Analyzing End-to-End Performance

with TeamQuest Performance Software

Measuring the performance applications deployed across a network and the components that comprise them is essential to maintaining service level objectives. TeamQuest® Performance Software collects and analyzes performance data from many levels including network, application, compute server, storage server, network device, operating system, middleware, and database.

This paper concentrates on the end-to-end performance analysis of TCP/IP-based applications (e.g. web or client/server applications) available with the TeamQuest Network Application Agent. It overviews the performance measurements and describes the collection methodology. Examples are used to illustrate how the agent can be used in different environments.

About the Author
Scott Adams leads TeamQuest's product management activities. He is responsible for guiding product strategy and development of the company's product road map. He has held various engineering and product management positions at TeamQuest since joining the company in 1993. Prior to joining TeamQuest, Adams was employed by Unisys Corporation. Adams holds degrees in Computer Science and Economics.

What end-to-end network performance data is available?

The Network Application Agent monitors network packets. Using a set of correlation algorithms, the agent turns network packets into meaningful performance information. Response times, transaction counts, and application load are a few of the items that the agent reports. The agent summarizes the performance information by application, by user, and by system.

How does it work?

TeamQuest Manager, a component of TeamQuest Performance Software, includes collection agents that collect performance data from a wide range of hardware and software computing elements. One of those agents, the Network Application Agent, passively collects information from TCP/IP-based applications. The Network Application Agent is a software-based collection agent. It is deployed outside of the application data path as to not interfere with the application.

The agent can collect data about applications deployed across any number of tiers, from the simple client-server application (see Figure 1) to the commonly used multi-tiered, java-based, web application (see Figure 2).

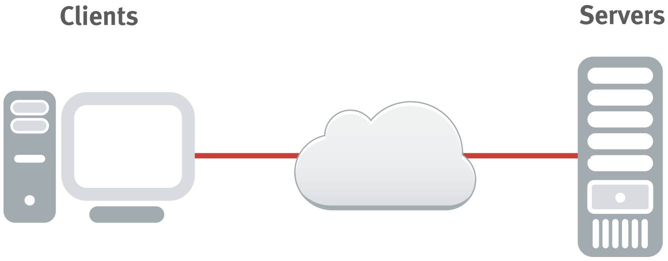


Figure 1
Client-server
Application

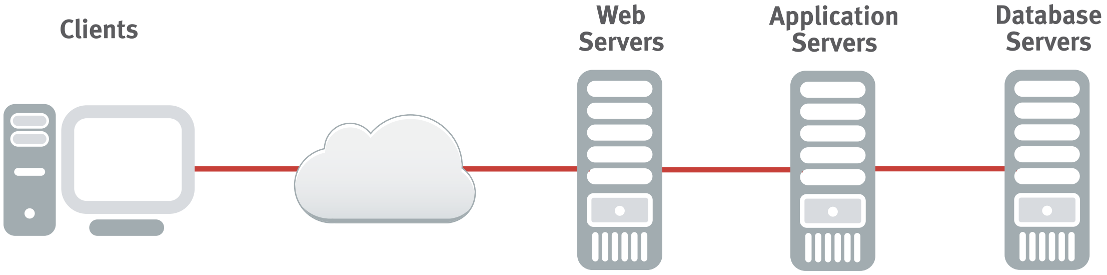


Figure 2
Multi-tiered
Application

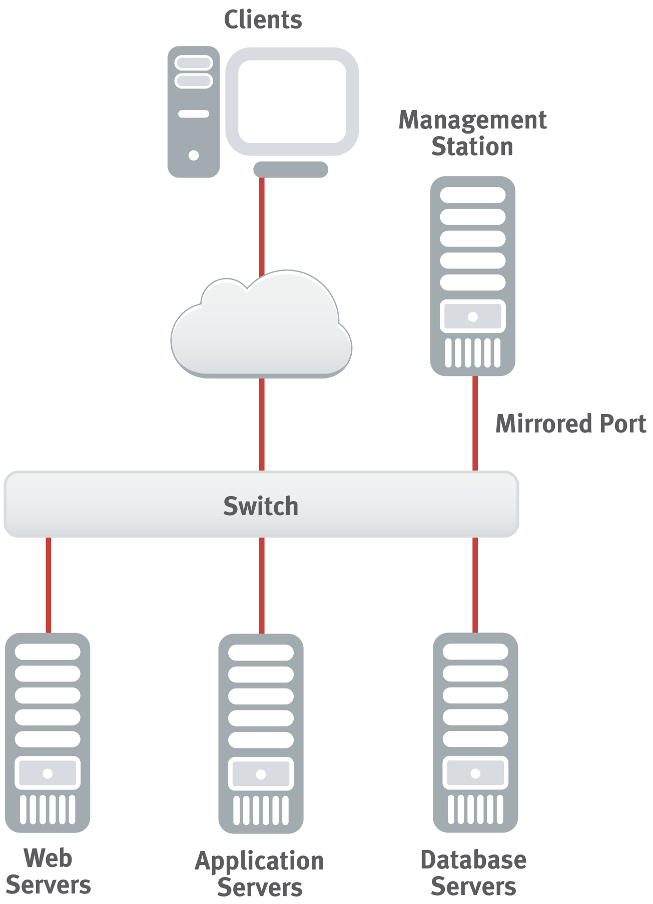


Figure 3
LAN Switch Port Mirroring

The Network Application Agent is normally installed on a network management or performance management system connected to a port mirror on a local area network (LAN) switch (see Figure 3). Please refer to your LAN switch references for information on how to port mirror on your particular switch.

Once installed, the agent is configured by specifying the servers and the port numbers used by the applications to be monitored. The agent then monitors the network traffic for the configured servers and ports. Subsequently, performance statistics are compiled and saved for the monitored applications.

A basic understanding of your network topology is helpful when deploying and configuring the agent. Depending on the configuration and size of the environment to be monitored, you may need to deploy multiple agents in order to monitor the entire application or to scale to your environment. Multiple agents may be necessary if the systems being used to run the application are not all connected to the same switch.

In addition, consideration should be given to the amount of data gathered. You may want to avoid exceeding default limits that prevent the agent from using significant amounts of resources on the system hosting the agent.

Consider the size of your infrastructure and determine what is reasonable to monitor. For example, you may want to select a single or subset of servers at a horizontally-scaled, load-balanced tier rather than attempting to monitor the network traffic to ever server in the tier.

Client-Server Example

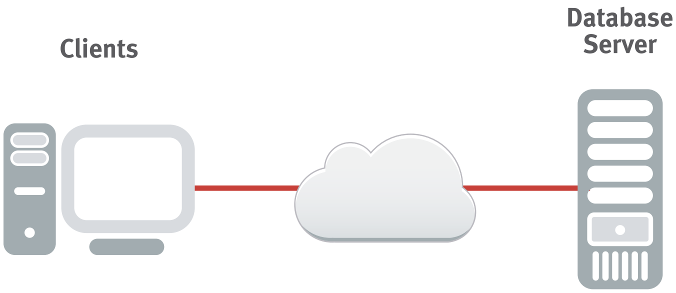


Figure 4
Logical View of Client-Server CRM Application

For illustration, let’s look at a customer relationship management (CRM) application. In this application, CRM client applications make requests directly to the database server (see Figure 4).

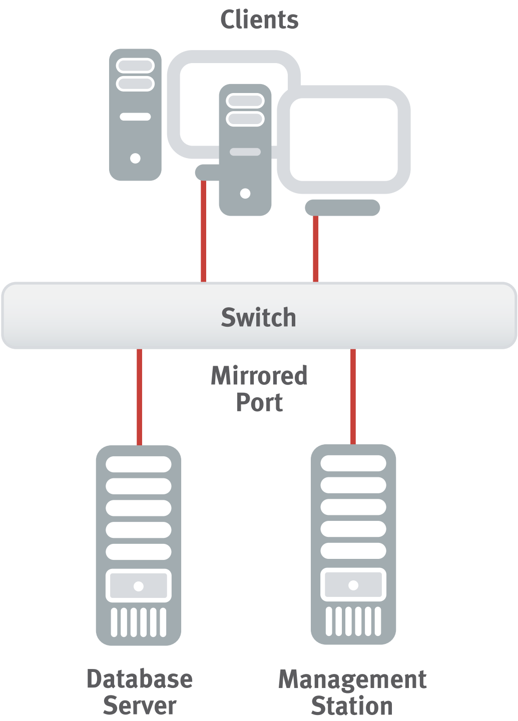


Figure 5
Physical View of Client-Server CRM Application with Monitoring Agent

The database server (siebel1) is running Microsoft SQL Server. The client systems are running Siebel. The Siebel applications communicate with the database server over port 1433 (ms-sql-s). The Network Application Agent is installed on a performance management system connected to the same switch as the database server. The switch is configured to mirror the database server switch port to the performance management system's switch port. The Network Application Agent is configured to monitor siebel1 and port 1433.

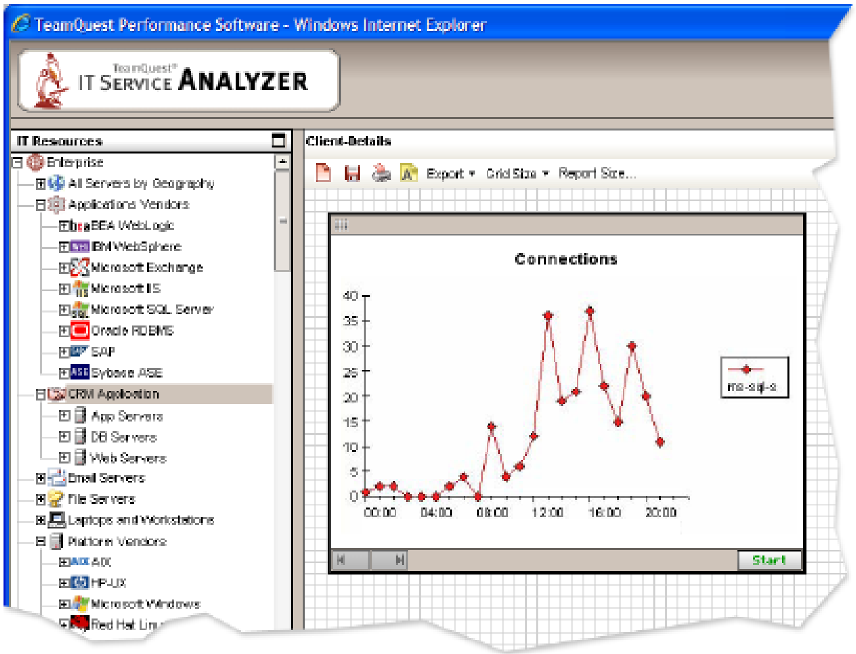
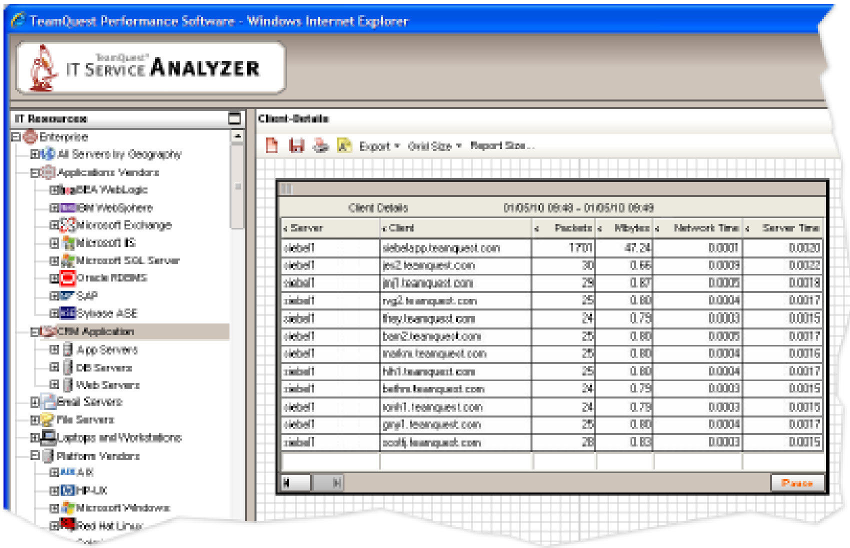


Figure 6
Chart of CRM Application Client System Connections

The performance data collected by the Network Application Agent is organized by server. In this example, the network application data is stored in the TeamQuest database under the server named siebel1 which belongs to the IT Resource group CRM Application. Below is a chart (see Figure 6) that shows the number of client systems connected to the database server. The performance data in the chart is plotted over a one day time period.



Client Details 01/05/10 08:48 - 01/05/10 08:49

Server	Client	Packets	Mbytes	Network Time	Server Time
siebel1	siebelapp.teamquest.com	1701	47.24	0.0001	0.0020
siebel1	jes2.teamquest.com	30	0.66	0.0009	0.0022
siebel1	jinj1.teamquest.com	29	0.87	0.0005	0.0018
siebel1	rvg2.teamquest.com	25	0.80	0.0004	0.0017
siebel1	they.teamquest.com	24	0.79	0.0003	0.0015
siebel1	bein2.teamquest.com	25	0.80	0.0005	0.0017
siebel1	malkni.teamquest.com	25	0.80	0.0004	0.0016
siebel1	hih1.teamquest.com	25	0.80	0.0004	0.0017
siebel1	bethra.teamquest.com	24	0.79	0.0003	0.0015
siebel1	ionh1.teamquest.com	24	0.79	0.0003	0.0015
siebel1	giny1.teamquest.com	25	0.80	0.0004	0.0017
siebel1	scotfj.teamquest.com	28	0.83	0.0003	0.0015

Figure 7
CRM Application
Client System Detail

From this chart, more detail can be obtained by drilling-down (see Figure 7) to see which client systems were connected to the database server and each client system's activity and response times.

With this type of information, (The charts above only depict several of the performance data items collected by the Network Application Agent), application performance can be tracked and application service levels can be monitored. When a performance problem is identified, it can be further isolated by correlating the network application performance data with the detailed Microsoft SQL and Microsoft Windows performance data collected by the TeamQuest Manager System Activity agent.

Multi-tiered Example

For illustration, we will use a Java-based web site application example. HTTP requests come in from the client systems. The load balancer passes the request to the HTTP servers. The HTTP servers either return static content directly or pass the requests back to the application servers. The HTTP servers use application plug-ins to load-balance their requests to the Java Application servers. The application servers coordinate the tasks needed to satisfy the request including any interfaces to the database server.

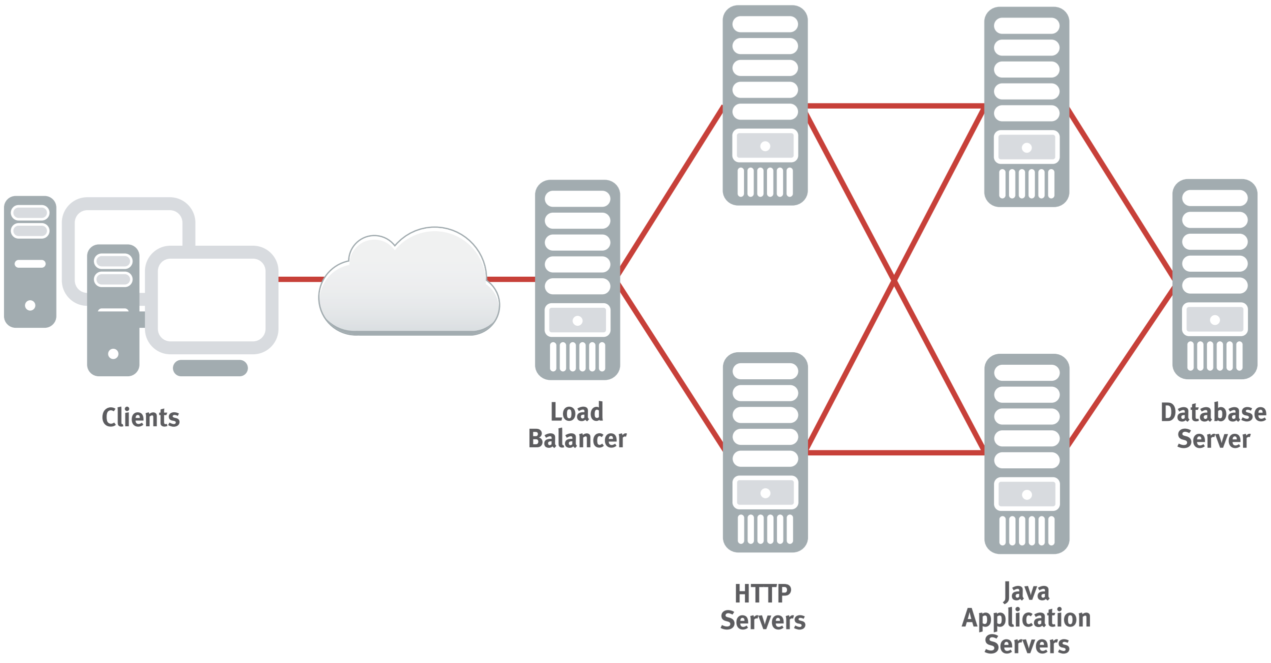
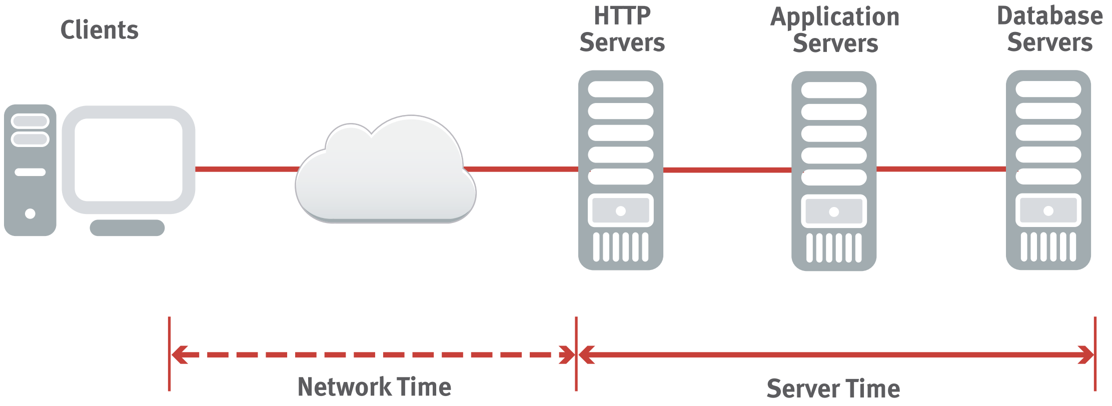


Figure 8
Logical View of Multi-tiered Java Application

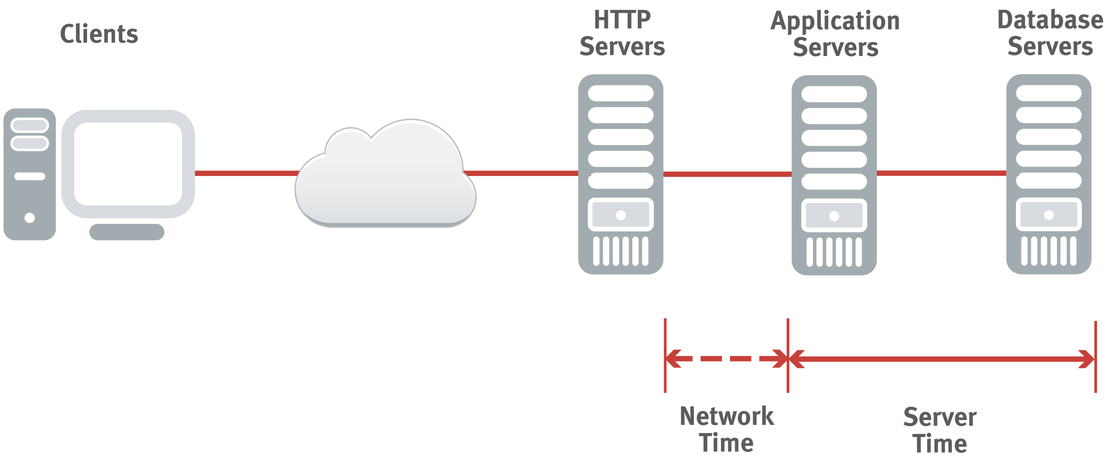
The HTTP servers are running Apache using port 80, the Java Application servers are running WebSphere using port 80, and the database server is running Oracle using port 4443. The Network Application Agent is configured with the HTTP servers and port 80, the Application servers and port 80, and the Database server and port 4443. This example assumes all five servers are all connected to the same switch. The illustration (see Figure 8), does not depict the firewalls, routers, and switches used in the application infrastructure. If the five servers were not sharing a single switch, multiple Network Application Agents would be required to monitor the entire application.

Remember from the first example that the performance data collected by the Network Application Agent was organized by server. Therefore, in this example performance data is stored for the two HTTP servers, the two application servers, and the database server.



For an overall application perspective, start by looking at the response times associated with the HTTP servers. These values will represent the activity that traverse any and all three tiers (see Figure 9).

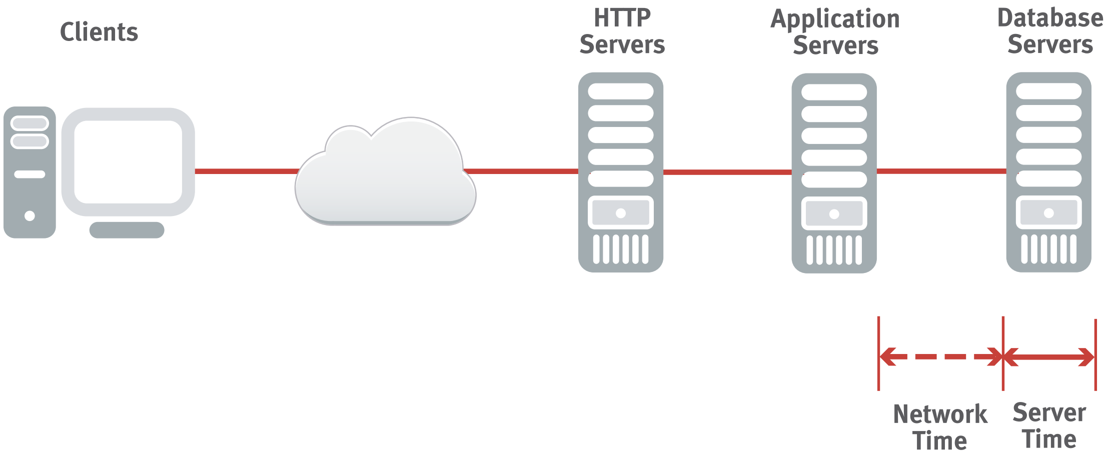
Figure 9
HTTP Server Tier Response Time



The response times associated with the application servers will represent the activity from the back two tiers (see Figure 10).

Figure 10
Application Server
Tier Response Time

In addition, the response times associated with the database server will represent the activity in the last tier.



By combining the performance data together from all three tiers, the components of response at each tier level can be derived.

Figure 11
Database Tier
Response Time

Deployment Steps

The following procedure outlines the steps necessary to deploy the Network Application Agent.

1. Identify the application(s) to monitor.
2. Identify the server(s) that runs the application(s).
3. Identify the port number(s) the application(s) uses to communicate.
4. Identify the switch(s) that connects the servers identified in Step 2.
5. Identify a system to host the agent.
6. Mirror the switch ports for the servers identified in Step 2 to a single switch port and make sure the system identified in Step 5 is connected to the mirrored switch port.
7. Install TeamQuest Manager and the custom network application database on the system identified in Step 5.
8. Configure the Network Application Agent installed in Step 7 with the servers identified in Step 2 and the port numbers identified in Step 3.
9. Enable the agent that was configured in Step 8.

Bibliography

TeamQuest Performance Software Administration Reference Manual for UNIX Systems, TeamQuest Corporation, TQ-10022.1.

TeamQuest Performance Software Administration Guide for UNIX Systems, TeamQuest Corporation, TQ-10020.1.

TeamQuest Performance Software Statistics Reference Manual for UNIX Systems, Volume 1, TeamQuest Corporation, TQ-10020.1.

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