White paper

WANOPT
The Wide Area Network Optimizers

WIDE AREA NETWORK STRUCTURAL ANALYSIS COMPARING SERVICE PROVIDER PROPOSALS

A company trying to decide between service providers offering several possible services must consider a combination of factors. The obvious comparison is between ongoing monthly payments. Then there are more intangible issues related to things like control, level of responsiveness and technological trends.

But even if we limit ourselves to the tangible factors (prices), it is very difficult to compare service provider's proposals. It happens due the fact that reorganizing the WAN topology to take full advantage of the different interconnection alternatives isn't trivial and the pricing strategies adopted by each service provider for different services vary. So comparing proposals brings two sets of problems:

- First, there is the issue of rearranging the network topology. To be able to identify the ideal WAN structure we should be able to define all possible topological scenarios and for each topological scenario verify the volume/flow and then quote the interconnections with the service providers. Only doing it we would be able to take full advantage of the different interconnection pricing strategies and prices associated with our specific geographical dispersion. However, Identify the possible topologies isn't easy, and calculate the traffic volume/flows for each topological scenario is even more difficult.

- Secondly, even if we do not intend to rearrange the network topology, we can lock in the current topology (to simplify the problem) and ask the service providers to quote the interconnections for a specific traffic volume/profile the comparison will be difficult due the differences in pricing strategies adopted. Some services providers will charge based on bandwidth and distance others on CIR, others will charge a defined value for the cloud plus access, so forth so on.

Therefore, even locking the topology (most telecom managers do exactly that in this situation) the calculations necessary to properly compare the proposals are not easy. You have to know very well your traffic (volume/profile/interest) and be able to properly calculate all distances, CIRs, bandwidths, spoken minutes etc, in order to be able to calculate how much would cost to transport each site's flow using each pricing strategy (used by each service provider for each service/technology) (Of course, everything within a defined QoS). Definitely, not a trivial task.

As a result of these difficulties, most companies decide about which services/technologies and service providers are going to be adopted based on intangible factors (relationship with the service provider, technological trends etc) or based on tangible factors improperly calculated (Normally based on monthly payment value assuming a defined topological scenario (usually star)).

This process leds to a situation where most WANs are far from ideally designed and usually have room for improvements. The key point to be able to take advantage of this potential for improvement is having the tools to do the necessary calculations. **WANOPT** provides the services to address this kind of situation. Through its exclusive analytical tool (Ariete®) it empowers its clients allowing them to achieve the utmost in wide area networks optimizations and analysis.

- We analyze all possible topologies.
- For each topology we analyze all possible physical routes.
- For each possible combination of routes we analyze all possible combinations of applications flows.
- For each possible combination of flows over routes we test all possible service providers and all possible technologies available in each interconnection.
- Doing this we find the optimum backbone cost.
- We also calculate the access and the node's costs.

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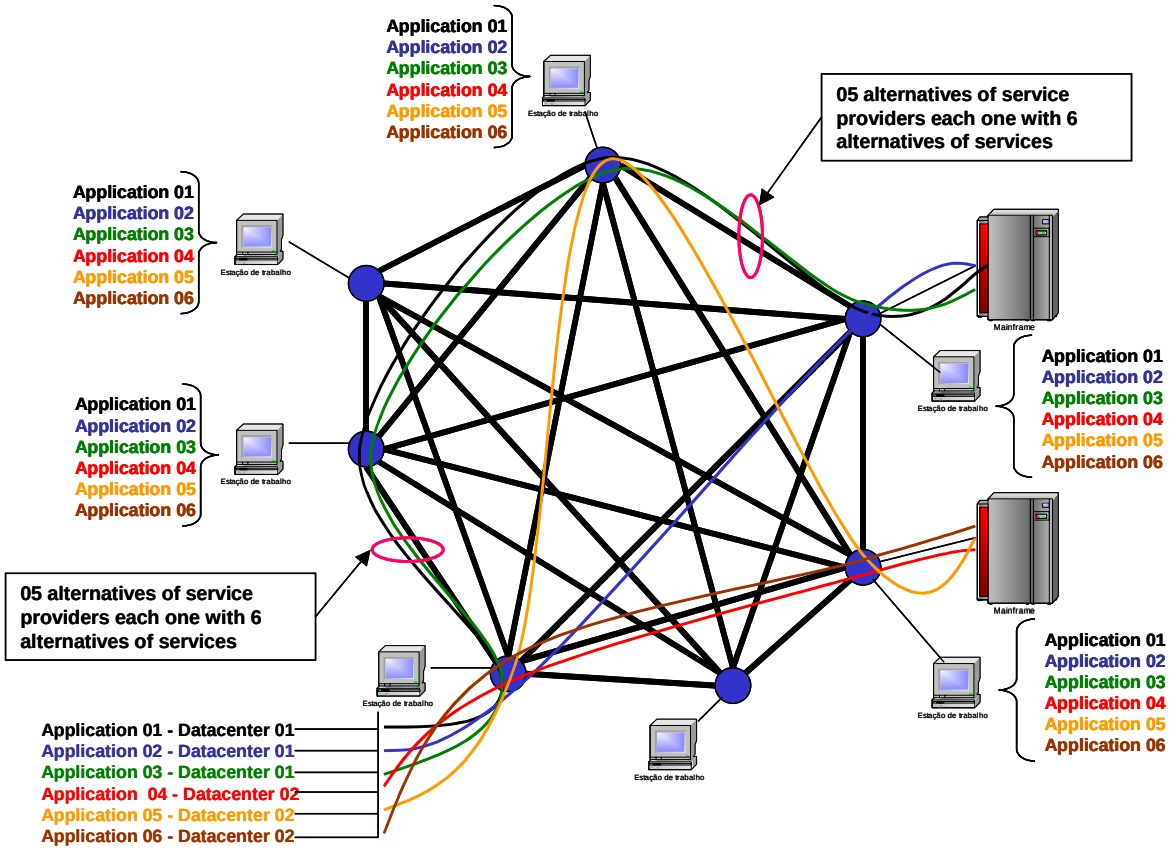
- The network cost is a combination of backbone, access and nodes.

In addition, as a by product of these calculations, we do the capacity planning, and generate the configuration logic of each equipment.

Example:

Just to illustrate the complexity of the problem lets assume a situation where we locked the topology into seven nodes, assuming a company with two data centers and six applications. We are also assuming that we are going to compare five service providers and each one has six alternatives of services.



In this specific topology we have 6x6x6x6x6x6 possible physical routes = 46.656

- Six applications and two data centers.
- Five service providers with six services each.
- Number total of alternatives compared for this topology: $6^{6} \times 6 \times 5 \times 6 = 8.398.080$

$4^{4} \times 6 \times 5 \times 6 = 46.080$
$5^{5} \times 6 \times 5 \times 6 = 562.500$
$6^{6} \times 6 \times 5 \times 6 = 8.398.080$
$7^{7} \times 6 \times 5 \times 6 = 148.237.740$
$8^{8} \times 6 \times 5 \times 6 = 3.019.898.880$
$9^{9} \times 6 \times 5 \times 6 = 69.735.688.020$
$10^{10} \times 6 \times 5 \times 6 = 1.800.000.000.000$

The number of alternatives analyzed grows logarithmically when the number of nodes grows. Other interesting aspects to notice here are:

- What would be the possibility to identify the ideal design if analyzing a backbone with 10 nodes manually?
- What is the chance that the manually identified design be even among the best 10% ?

This example shows us why we find savings and why it is so difficult to find WANs where this kind of analysis isn't worthy doing.

In addition of that, it is important to mention that we can calculate several possible topologies, can do the load balancing (adjusting the combination of flows over the physical paths) and can properly calculate the interconnection costs.

If we take our example: For five service providers each one offering six different services, each one of these services may use different pricing strategies and demand different parameters to have their prices calculated (Prices, total volume, bandwidth, distance, taxes, state boundaries, countries boundaries, CIRs, just to mention some of them) then we can clearly see how difficult would be to compare their prices.

Ariete® is a tool created to support us with these problems and through its use it is not uncommon to identify structures 30% more cost effective than the current one.