

# Adding Visibility to WAN Optimization, Your Ticket to Even Better Performance

By Peter Sevcik and Rebecca Wetzel  
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Much of a network professional's time is spent in the weeds—fixing what breaks—and trying to keep infrastructure humming so users don't call the help desk. It's a reactive existence that leaves little time for strategizing and planning. Climbing out of the weeds to take in the big picture and thoughtfully lay the groundwork for better future performance seems a luxury. But NetForecast's research shows that strategic planning to improve performance is, in fact, a smart use of your time because it gets results—and such planning requires visibility.

Although WAN optimization (solutions that speed the delivery of applications over a WAN) can dramatically improve the user experience, you can further improve performance by proactively managing it. This requires you to “see” what is happening in your network. Without visibility into performance, you can't know how well or poorly you are doing, and you can't align performance with business needs.

This report introduces best practices for understanding and improving the performance of your mission-critical networked applications. It explains why it is important to measure performance before you install WAN optimization technology—and to continuously measure thereafter so you can take action to enhance performance whenever possible and observe the outcome. The report also provides pointers for what to look for in a measurement tool in a WAN optimized environment. It also assesses Riverbed's Cascade visibility solution.

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## Measuring: An Essential Performance Management Best Practice

Performance management best practices weave together people, process, and tools to understand, measure (i.e., provide visibility into), and communicate about performance—as well as to link performance to the business. These best practices must be embedded into a continuous improvement cycle that ensures performance meets your business needs.



Figure 1 – Performance Management Best Practice Cycle

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This cycle begins by understanding your users and their performance needs, measuring and aggregating relevant performance data, and communicating that data in understandable reports to the right people. The reports serve as input for IT and business groups to collectively determine what measurements and performance objectives best support the business. Measuring provides the essential “eyes” of performance management. Without visibility into performance, there is no foundation upon which to build a performance management strategy.

Here are the four performance management best practices with examples of what they entail:

**Understand:** Define what technical parameters are important, establish which applications are mission critical, document this information, and then distribute it throughout the organization.

**Measure:** Measure the important technical parameters defined above, track the measurements over time, set critical objectives, and automate data gathering and correlation.

**Communicate (Report):** Submit relevant performance reports regularly to management, and communicate important measurement information throughout the enterprise (along with explanations about what it means and how it should be used).

**Link:** Work with business managers to ensure that business-critical performance elements are monitored, establish business-relevant performance targets and application-level SLAs, and periodically meet with business managers to review the above.

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## Measuring Performance = Results

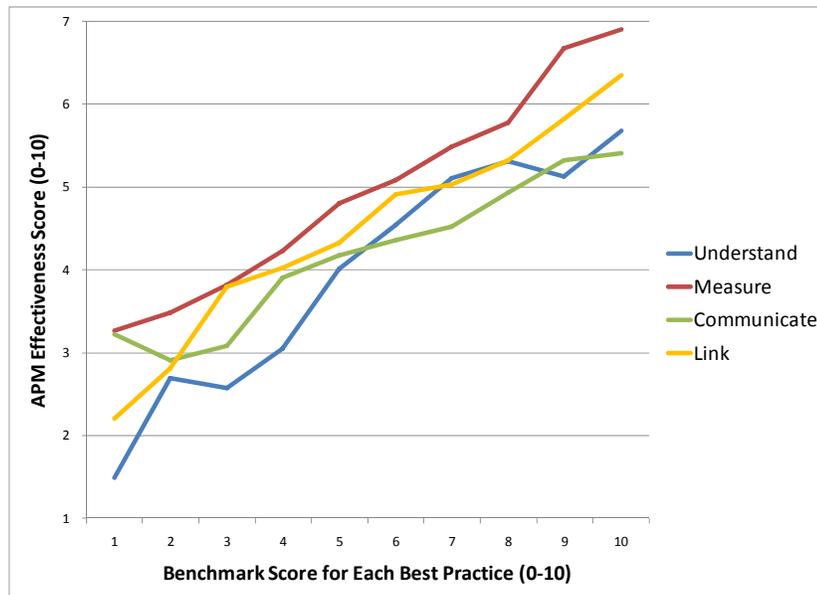
NetForecast conducted a benchmarking survey of more than 600 enterprises and their performance management practices. As Figure 2 shows, we found that of the four best practice areas described above, *measuring did the most to boost performance effectiveness.*

Although all four practices are essential, measuring is the performance management linchpin. Understanding, reporting, and linking performance to the business all rely upon and enhance the value of measurement.

We analyzed each respondent's answers to formulate a performance benchmark score for each of the four best practices using a 10-point scale, with 10 the best (highly organized and formal approach) and 0 the poorest (no attempt to perform the function).

The survey results show extremely positive correlations between best practices benchmark scores and actual application performance delivered to the business. On the whole, enterprises with excellent best practices deliver 2.4 times better results to their users than those with poor practices.

Here's where the rubber meets the road. Our survey results show that best practices exert their most dramatic effect on improving the time it takes enterprises to solve problems, with a 338% score improvement in problem-resolution time among those with best practices compared with their poorer-performing counterparts.



**Figure 2 – Performance Best Practices Correlation to Effectiveness**

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## Visibility Improves Initial WAN Optimization Implementation

WAN optimization systems consist of a virtual or physical device in the data center and companion devices in remote offices that work together to speed the delivery of applications. These devices are placed near WAN ingress/egress points where they can see, prioritize, and modify traffic.

Before implementing WAN optimization, it is important to know what applications are running over your network, and how well or poorly they are performing. If you proceed blindly, you may inadvertently accelerate the wrong applications (e.g., non-business application like BitTorrent)—and you may fail to accelerate some of your mission-critical applications.

Knowledge is the bedrock upon which good performance is built, but it is short supply within most enterprises. After gaining visibility into traffic on their network, we often hear network managers say things like: “We were shocked to learn that what was actually happening on our network was far different from what should have been happening.”

A financial services firm we once interviewed found an OC12 line was consistently hitting the top of its bandwidth threshold. When the firm installed a visibility tool, it discovered that some data streams were being resent up to five times. This would have been impossible to see without the monitoring tool. Armed with information, the company was able to reduce its WAN bandwidth consumption by 150 Mb, so they no longer hit their ceiling. Similarly, a major department store found to its surprise that non-critical applications were consuming nearly half of the company’s network resources during peak usage times, a problem they were able to correct by taking such actions as scheduling backups to occur after hours.

To assess what applications should be optimized to which locations, you first need to understand:

- What applications are traversing your network,
- Who is using them,
- How well they are performing, and
- How much bandwidth they are consuming.

This knowledge is essential to specifying a WAN optimization solution that will deliver the best performance your budget can support.

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## Ongoing Visibility Is Fundamental to WAN Optimization

Measuring application performance can improve already optimized performance because it enables you to:

- Identify all applications on your network (which is almost always eye-opening),
- Baseline their performance,
- Align optimization treatments to business needs, and finally
- Monitor performance against baselines and be alerted when performance degrades.

Once an initial baseline is documented, ongoing performance measurement helps identify and fix problems and continuously improve performance. This is, however, by no means a one-shot effort. A performance history allows you to identify what is “normal” so you can take action when behavior degrades.

For example, as mentioned above, it is not unusual for backups to run during business hours instead of after hours, thus hurting performance of other applications. Ongoing visibility allows you to identify who is responsible, and nip such problems in the bud. In the case of a bandwidth-hogging backup, this means optimizing the backup or moving it to another time of day.

If you plan to make a major change to an application or a data center, you can measure a baseline and use that information to develop an SLA. After making the change, you can then compare the new and old performance to determine if the SLA should stay the same, or if it should be tightened. In planning for the change you should ensure that you have the appropriate WAN optimization design in place.

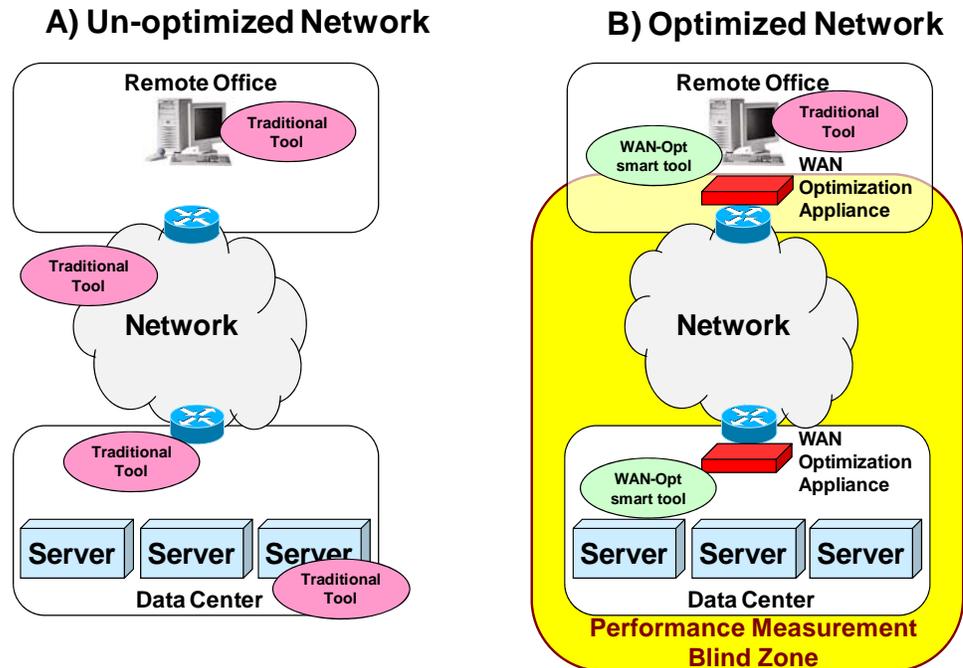
It is also helpful to use your visibility tool to regularly assess whether your WAN optimization design is delivering the application response times that are right for your business, and delivering the bandwidth resource usage results you want.

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## Problem: Not All Measurement Tools “See” Optimized Traffic

Most measurement tools cannot see optimized traffic because acceleration techniques change WAN traffic. Optimization creates blind zones (see Figure 3) because it makes performance information opaque. As a result, most traditional network-based performance measurement tools cannot properly interpret performance, and are therefore essentially useless in an optimized system. Here are the primary reasons for this opacity:

1. User and application traffic are masked (essentially encrypted), so network-based tools don’t work.
2. The amount of traffic flowing over the WAN is dramatically reduced, so traffic counters (bytes or packets) don’t reflect how much data is actually being sent by the application.
3. Transaction response times are no longer end-to-end, so response time measurements at the data center are too short because some application data is delivered locally.



**Figure 3 – Optimization Creates Performance Measurement Blind Zones**

Measuring true performance requires reconstructing information from three sources to show optimized and non-optimized values side by side at:

- The data center,
- The network, and
- Remote sites.

The information includes flow paths, packet counts, bandwidth, headers, and remote site response times. Most measurement tools cannot reconstruct this information because they do not have views into traffic before as well as after it is optimized. As a result, measurement data that was helpful in an un-optimized network becomes gibberish in an optimized network. Measurement tools that are integral with WAN optimization appliances measure traffic that passes through the appliances, but they don't give you the complete picture if any traffic on the network does not pass through the appliances.

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### Choosing a Measurement Tool for an Optimized Network

Measurement tools in an optimized network must provide integrated visibility into:

- The un-optimized portion of the data center environment
- Network transit that is optimized
- The un-optimized portion of the remote office environments

**... and must be able to measure these parameters:**

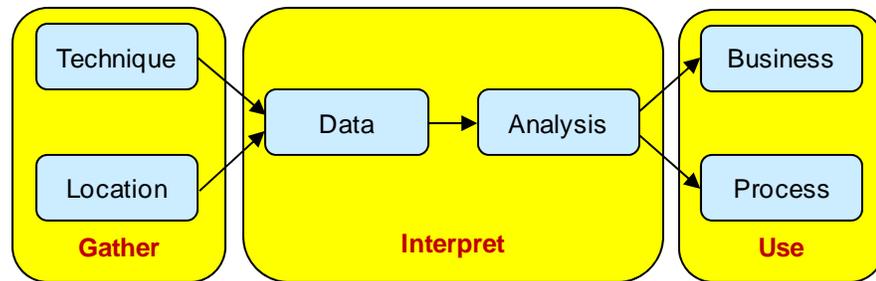
- ✓ Server availability
- ✓ Server utilization
- ✓ Transactions processed
- ✓ Server errors
- ✓ Server query response time
- ✓ Network availability

- ✓ Bandwidth utilization
- ✓ Network protocol errors
- ✓ Network latency (RTT)
- ✓ Traffic flow data (by application)
- ✓ TCP transaction response time
- ✓ End-user page response time

The key to choosing the right tool set is to place your performance tool choices into a "big picture" context (or framework) that helps you define what you need from your tools—and map those needs to the current crop of tools.

Here's the underlying concept of the NetForecast Performance Management Tool Framework. As Figure 4 illustrates, there are three application performance management functions:

1. Gathering performance data,
2. Interpreting the data, and
3. Using the results to support the organization.



**Figure 4 – Performance Management Tools Framework**

**Gathering the Data:** There are two key aspects to gathering application performance data—technique and location. Technique determines how to measure performance, and location determines where to measure it.

**Interpreting the Data:** Data interpretation involves first determining what to measure (i.e., what data to gather), and then to analyze the data to make sense of it.

**Using the Data:** When all is said and done, the results of the analysis must support IT processes—and ultimately the business as a whole. Information must be based on analysis of performance by time of day, location, and business function. It must provide trend analysis over long periods, integration and correlation of data from multiple sources (e.g. other tools and outside data feeds)—and it must be stored in a long-term data repository for data mining.

Some tools are good on the front end of this functional flow, but require lots of human gray matter to make sense of the data, put it to use, and keep a record of it. Although there is no substitute for a smart geek, there is much to gain from incorporating geek-smarts into automated tools that analyze data and apply it to improve performance.

The back-end functional flow (analysis, process, business reports) is where a good tool can make your life easier. Who has time to pore over packet traces every day to ferret out performance issues? A tool that automatically tracks and reports on performance can do what you don't have time for, and free you up for more meaningful work. Such a tool can automatically generate daily reports detailing how well you are managing performance. That can be your starting point to do things like gather and analyze packet traces to investigate intractable problems.

## The Riverbed Cascade Solution

The Riverbed Cascade solution (see Figure 5) is a passive network performance monitoring system that sees and reports on user interactions with application delivery infrastructure such as application servers, web servers, and load balancers. It collects network flow data, identifies applications and users, and applies behavioral analysis to help you interpret that data, and use it to support your business. The Cascade solution learns what “normal” is and sends alerts when changes indicate actual or potential problems. For more information about Cascade visit <http://www.riverbed.com/us/products/cascade/>

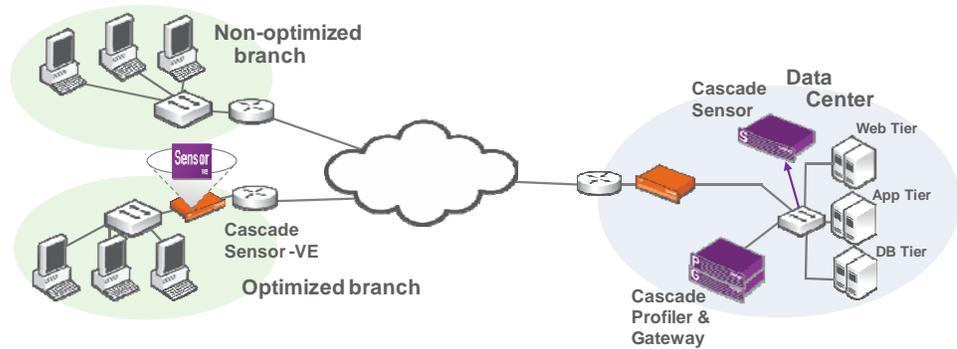


Figure 5 – Example of a Riverbed Cascade Deployment

## NetForecast Assessment of Riverbed Cascade

Figure 6 maps the Riverbed Cascade capabilities to the NetForecast performance management tools framework (see page 5). The purpose of this matrix is to help you assess at a glance whether the Riverbed Cascade solution meets your needs.

Gather		
<b>Technique</b>	Touch: Passive/Active	Passive
	View: Internal/External	Internal
<b>Location</b>	Remote LAN	✓
	Private WAN points	Optimized/Non-opt
	Data center LAN	✓
Interpret		
<b>Data</b>	Bandwidth utilization	Optimized/Non-opt
	Network time to user locations (RTT)	Optimized/Non-opt
	Traffic flow data (by application, location, user)	Optimized/Non-opt
	TCP transaction response time (by application, location, user)	Optimized/Non-opt
<b>Analysis</b>	Functional performance tracking	✓
	Trend analysis over long periods of time	✓
	Correlation analysis across measurement data types	✓
	Analytics automate converting data into information	✓
Use		
<b>Process</b>	Incident: resolving performance degradation	✓
	Capacity: proper service resources	✓

Figure 6 – Riverbed Cascade Performance Management Capabilities

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## Conclusion

What you can't see CAN hurt, or at least hobble performance. Therefore, WAN optimization and visibility must be paired to achieve the best performance possible for your network and the applications that traverse it. In NetForecast's assessment, Riverbed Cascade is indeed a good solution to provide the visibility needed to plan and manage performance in a WAN optimized network environment.

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## About the Authors

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