BIOGRAPHICAL INFORMATION

Alcymar Vaz Gigliotti
Deployment Manager
CPqD Telecom & IT Solutions

Specific Responsibilities

Joined CPqD in 1983. Responsible for the deployment of the Geographic Information based OSS in Telefónica, working from the conception and planning of the deployment project to the beginning of production and mass production.

Past Experience

From 1983 to 1991 worked in the research and development of optoelectronic devices. Since 1991, worked with research and development of information systems. Joined the OSS project since its beginning, participating actively in the specification of the system and managing the conversion module development. Also managed the pilot deployment of the OSS in many operating companies in Brazil.

Educational Information

B. S. – Electrical Engineering, State University of Campinas

BIOGRAPHICAL INFORMATION

Marcos Fernandes de Faria
OSP e-Records Data Manager
Telefónica S/A

Specific Responsibilities

Joined Telefónica in 1987. Since 2001, manages the activities of conversion, updating and production of a georeferenced system in the state of São Paulo. Responsible for the strategy of contract of data conversion services for 14,000,000 POTS.

Past Experience

Responsible for the maintenance of an area that corresponds to 500,000 POTS and 15,000 high speed data communication lines. He was also responsible for the expansion of 200,000 terminals to meet the regulatory agency goal at the privatization process, and the execution of 47 mass movements of customers between facilities in the city of São Paulo, the third greatest metropolis of the world.

Educational Information

B.S. – Electrical Engineering, University of Mogi das Cruzes
PG – Data Communication Engineering, Telecommunications National Institute – INATEL
PG – Geoprocessing, State University of Campinas

ON-LINE TRANSACTION PROCESSING ON A 5 MILLION SUBSCRIBERS GEOSPATIAL DATABASE

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A Telecom OSS (Operation Support System) using georeferenced information technology was deployed in a major Brazilian telecom operating company, with the purpose of: unifying both engineering databases (network design and construction) and facilities assignment (network operation); improving outside plant records reliability; improving work processes; reducing costs and increasing earnings. The implementation of a large program, composed of many projects, encompassing, among others, feasibility study, pilot project, initial and mass production, was the way chosen to deploy this system. As part of this program, intense intra and inter departmental negotiation in all hierarchy levels of the telecom operating company were carried out. Actions with the third party companies contracted to operate the network, the building up of conversion suppliers and the building of work teams were contemplated by this program. The full operation of 5 million subscribers in a GIS platform was achieved at this moment. The simultaneous utilization of a geospatial database, processing a great volume of on-line transactions for facilities assignment, as well as for long transactions for design and maintenance of telecom networks makes this deployment unique in the world. In this paper, details and learned lessons from this deployment will be shared with the GITA community.

I) Introduction

With the great advance of high performance computational systems in the last few years, georeferenced database applications have become a very attractive possibility in terms of management and cadastral data, provided that, in some areas, the georeferencing of resources is a very adequate approach. In the case of telecommunications equipment,

this approach has the advantage of facilitating the equipment's modeling, connectivity and accessibility, being an almost natural way of management and record's keeping. This and the fact that the telecommunication operating company's assets are mostly formed by maps, makes the georeferenced management the optimal storage way of these companies' data.

The deployment experience concerned with a georeferenced system in a Brazilian telecom operating company started in 1995, with the pilot conversion of approximately 40.000 subscribers only for the records and design data. Since it has been realized that the major cost for the deployment of this kind of system is in database assembling — converted mostly from paper records and maps — a module which was capable of turning the conversion into an economic and easily outsourced process was developed. As a result, many Brazilian companies specialized in the assembling of these databases were created for this project. From 1997 to 2000, the maps and plats of nearly 9 million subscribers were converted to the system, but without the necessary updating, these maps were deteriorating. It was found that the best way to keep these maps updated was the deployment of an operation module, accessed in an everyday basis, so the maps would be updated automatically. The deployment of this module and the conversion of data began in 2001, with two pilot projects in two different cities of Brazil and data related to approximately 120.000 subscribers.

II) The processes

In the operating company, before 1997, the operations and facilities management was in a mainframe environment and the engineering management in a graphical environment (CAD and/or paper records), with manual data entry — susceptible to errors. It was difficult to maintain the data, which led to an increase in the probability of data problems. There was a large quantity of processes (many of them being manual ones), involving different areas and applications. The engineering georeferenced databases (urban maps and network data) were separated by central office. After the conversion, it was necessary to update network records (cables, terminal boxes, pairs, etc.) and cadastral urban records (streets, parcels). Since the databases were separated, it was necessary to correct the superposition of areas and data in the limits of the central office areas and of displacements (errors and datum).

The system was developed so that the following processes were related to the geographic information system: records keeping, planning, design, construction and operations of the outside plant and supervision of the outsourcing of the activities.

The digitized cadastral data is the main database of network equipment and is used by planning, design, construction, operation and supervision areas, in an integrated form and

without replications, becoming the only information source of the company for these areas and being updated by all these areas — each in its expertise.

While planning the network, the system generates infra-structure, occupation, network saturation and other reports to be used in the definition of planning aspects. It also permits market analysis through thematic maps (geomarketing), external data utilization, market projections and forecast calculations.

In the network design and construction, the system acts in the following cycle: the need of network re-design is detected. This re-design is studied in the system engineering/cadastral module, which deals with digitized plats, schematics and automatic bill of material calculations. After that, the necessity of facilities modifications is verified, through maneuver, exclusion or insertion, with the system operations module. If a bigger change is needed, the system transfer sheet module is used. Then, the service is sent to be processed in the field. After the intervention, the service is confirmed and/or the modifications are registered in the engineering/cadastral module and maneuvered pairs in the operations module. In these processes the system works with long transactions, the duration of which spans from hours to weeks. To handle this kind of transactions, there were used optimizations for long transactions in the system.

In the sale cycle, the call center asks for the facilities through a service order management system. These are made available from the operations module of the georeferenced system, as pairs and facilities. The service order management system then asks for the terminal number from a terminal number management system and the requisition is sent to the field, through a workforce management system. The installation is confirmed, with the updating of pairs, facilities and terminal number in the operations module. In these processes, the system must answer the requests with times compatible with on-line transactions, typically in the order of seconds. Due to this, the system is also optimized to handle on-line transactions.

In the network operation, the call center registers the request for service, which is registered in the system operations module. Network data such as equipment, cables and ducts are available to the operations module from the engineering/cadastral module database, generating plots of these data to be used by field personnel to implement the modifications. After the modifications are put into effect, the confirmation and/or modification in the service is sent to the operations module (for updating) and to the engineering/cadastral module (for network equipment updating).

For network supervision, once the company works with third party companies that are responsible for keeping the outside plant, it has the control over the status of the network through queries in the database, management reports, access control and change logs.

The third party companies effectively use the system in the day-to-day operation, updating the database and working with the facilities.

III) The Project

The objective of the project was the deployment of a telecom operating company operations support system using georeferenced information technologies with the purpose of unifying the engineering network design and construction) and facilities management databases, improve the reliability of cadastral data, improve work processes, reduce cost and augment gains. Five million subscribers were converted to the GIS platform adopted as standard and put in production, in a period of 12 months, beginning in July, 2002.

The project had the following activities: initial database assessment, data updating, data validation and merge of the production databases.

The initial assessment is done based on the documentation of the Central Offices in a global context and in the data quality. Three major problems were found: displaced databases (Figs 1 and 2), superposed databases (Figs. 3 and 4) and fictitious streets. A report was generated and used in the updating phase.

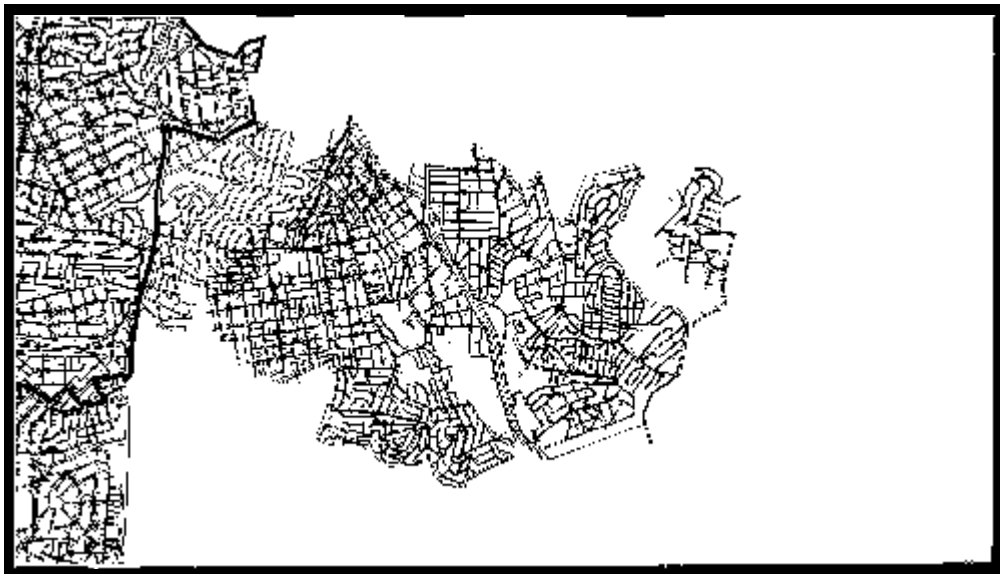

Fig. 1 – Displaced database before correction

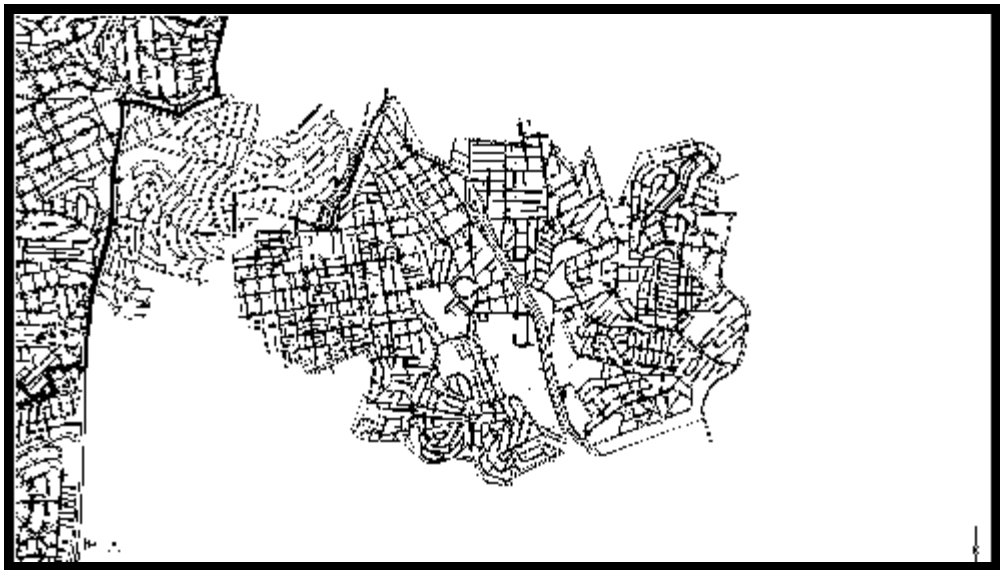

Fig. 2 – Displaced database after correction

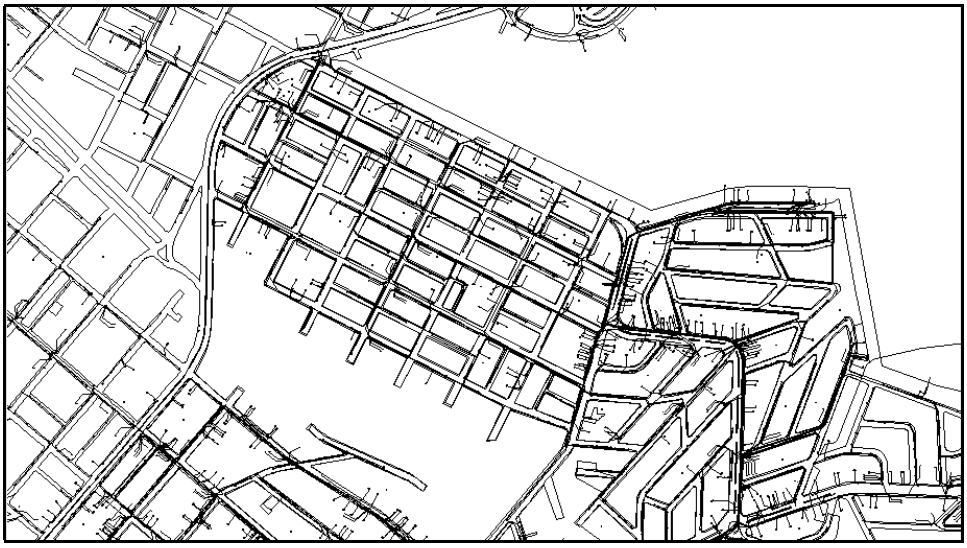

Fig. 3 – Superposed database before correction

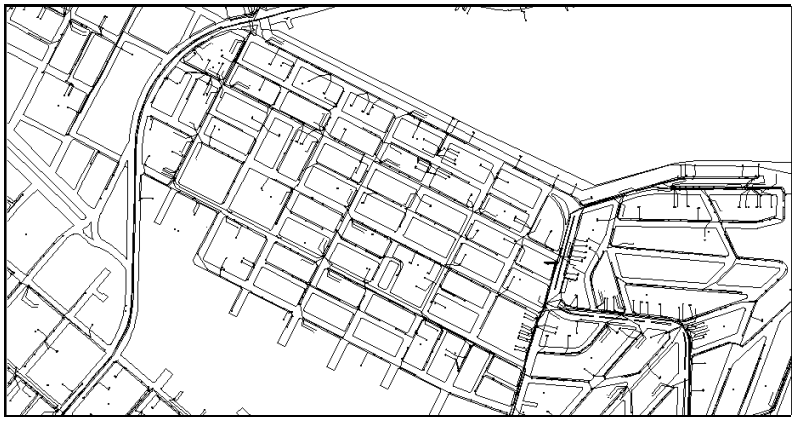

Fig. 4 – Superposed database after correction

The fictitious streets report lists all the streets from the database that have fictitious coding, inserted due to conversion processes that allowed — as a last resource — the assignment of fictitious codes to streets, used only for unnamed streets of the cities.

The data update activities consisted of updating information from both outside plant records and urban records, correction of the problems listed in the reports of the initial assessment (such as superposed databases and fictitious streets) and checking with the legacy operation system data.

At the beginning of the project, the low index of agreement with the legacy system data (Quality Index) — about 30% — was one of the activity's main problems, along with the low productivity of data updating.

The following is an example of this situation:

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Process summary

Total of lines:    419922
Total of groups:     92856
Syntactic errors:     4008
Semantic errors:     30055
Quality index: 63.32
```

Data validation activities consisted of: reports analysis, comparing database status before and after the update; database merge tests and results analysis before the production; and conversion of the operations data tests and results analysis before the production. If after the results analysis from the comparative reports, it was decided that the database was ready to be put in production, database merge and conversion tests were done in a dedicated computational environment, so that every problem found during the merge and conversion processes was previously diagnosed and corrected, provided that, once the system was mission critical (available 7 days a week x 24 hours a day), for the execution of the merge and conversion in production an operational window of 8 hours was defined, which could not be extrapolated.

The problems found in this activity were the low index of agreement with the legacy system data (bellow 90 %) and the corrections which were diagnosed though not implemented.

Finally, in the production database merge activity, which should be executed in the operating company's computational environment, with the system off-line, the problems were mostly caused by the system necessity to be unavailable during the minimum time length, since it is a mission critical system. Due to this fact, the 8-hour operational window was defined, the execution of activities occurred only in weekends and the system stabilization through the project was impossible, since the version upgrades were executed as required, without considering the project needs.

IV) Bidding process

The operating company hired nine companies for the execution of the services: eight for the data updating and one for the database geopositioning analysis, displacements corrections, data agreement index validation, merge of maps, engineering and operation databases.

The unit used for the payments was the quantity of terminals data processed.

This is a graph which shows the quantity of terminals in production x month:

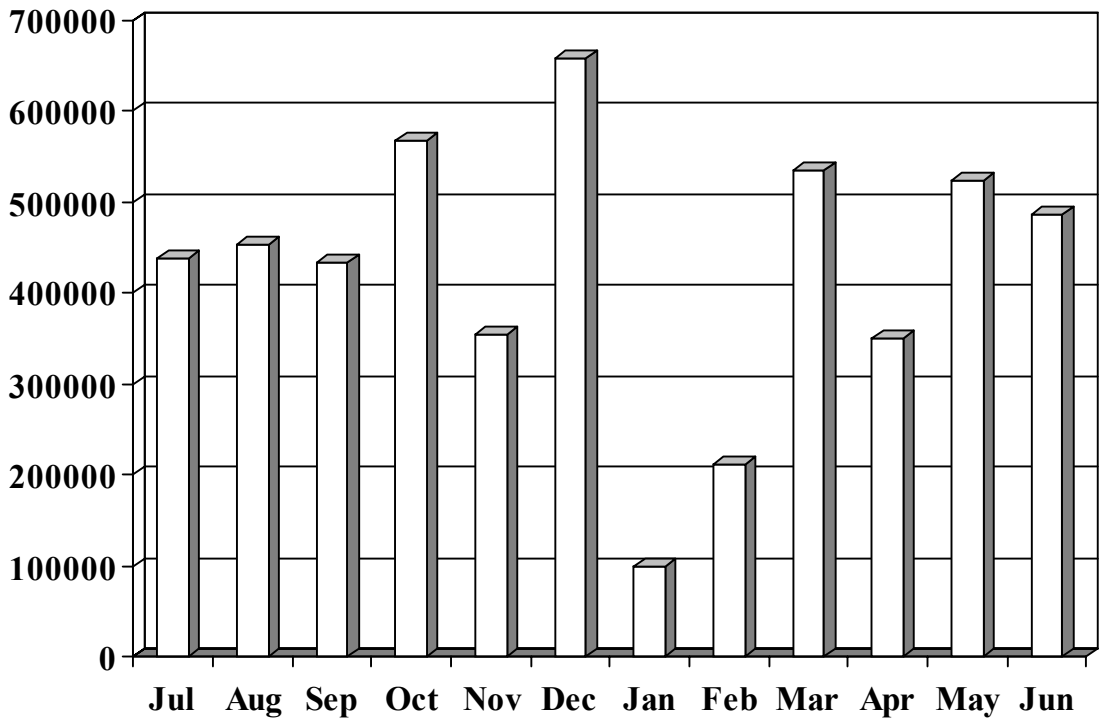
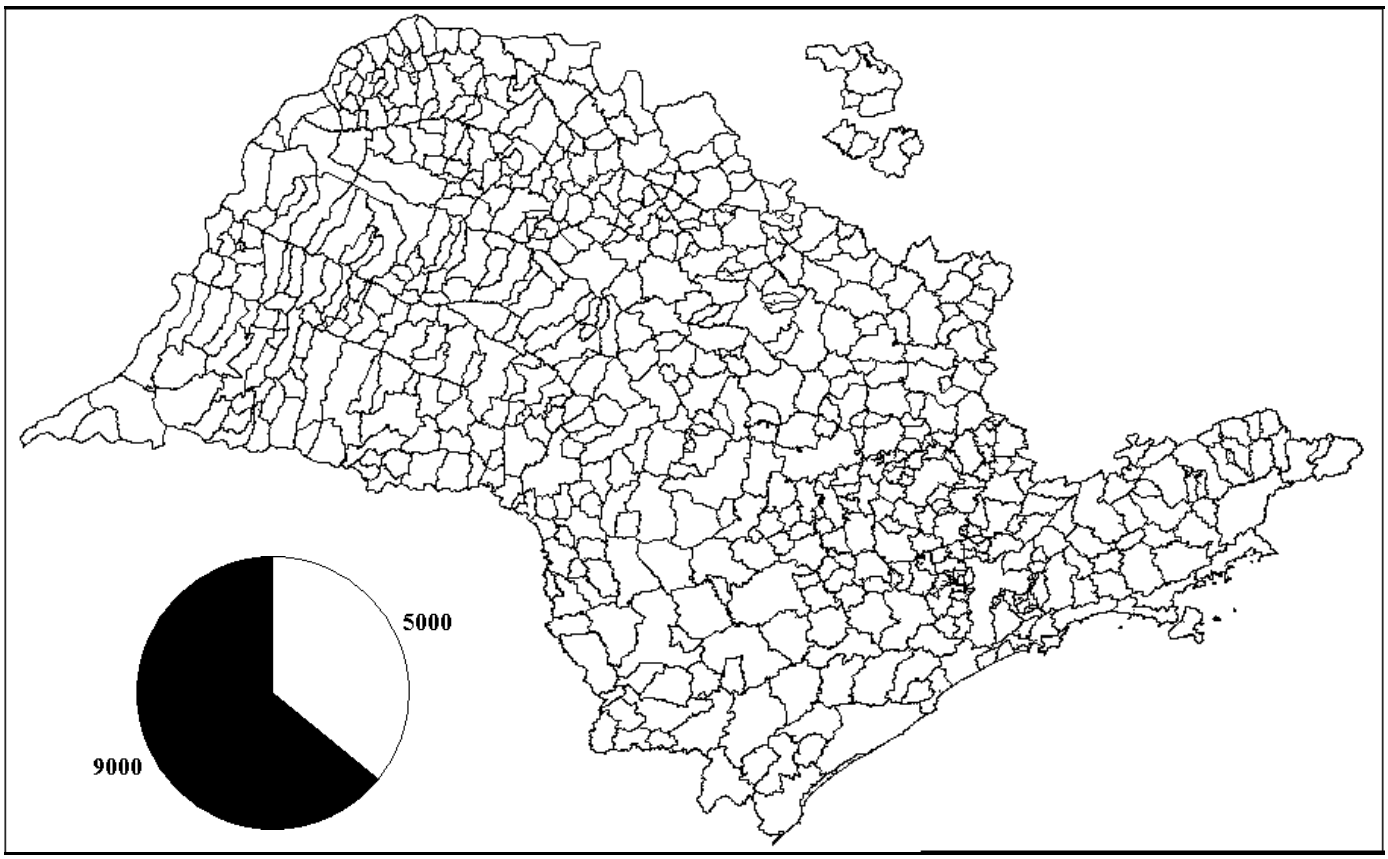


Fig. 5 – Quantity of terminals x month



source: IBGE

Fig. 6 – Operational area of the telecom operating company and a graph of the quantity of terminals data in operation (in kterminals) (white) x quantity of terminals data to be put in operation (in kterminals) (black)

Conclusions

The operational gains planned with the utilization of the system where confirmed, since in some central offices, with the system in production, facility attribution with 97% of correctness was achieved. With the system deployment, a change in the working philosophy of the operating company was necessary. This was the most difficult task, because it is the modification of methodologies and processes that takes the mainframe monitor and gives a GIS drawing to the call center operator, and takes the pen and gives a computer mouse to the designer, and yet integrates the activities of engineering and operations. Other relevant change was the integration with other areas: there was an approximation between the commercial and engineering areas, reaching a goal stated by the CEO of the telecom operating company: "make available the knowledge of the technical personnel in the service of the clients". Concluding, to the future (2003/2004) the main objective of the project is the operation of 9 million more terminals, encompassing the whole operational area of the company (fig. 6), and the conversion of an important center in which the data is not according to the adopted standards.