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## *Shunra Professional Services*

Project Report for:

Fortune 100

Technology Company

Project:

WAN Optimization Evaluation



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## Executive Summary

### Objective

A large, enterprise customer was experiencing application performance problems with their core business applications that were managed from a central datacenter, but deployed around the globe. The customer engaged Shunra to evaluate three WAN Optimization solutions and provide objective results that would enable them to decide which, if any solution to purchase.

The goals of this engagement were to:

- Evaluate each WAN Optimization solution by measuring application performance changes for key business processes with and without each solution.
- Provide comprehensive reports that would enable the customer to decide which, if any solution to purchase.

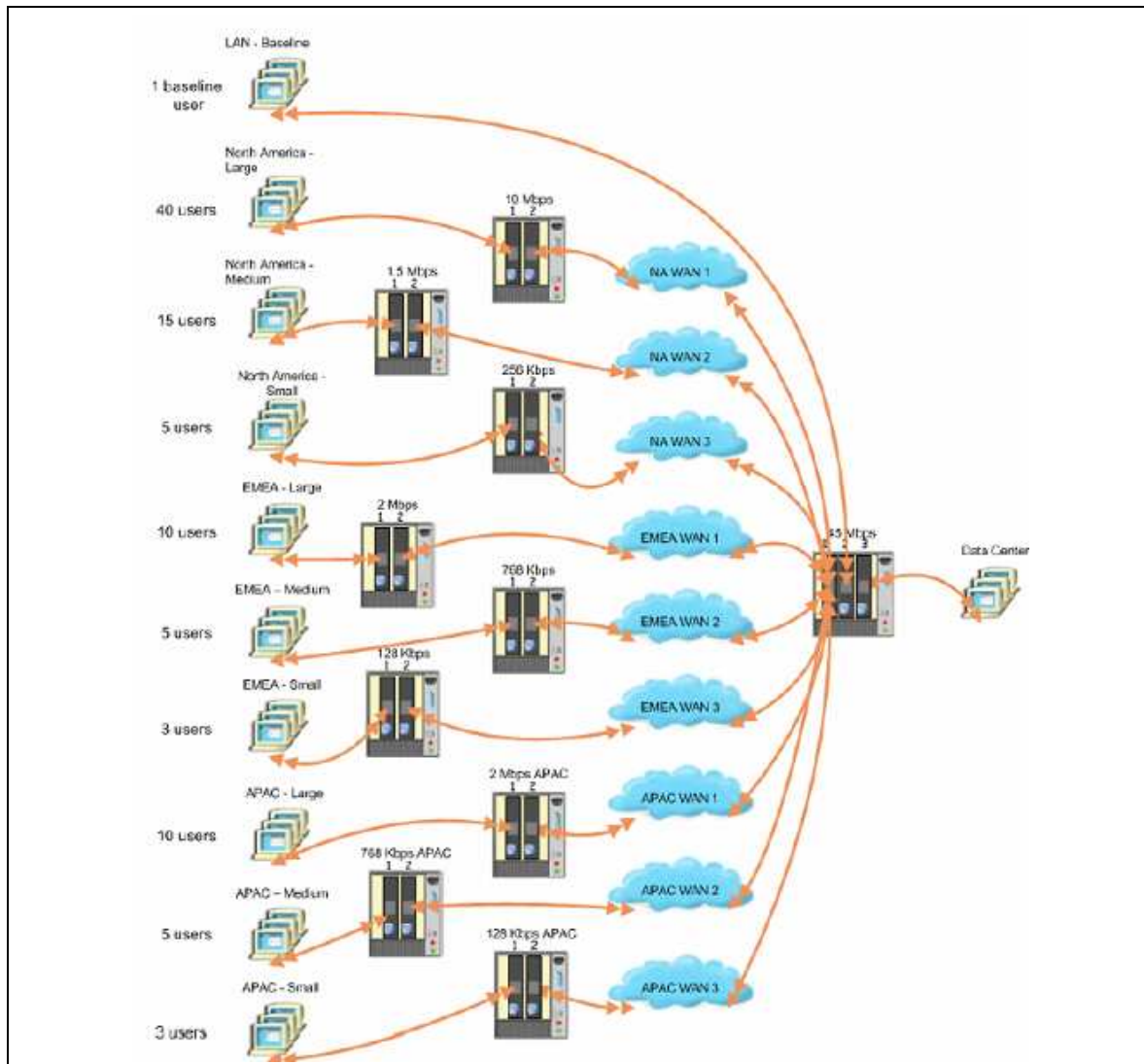


## Methodology

### Planning and Design

The first step in modeling the WAN characteristics of the customer's production network was to understand the network components and conditions. The customer provided Shunra with network diagrams which detailed the type of network and bandwidth utilization percentage for the existing network topology.

The customer also installed Shunra's VE Network Catcher on a machine at their main Data Center. This captured the network characteristics between the desired remote locations and the Data Center. Network templates were then created using Shunra's VE Modeler to represent the production network.



## Test Preparation

Shunra worked with the customer to define the business processes which would be used in the simulation. The user activities chosen were financial trades (swaps, options, and exchanges) and physical trades. These transactions were scripted using HP's Mercury LoadRunner application automation tool.



When replayed from the WAN remote locations, the LoadRunner scripts simulated business users using the application as if they were located at a variety of remote locations.

### **Test Execution**

Overall 10 test scenarios were executed, for each WAN Optimization solution during the testing.

#### **Business Process Analysis**

The business processes were executed to validate the virtual enterprise's functionality and to provide meaningful metrics for evaluating each vendor. The trades were confirmed on the back end systems.

#### **Benchmark Tests**

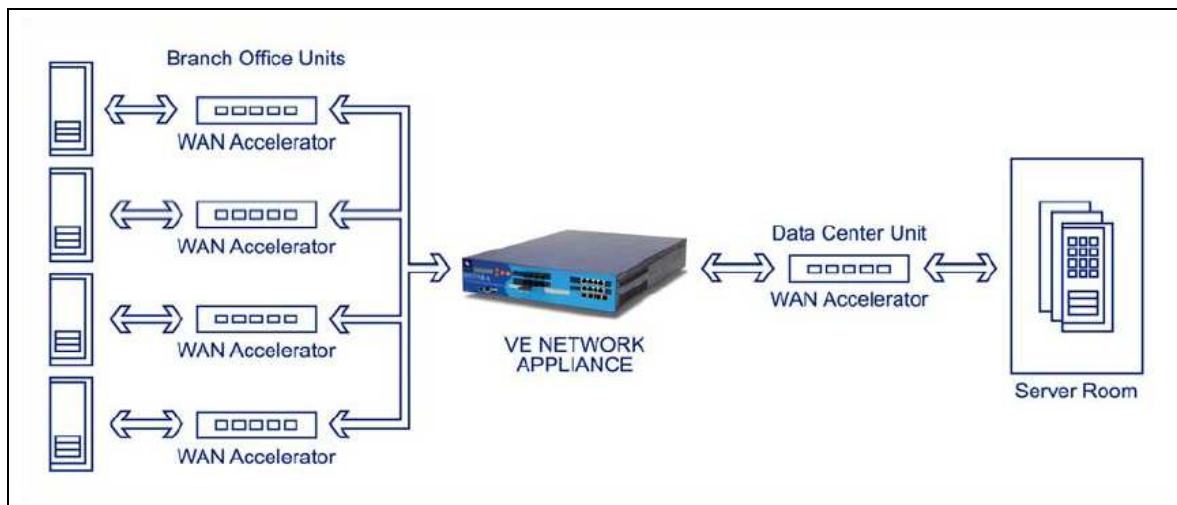
Various scenarios were then executed over the simulated production network, through LAN, native WAN, and optimized WAN conditions.

#### **End User Experience Analysis**

Additionally, video capture files were created for the business transactions from each of the remote locations, while under end-user load.



**Figure 1: The Setup**





## Reporting and Analysis

Based on the metrics captured by Shunra's VE Reporter, across all testing scenarios, the team was able to product performance ROI figures. This data was vital for decision-makers to understand before selecting the optimal WAN optimization solution for the business.

## Test Results

Each group of tests used the same test scripts. The factors that changed each time were the location of the virtual users, iteration pacing (how fast the script is executed), number of virtual users simulated, and whether the link was optimized or not. A full description of the scripts and the transactions can be found in Appendix A.

## Performance ROI Results

Based on the benchmark metrics captured across all testing scenarios, the testing team produced the performance ROI results. These results are important influencers for decision-makers to consider when selecting the optimal WAN Optimization solution for their business.

The results below show an average performance gain per business process across all sites, for a given WAN Optimization solution.

<b>Business Process</b>	<b>Average Performance Gain with Vendor A (Sec)</b>	<b>Average Performance Gain with Vendor B (Sec)</b>	<b>Average Performance Gain with Vendor C (Sec)</b>
Swap Trade	5.34	2.45	3.18
Physical Trade	6.72	7.70	4.06
Paper Trade	7.50	3.30	4.20
Total	19.56	13.45	11.44



To calculate the performance ROI, we need to quantify the “I” – which is the total cost of ownership for each solution. This total cost accounts for the number of remote sites, hardware costs, setup costs, management costs, integration costs, and any professional services required.

For 20 remote sites, these costs were calculated to be:

<b>TCO – Vendor A</b>	<b>TCO – Vendor B</b>	<b>TCO – Vendor C</b>
\$120,000	\$110,000	\$90,000

The total performance gain for each solution can be calculated by multiplying the average performance gain per business process by the total number of sites where the WAN Optimization devices will be deployed (20, in this example).

By dividing performance gain by TCO, we calculate the performance ROI for each solution:

	<b>Vendor A</b>	<b>Vendor B</b>	<b>Vendor C</b>
<b>TCO</b>	\$120,000	\$110,000	\$90,000
<b>Performance Gain (Sec)</b>	19.56	13.45	11.44
<b>Performance ROI (Sec/\$1000)</b>	$19.56/120 = 0.163$	$13.45/110 = 0.122$	$11.44/90 = 0.127$

Note: Performance ROI is clearly a powerful metric for sorting through competing claims of WAN Optimization vendors, but it may not be the sole factor in the acquisition of a specific WAN Optimization solution. The financial stability of the vendor, the quality of support and service, and other contract terms may add influence. Decision-makers may also choose to use the result of such benchmarking to wrest price and contract concessions from a favored vendor.



## Benchmark Results

These are the summary results for the benchmark tests.

Site	LAN Baseline (Sec)	Current WAN Baseline (Sec)	Average Response Time Vendor A (Sec)	Average Response Time Vendor B (Sec)	Average Response Time Vendor C (Sec)
North America (large office)	15	23	19	21	22
North America (medium office)	15	25	22	24	25
North America (small office)	15	29	30	32	32
EMEA (large office)	15	35	30	32	34
EMEA (medium office)	15	38	33	35	37
EMEA (small office)	15	42	35	38	40
APAC (large office)	15	48	40	47	47
APAC (medium office)	15	54	42	49	51
APAC (small office)	15	58	45	51	53
Total		352	296	329	321



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Average Response Time per Site		$352/10 = 35.2$	$296/10 = 29.6$	$329/10 = 32.9$	$321/10 = 32.1$
Average Gain per Site vs. WAN Baseline			$35.2 - 29.6 = 5.6$	$35.2 - 32.9 = 2.3$	$35.2 - 32.1 = 3.1$



## Network Configuration

These are the simulated network conditions for the test.

Region	Office Size	Bandwidth	One-way WAN latency	Number of users
North America	Large	10 Mbps	25 msec	40
	Medium	1.5 Mbps		15
	Small	256 Kbps		5
EMEA	Large	2 Mbps	50 msec	10
	Medium	768 Kbps		5
	Small	128 Kbps		3
APAC	Large	2 Mbps	70 msec	10
	Medium	768 Kbps		5
	Small	128 Kbps		3

## Response Time Results

For every iteration of testing (e.g. number of users, site, and WAN configuration) the following table will detail the application performance results on a business process and transaction basis.

		North America (small office)			EMEA (small office)			APAC (small office)		
Script	Transaction Name	Response Time			Response Time			Response Time		
Name		Min	Max	Avg	Min	Max	Avg	Min	Max	Avg
Paper	Swap_Trading									
	01_swap_screen									
	01a_bullet_swap_execute									
	01b_crude_swap_execute									
	Option_Trading									
	01_option_screen									



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	01a_Asian_option_execute									
	01b_OTC_option_execute									
	Exchange_Trading									
	01_Execute Exchange									
Physical	Physical_Trade									
	01_Physical Trade Page									
	02_Execute Physical Trade									

## Additional Tests

Some additional tests were run while LoadRunner was generating load on the system. These tests included performing non-scripted interactions with the application and recording AVI movies of the transactions from various remote locations in order to capture the end-user experience.



## **Appendix A: Mercury LoadRunner Scripts for Load Test**

Details of every script used are shown here.