Maximizing Return on Network Infrastructure Investment with Cisco MATE Design

This major North American service provider was able to gain very high control of its network during a critical period of huge traffic growth, and to maintain high reliability along with huge cost savings using the Cisco MATE portfolio.

EXECUTIVE SUMMARY

Company: Major North American ISP

Industry: Telecommunications

CHALLENGE(S)

- Major North American ISP was experiencing rapid growth to both subscribers and traffic, and facing a need for critical upgrades
- The ISP was upgrading backbone links when it exceeded 50 percent capacity, and would have to upgrade dozens of links at very high cost

SOLUTION(S)

- Cisco MATE™ Design and MATE Collector

SELECTION CRITERIA

- Accurate traffic simulations and growth projections
- Ability to confidently plan for a more prudent (cost-saving) upgrade pace
- Certain high availability on worst-case analysis under higher (80 percent) capacity Fast network discovery and data collection

RESULTS

- **Savings of US$2.5M in the first year of using the MATE portfolio**
- Huge reductions in capital expenditures over time
- Highly available network
- Better understanding of the network's behavior for continued safe operation

Overview

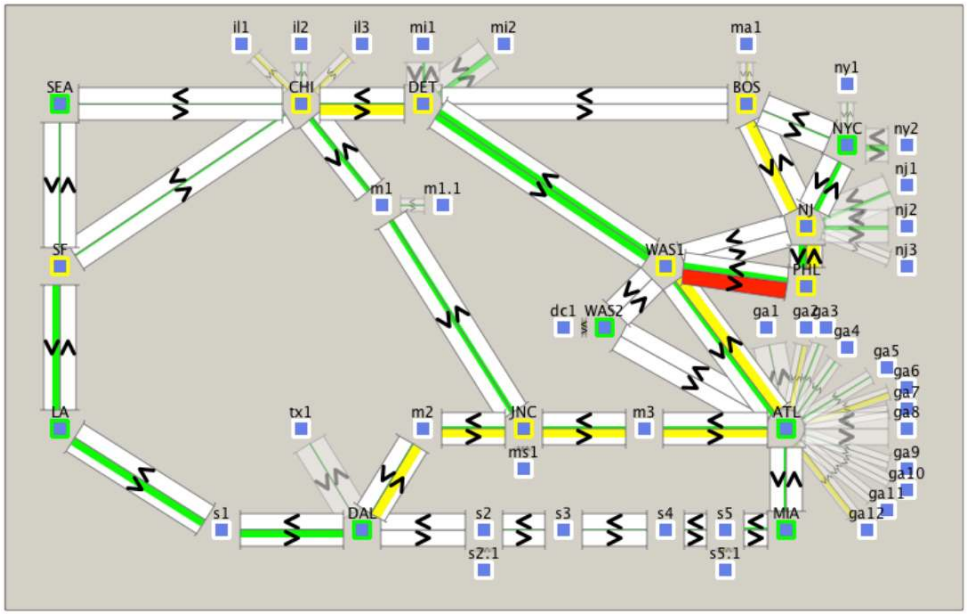
Cisco worked with a major North American ISP that was facing some critical network upgrades to accommodate rapid growth in both subscribers and traffic. The customer turned to Cisco to provide an integrated network planning and design system to enable the company to anticipate the impacts of such growth.

Using MATE Design and MATE Collector, the customer created a model of its network and simulated various traffic growth scenarios, their impact on the network, and the capacity planning that was necessary to accommodate that growth.

Early in the analysis, in estimating short-term growth, the ISP found that it would soon have a total of 25 links in its network that would exceed its baseline performance standard of 50 percent utilization on any link. In fact, the ISP's Washington-to-Philadelphia link would become totally congested.

The sample network model shown in Figure 1 indicates that result. Link traffic of 50 percent or more is colored yellow, and 100 percent or greater is colored red.

Figure 1. Short-Term Traffic Growth Projections



Note: Twenty-five links have larger than 50 percent utilization.

Although under normal operation up to 80 percent utilization of a link is quite functional, the ISP's capacity planning policy was to upgrade any link that exceeded 50 percent utilization to provide margin for potential failures and consequent traffic re-routing. That policy had served the company well up until then, but the expected rapid growth would make the policy prohibitively expensive to maintain. Under this policy, 25 links would have to be upgraded to meet the short-term traffic growth demands.

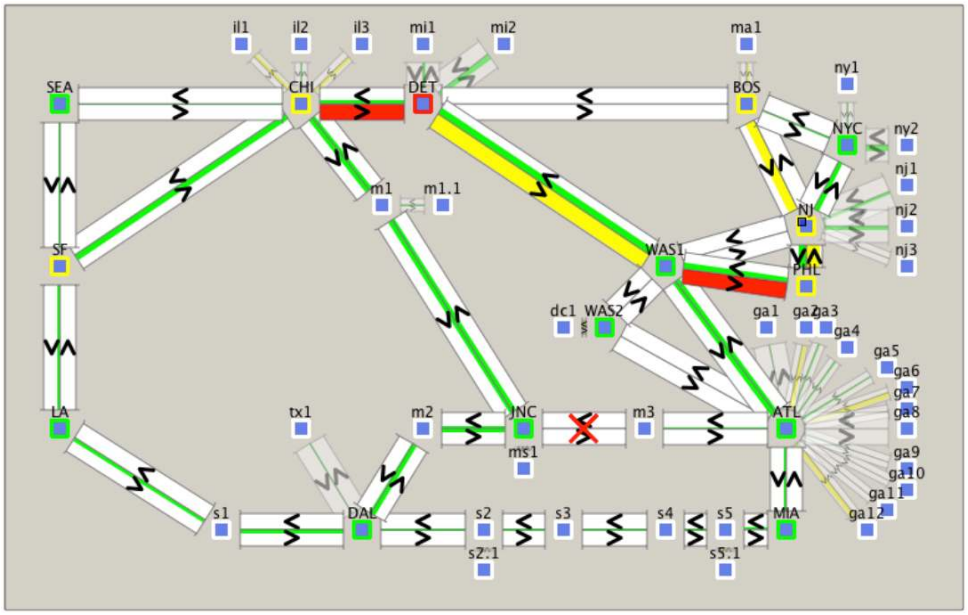
> "With the metric optimization in MATE Design, we were able to accommodate all of our short-term traffic growth and maintain a network that was completely robust with single circuit failures. We were able to safely slow the pace of circuit and link upgrades on a continual basis."

Finding the Primary Cause of Congestion

The customer decided to examine the impact of network failures in more detail, to see if the upgrade-at-50 percent policy was too aggressive. With Cisco MATE Design, the customer modeled various failures on the network and examined the effects on routing and the traffic demands on circuit capacities.

For example, Cisco MATE Design showed the ISP that a failure of the JNC<-->m3 link would cause only three circuits to become congested (Figure 2). Further analysis of other possible failures showed similar results, indicating that perhaps the previous policy was indeed too aggressive and too costly.

Figure 2. Impact of Failure of JNC<-->m3

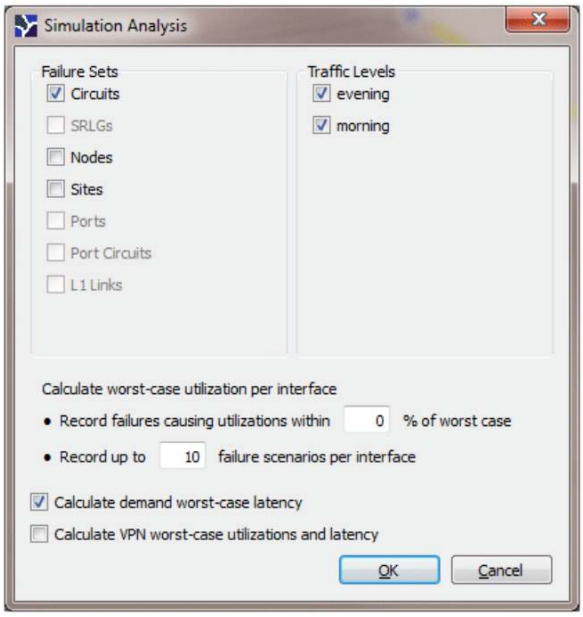


Note: The red square around the DET site indicates intra-site link congestion.

Worst-Case Analysis

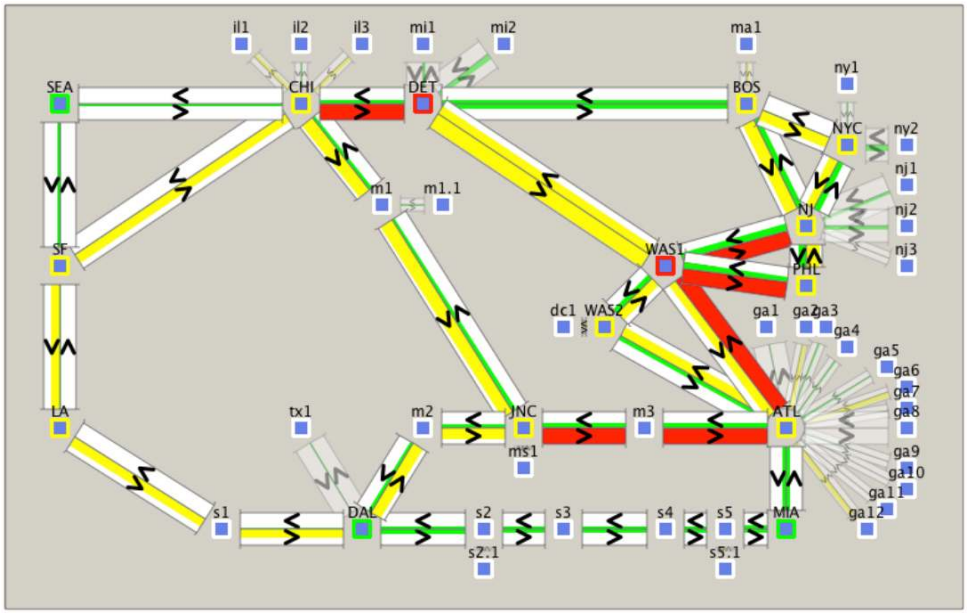
Rather than examining all possible failures one at a time, the customer chose to use the Simulation Analysis function of MATE Design to examine all possible failures automatically. The company chose to consider all single-circuit failures and have MATE Design tally the worst-case link utilization for every link under all such failures. (Figure 3).

Figure 3. MATE Design Simulation Analysis; Single-Circuit Failures



The effect of **all possible** single-circuit failures was calculated automatically, and displayed to show “worst-case” utilization (Figure 4). This analysis showed that under all possible single-circuit failures only 8 circuits were vulnerable to congestion, not 25 as originally thought.

Figure 4. Worst-Case Failure Analysis



Note: Only eight circuits subject to congestion under failure.

A new policy of upgrading only those circuits vulnerable to any possible single-circuit failure reduced the cost of maintaining a robust network from 25 upgrades to only 8 upgrades.

Determining Root Cause

A further analysis of the MATE Design results led to yet more savings. The customer examined the MATE quantitative tables (Figure 5) and found that most of the congested links became congested when the CHI<->DET link failed. So, rather than upgrading all the congested links, the customer decided to duplicate the CHI<->DET link and eliminate it altogether as a potential single-circuit failure.

Figure 5. MATE Design Results for Simulation Analysis

Interfaces | Demands | Routes | Nodes | LSPs | Sites | SRLGs | ASs

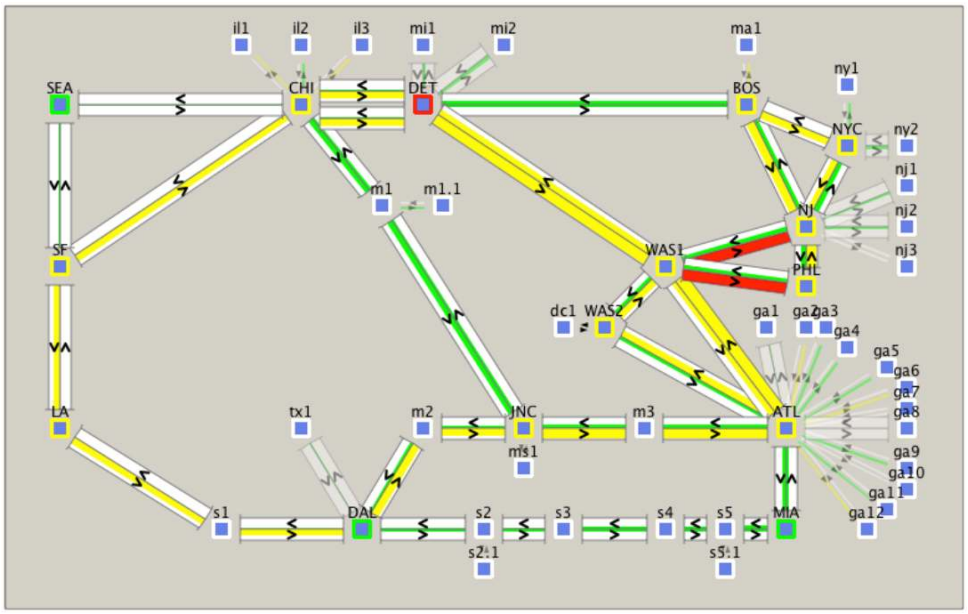
Show All | Filter | 208/208 rows (0 selected) | Select All

	Node	Interface	Remote Nc	Capacity	IGP Metric	Delay	Traff Meas	Util	Traff Sim	Util Sim	WC Util Sim	WC Failure
1	cr2.jnc	{to_vr....	vr.m3	10000...	122	1.00	na	na	5968.90	59.69...	131.26	circuit cr1.chi-cr2.det
2	vr.m3	{to_cr...	cr1.atl	10000...	290	1.00	na	na	5869.65	58.70...	130.27	circuit cr1.chi-cr2.det
3	cr2.was1	{to_cr...	cr1.was1	10000...	1	0.00	na	na	5908.60	59.09...	129.54	circuit cr1.chi-cr2.det
4	cr1.atl	{to_cr...	cr2.was1	10000...	769	5.00	na	na	5908.60	59.09...	129.54	circuit cr1.chi-cr2.det
5	cr1.chi	{to_cr...	cr2.det	10000...	331	2.00	na	na	7157.35	71.57...	122.37	circuit cr2.jnc-vr.m3
6	cr2.det	{to_cr...	cr1.det	10000...	1	0.00	na	na	7157.35	71.57...	122.37	circuit cr2.jnc-vr.m3
7	cr1.was1	{to_cr...	cr1.phl	10000...	40	1.00	na	na	12071...	120.71...	120.71	none
8	cr2.was1	{to_cr...	cr2.nj	10000...	192	1.00	na	na	0.00	0.00...	120.71	*circuit cr2.phl-cr1.was1*
9	cr1.det	{to_cr...	cr1.was1	10000...	630	4.00	na	na	4264.15	42.64...	93.43	circuit cr2.jnc-vr.m3

Note: Column “WC Failure” shows cause of “WC Util Sim” congestion values (sorted, max first).

A re-run of the Simulation Analysis showed that, with the added CHI<->DET circuit, only three other circuits were vulnerable to congestion under any possible single-circuit failure in the network (Figure 6).

Figure 6. Worst Case Analysis With Extra CHI<-->DET Link



Note: Only three circuits now need to be upgraded.

Upgrading the network for full reliability under any single-circuit failure then required only the upgrade of 3 existing circuits and adding a new one, instead of the originally planned 25 circuits.

Conclusion

At the current price point of 10 Gbps links on the backbone, the customer estimated a savings of over US$2.5M in the first year as a result of using Cisco MATE Design and Collector. The ROI for the MATE portfolio was immediate.

Americas Headquarters
Cisco Systems, Inc.
San Jose, CA

Asia Pacific Headquarters
Cisco Systems (USA) Pte. Ltd.
Singapore

Europe Headquarters
Cisco Systems International BV Amsterdam,
The Netherlands

Cisco has more than 200 offices worldwide. Addresses, phone numbers, and fax numbers are listed on the Cisco Website at www.cisco.com/go/offices.

Printed in USA C36-728813-00 07/13