GIS for Inside Plants of Telecommunications

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Agenda:

Copel Telecommunications

- OSS
- GIS for OSS
- GIS for OSS at Copel Telecom

Project Optimization
Where is Paraná State?

Fonte: http://www.diaadiaeducacao.pr.gov.br/portals/portal/mapas/localizacao_parana.php
COPEL Holding

TELECOMMUNICATIONS
With Copel Telecom, Paraná state became the first Brazilian State to have 100% digital coverage. Its 399 municipalities have optical fiber network installed.

GENERATION
Copel operates 21 power stations of its own, 19 hydroelectric, 1 thermoelectric and 1 wind power station.

TRANSMISSION
The power transmission system is responsible for operation and maintenance of 32 substations and 2,170 km of lines.

DISTRIBUTION
The electric power distribution system attends more than four million consumers in Paraná.

Copel also operates in the segments of sanitation and natural gas.
COMPLETE SOLUTIONS

- Residential
- Small Companies
- Large Companies
- Public Services
- Telecom Operators

Flexibility Coverage Areas Optic Fiber Technology
At Copel Telecom, GIS solutions with ArcGIS platform are used in OSS solutions, and in the support to commercial solutions.
OSS - Operational Support Systems

Software (sometimes hardware) applications that support back-office activities which operate a telco’s network, provision and maintain customer services.

OSS is traditionally used by network planners, service designers, operations, architects, support, and engineering teams in the service provider.
OSS - Operational Support Systems

Inventory

Service Assurance

Design

Activation

GIS

Geographic Information Systems
Copel Telecom uses GIS as a tool for:

- Inventory
- Development of telecommunications network
- Support the commercial department
Inventory – “data management”
Inventory – “connectivity”
Project management
We use GIS for business support in:

- Researches of new markets
- Analyses of new client’s viability
The printing was customized, with the definition of “templates”, in order to meet the company’s standards.
Project Design

R&D – Research and experimental development

Demands

2nd level Splitters

1st level Splitters

OLT

OLT

2nd level Splitters

Demandsn
Identification of prospective clients
Example - step 1

Identification of 2nd level splitters
Identification of 1st level splitters
Example – step 3

Identification of the OLT
Results

A network planning with spatial definition of the necessary equipment installation.
Results on a map
How it works...
Proposed Algorithm – schematic view

a) To plan a PON network, from a group of demands.

b) To find a ideal quantity and the best place to install the 2\textsuperscript{nd} level splitters.

c) To find the ideal quantity and the best place to install the 1\textsuperscript{st} level splitters.

d) To find the ideal quantity and the best place to install the OLT.

LEGENDA
- Facility Node – 3rd level
- Facility Node – 2nd level
- Facility Node – 1st level
- Demand Node
Proposed Algorithm

It is a multiobjective optimization problem, each level of the network is dealt in an individual way, and at the same time it influences the development of the solution for adjacent levels.
Multilevel Algorithm for Network Design

Interactivity among network levels

Start

- Identifying equipment
  - Optimization Algorithms

Demand

- Identifying paths
  - Shortest path Algorithms

Equipment

Finish
Discussion / Conclusion

1) Customization of data input interfaces
   a) Standardization in the use of the system for inventory data input;
   b) Integrity of registered data.

2) Project Tools
   a) Single Management of network projects;
   b) Network expansion Management;
   c) Emission of standardized list of materials.

3) R&D
   a) To enhance time in the development of PON network project;
   b) Standardization in the development of new projects;
   To do:
   i) Integrate the analyzed data from algorithms with existent data in the inventory registry, i.e. to consider the existent network;
   ii) Enhance the computational performance of execution of the algorithm in the interactions among levels.
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