ISP OPTMIZES IT'S WIDE AREA NETWORK

This document describes a Wide Area Network optimization project conducted in one of the largest Brazilian ISPs. The company was the result of a merge between six service providers, and besides providing Internet access it also provided data center outsourcing and web hosting. The company had 200 employees distributed into it's four main offices.

The company provided Internet access to more than 290 large organizations in Brazil and was looking for opportunities to reduce its operational cots.

Our objective when conducting this work was to develop a complete view of the Wide Area Network structure in order to identify possible opportunities for cost reduction.

Our analysis covered three aspects of the Wide Area Network:

- Circuit's real utilization verification: This analysis shows if the nominal bandwidths of the circuits are really necessary and opens the possibility to get savings from reducing them (Check if the contracted circuits are underused).

- Topology verification: This analysis (Using our design tool - Ariete®) allows the identification if there are opportunities of cost savings through rearranging the network structure.

- Prices verification: Allows the identification if there are possible gains attainable from renegotiating the values currently paid, and shows within which limits such gains stand. In this specific case we compared the company's current prices with the costs of other companies of similar size. The study also included verification between the company's sites physical distribution and the available telcos' infrastructure.

The basic data used to execute this study were: A file with the list of the circuits (Including all technical data about each one), the MRTG measurements (traffic measurements of each circuit) and the contracts with the telcos (Economical and contractual information). The organization had 290 circuits contracted with 13 telcos as follows:

Service Provider	Number of circuits	Value in Brazilian Reais	Value in US dollars	% do gasto total
AESCON	8	R$ 16,756.86	USD 6,444.95	3.46%
AT&T	44	R$ 61,465.99	USD 23,640.77	12.71%
Brasil Telecom	5	R$ 2,999.00	USD 1,153.46	0.62%
D3	2	R$ 2,068.00	USD 795.38	0.43%
Diveo	1	R$ 1,294.00	USD 497.69	0.27%
Eletropaulo Te	2	R$ 4,504.00	USD 1,732.31	0.93%
Embratel	10	R$ 63,648.96	USD 24,480.37	13.16%
Global Crossir	1	R$ 34,847.75	USD 13,402.98	7.20%
Iqara	28	R$ 34,198.69	USD 13,153.34	7.07%
MetroRED	30	R$ 37,033.80	USD 14,243.77	7.66%
Telefonica	82	R$ 115,831.99	USD 44,550.77	23.95%
Telemar	76	R$ 108,241.12	USD 41,631.20	22.38%
Canbrás	1	R$ 781.00	USD 300.38	0.16%
Total	**290**	**R$ 483,671.16**	**USD 186,027.37**	**100.00%**

Bandwidth usage   used bandwidth X contracted

The goal of this study is to verify if the contracted bandwidth corresponds to the traffic needed shown by the MRTG measurement tool. This analysis also allows the comparison between different technologies, because through this process we can compare alternatives such as using a packet network (Using defined EIR and CIR values) and using dedicated clear channels.

It was identified that the network had an overcapacity of approximately 15% and this volume could be reduced (with correspondent economical gains) without any damage to the network performance. However, the organization's management considered that its clients weren't prepared to have their access bandwidth reduced and therefore this line of action wasn't pursued further.

Topological analysis

Our topological analysis aimed to adjust the current topology (four nodes) to the real physical distribution of the sites, trying to guarantee the minimum cost possible to the last mile circuits.

We verified if the current interconnection strategy is compatible with the traffic interest and above all, if the geographical distribution of the sites (with precision of meters) within the large cities (São Paulo and Rio de Janeiro – where 90% of the sites are located) is adequate. We did it in order to identify some negotiable advantage when dealing with the service providers. Basically we matched the company's sites with the Telcos infrastructure.

We tried to demonstrate the clustering effect specific to the organization. This effect is demonstrated by the variation of the percentage of the sites located within distance ranges from a node, when we vary the number of nodes. The distance ranges defined were:

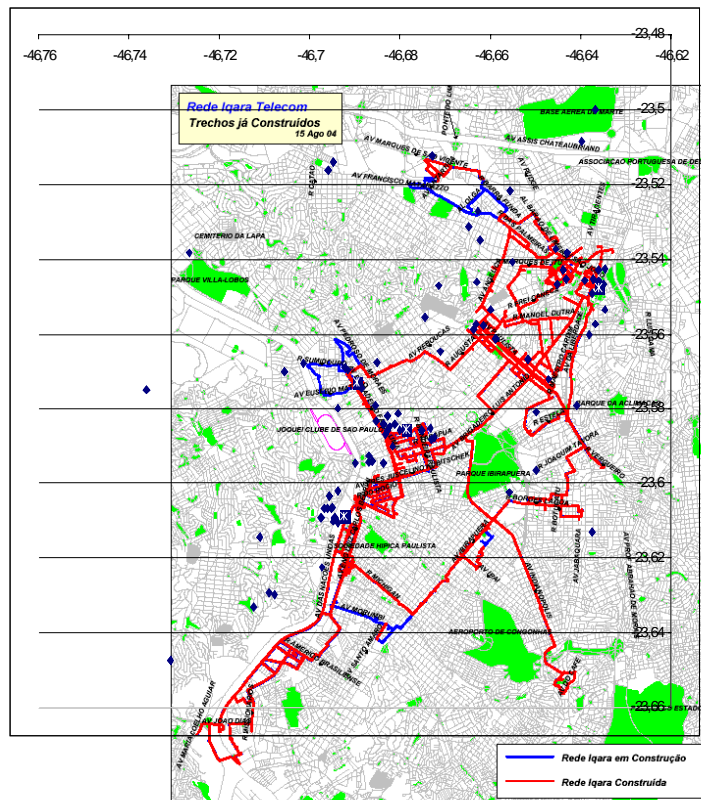| Range 1	Range 2	Range 3	Range 4	Range 5	Range 6	Range 7	Range 8
<5Km	<10Km	<20Km	<50Km	<70Km	<100Km	<200Km	>200Km

The topological study by itself isn't enough to indicate the optimized WAN, it happens because WAN's cost also depends from the interconnection costs which not always are distance sensitive. Nevertheless, this analysis gives us a good view of what tend to be the ideal topology. This study can also help when dealing with the service providers because it demonstrates with great precision the site's physical distribution within the cities (By region, by avenue etc) what can be a fundamental factor when negotiating discounts.

WANOPT
Condomínio Centro Empresarial Raja Gabaglia - Raja Gabaglia Avenue 1011 Suite 504B
Belo Horizonte - Minas Gerais - Zipcode 30380-090 - Brazil
Phone:+55 31 3296 3474 - Fax:+55 31 3292 0490
E-mail: wanopt@wanopt.com

www.wanopt.com

The bellow spreadsheet gives a good view of the clustering effect of this specific organization:

Numero de nos	< 5 Km	5 Km < X < 10 Km	10 Km < X < 20 Km	50 Km < X < 70 Km	70 Km < X < 100 Km	100 Km < X < 200 Km	100 Km < X < 200 Km	200 Km < X < 300 Km	> 300 Km
1	32,66%	21,74%	9,91%	0,72%	2,65%	7,55%	0,72%	0,00%	24,05%
2	44,65%	24,66%	15,89%	1,20%	2,65%	7,63%	2,17%	0,08%	1,08%
3	51,83%	24,66%	15,89%	3,65%	0,80%	0,48%	1,53%	0,08%	1,08%
4	53,76%	24,66%	15,89%	1,72%	0,80%	0,52%	1,49%	0,08%	1,08%
5	55,05%	24,66%	15,89%	1,72%	0,80%	0,52%	0,20%	0,52%	0,64%
6	55,69%	24,66%	15,89%	1,72%	0,24%	0,48%	0,16%	0,52%	0,64%
7	56,09%	24,66%	15,89%	1,72%	0,24%	0,48%	0,16%	0,52%	0,24%
8	56,49%	24,66%	15,89%	1,72%	0,24%	0,08%	0,16%	0,52%	0,24%
9	56,77%	24,66%	15,89%	1,72%	0,24%	0,08%	0,24%	0,16%	0,24%
12	57,33%	24,66%	15,97%	1,24%	0,08%	0,08%	0,24%	0,16%	0,24%
14	57,65%	24,66%	15,97%	1,24%	0,08%	0,08%	0,24%	0,00%	0,08%
16	57,85%	24,66%	15,97%	1,12%	0,16%	0,00%	0,16%	0,00%	0,08%
22	58,33%	24,66%	15,97%	0,96%	0,08%	0,00%	0,00%	0,00%	0,00%
60	100,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%

We executed a careful matching between the site's location and the public infrastructure available (Telco by Telco), such analysis was what made possible the good discounts achieved. We knew exactly what each provider had near each site.

The drawing bellow shows an example of the Company's sites X a public infrastructure. In this drawing the blue dots are the company's sites and the blue and red lines are the telco's infrastructure (In this case Iqara – British gas).

WANOPT
Condominio Centro Empresarial Raja Gabaglia - Raja Gabaglia Avenue 1011 Suite 504B
Belo Horizonte - Minas Gerais - Zipcode 30380-090 - Brazil
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E-mail: wanopt@wanopt.com
www.wanopt.com

The result

Applying the strategies described we managed to get a direct monthly saving of 33%. This gains implied rearranging the circuits, cancelling and contracting.

If we consider the migration costs (diluted throughout 36 months using a 1.27% p.m. financing rate) and assuming that the migration costs include the following:

- Simultaneous operation
- Penalties
- Installation fees

The monthly reduction was **25%** over the current expenditures and this effort generated **R$ 120,000.00 (USD 45,000)** per month in savings.