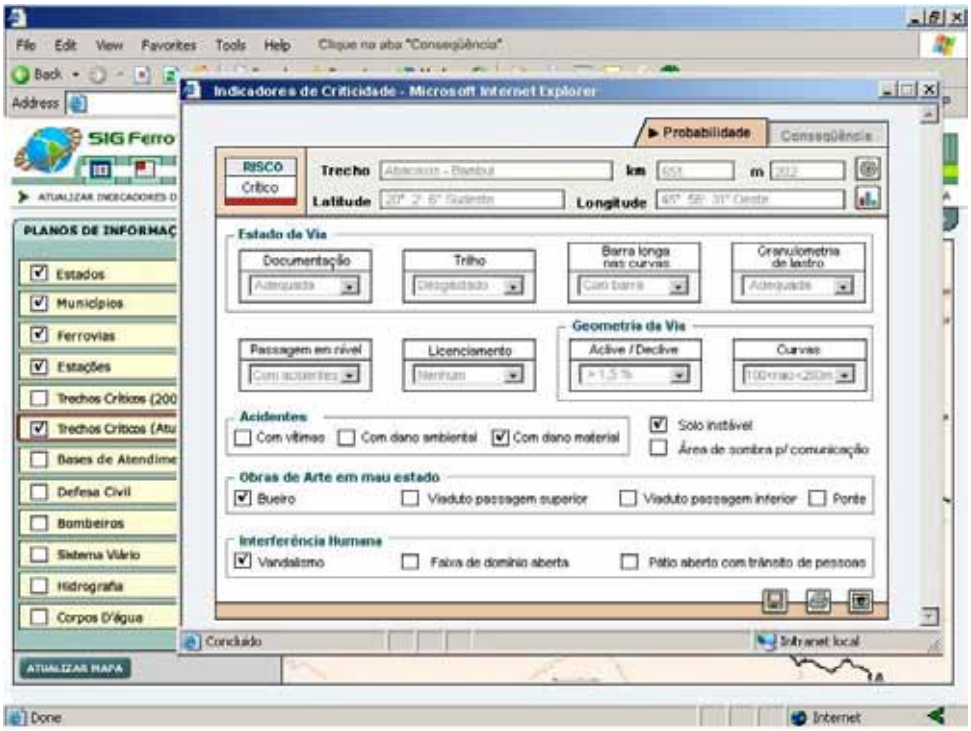

Fig. 4. The system permits the use of different scenarios when planning corrective actions to a specific segment.

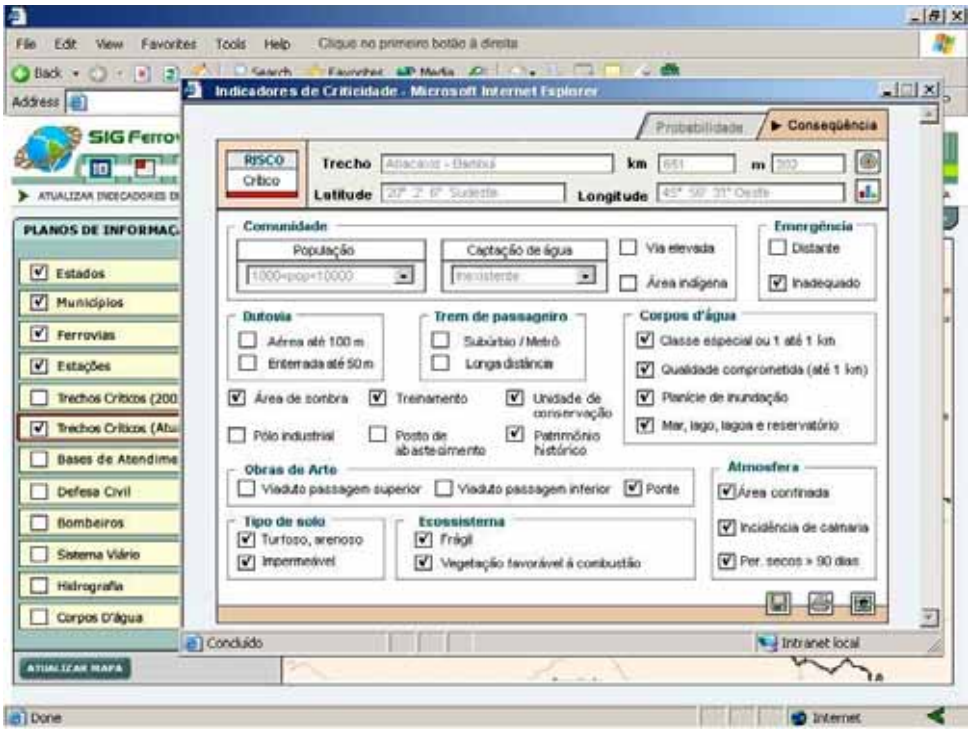

Fig. 5. Risk indicators are used to define rail risk.

System Architecture features

Application	
Source code	Java, JavaScript, HTML
Architectural pattern	MVC (model/view/controller)
Framework	Struts

Software Components	
ArcIMS	4.01
Virtual Server	ImageServer, ImageServer ArcMAp
Connector	ArcIMS Java Connector
ArcSDE	8.3
ORACLE	8i
ORACLE Application server	9i

Development Process

The development process I use is based in well established practices in order to achieve good quality software. Those practices include:

- All requirements collected through use cases.
- The development process is based on RUP – rational unified process.
- Version control - to track the code history and keep intermediate candidate releases apart from the main code (“head”).
- Bug control - A tool is being used to control bugs and programmers tasks, providing means to control the life cycle of the bug and the planning of which features will be part of the intermediate releases.
- In every code compilation unit tests are run to prevent new code to damage existing one.
- Automated nightly processes retrieve source code from the version control system, build and deploy the application and run functional tests.

Current Status of the Project

- The GOFER module is about to be deployed in the production environment.
- The PGR module is in the construction phase and is due to August this year.
- After deployment user training will take place, along with 30 days of assisted operation provided by the company responsible by the system development.

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